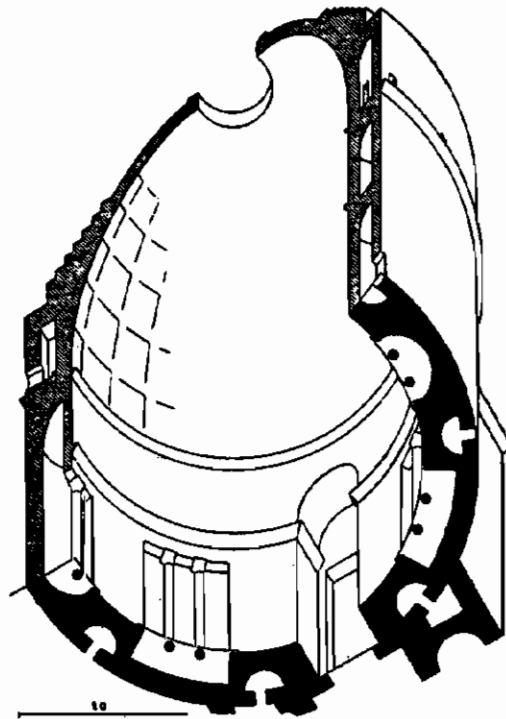


ARCHITECTURE : SOME BASICS

© Paul V. Turner, 1992



Contents

What is Architecture?	page 1
Ways to Look at Architecture	3
Architectural Structure	7
Architectural Drawings	13

WHAT IS ARCHITECTURE?

Everyone would agree that architecture has to do with buildings. But all buildings? And other things besides buildings? When we try to be more precise, agreement is elusive. It used to be that most experts on the subject thought of architecture rather restrictively, as including only structures that met certain criteria or standards. Nikolaus Pevsner began his Outline of European Architecture (first published in 1943) this way: "A bicycle shed is a building; Lincoln Cathedral is a piece of architecture." He explained that "the term architecture applies only to buildings designed with a view to aesthetic appeal."

Today, few architects or architectural historians would subscribe to such a categorical definition, or would feel confident proclaiming that some classes of buildings are devoid of esthetic appeal. Most would agree with Spiro Kostof's call (in the introduction to his A History of Architecture) for "a more inclusive definition of architecture." So it is now common to think of architecture as embracing all types of man-made structures, as well as whole cities and other kinds of human shaping of the environment. Kostof goes so far as to state that "Architecture [is] the gift of making places for some human purpose" -- a definition which, if taken literally, would include agricultural cultivation and nearly all human activity. Such a broad definition risks losing its usefulness; even Kostof, in his textbook, restricts his subject largely to buildings.

In this course, we too shall deal principally with buildings and other kinds of structures (such as bridges) that fit more-or-less common notions of architecture. But it is important to be aware of the widely differing views of what architecture is, to question these views ourselves, and to think about their implications. (Consider, for instance, Kostof's remarks in his introduction about the elitism of earlier definitions of architecture, in contrast to his own, more "democratic" conception.)

Architecture can also be defined in terms of the concerns it addresses. Since Antiquity, architects have emphasized the multi-faceted nature of their profession. The ancient Roman architect and writer Vitruvius stated that architecture concerned itself with firmitas, commoditas and venustas -- strength, functionalism and beauty. Architects still find this a good formulation, although they might add concerns such as economy or environmental sensitivity. The making of architecture is a complex creative activity, requiring skills in engineering, esthetics, finance, psychology, management, ecology and other fields.

Especially in the modern period, there have been widely differing ideas about what qualities are most important to architecture. "Form follows function" and similar pronouncements have shaped the popular notion of modern architecture as dealing mainly with practical matters. Yet the pioneering modernist Le Corbusier expressed a very

different attitude when he wrote that "Architecture is the wise, correct and magnificent play of volumes assembled under light." Conflicting views of what architecture is, or should be, continue to be voiced and debated today by architects and others interested in architecture. These "others" potentially include everyone on earth, since architecture shapes the lives and environment of all of us.

Another issue sometimes debated by architects is whether buildings have to be constructed in order to qualify as architecture. Many architectural designs are never executed, either because the client rejects the design for some reason, or because there never was a client. Especially since the Renaissance, architects have frequently produced designs that are imaginary or experimental, with no expectation of construction. As this "paper architecture" tends to be unusual and avant-garde, it often attracts the attention of architectural critics and the general public, when exhibited or published. It can certainly be argued that only a completed building, satisfying the requirements of structural solidity and human use, is truly architecture. Yet visionary designs can play a role in exploring new ideas and expanding the boundaries of architecture. The study of architecture should include the visionary as well as the constructed. It is important to remember, however, that studying drawings or even photographs of architecture is no substitute for experiencing the real thing -- the three-dimensional, spatial, structural, functional and environmental totality of an executed work of architecture.

WAYS TO LOOK AT ARCHITECTURE

We are surrounded by architecture for the greater parts of our lives. Yet most people are not very conscious of it — don't really see it. Taking a course on architecture offers the opportunity to develop the habit of looking at, and thinking about, the constructed world we inhabit.

There can be various reasons for looking carefully at architecture and analyzing it. One is evaluation. Is a particular building good or bad architecture? This activity, architectural criticism, may be done in a public context or for purely personal motives, as when one is deciding whether to buy a house or to construct an architect's design. Another reason for analyzing architecture is to understand it, to shed light on the intentions and values of the people who built it and on the culture that produced it. This is largely the goal of architectural history. Finally, we can look at architecture simply for appreciation, to increase our enjoyment of buildings and cities and to heighten our awareness of our environment.

Each of these activities may require a somewhat different kind of analysis. And the process may be different depending on whether we are looking at real architecture, or photographs and drawings of architecture. But let's assume we are in the presence of an actual building. Whether we want to evaluate, understand, or simply enjoy it, what questions can we ask?

First, keep in mind that a building is three-dimensional and has an inside as well as an outside. Don't look at it from just one position, as if it were a painting. Walk around it and through it, experiencing all its parts. Also, unlike most paintings and sculptures, which are movable and therefore can be viewed as independent objects, a building is an inseparable part of its environment. Think about how it relates to its surroundings, both natural and man-made. Does it blend into its environment or make a strong contrast with it? If it is close to other buildings, is it similar to them in size, shape or other qualities? Is there landscaping near the building; if so, how does it enhance or detract from the architecture? (Or how does the architecture enhance or detract from the landscaping?)

Also keep in mind that architecture serves specific human needs. What are the functions of the building? Observe how people use it. To what extent do the functions seem to have determined the form of the building? Or is it a building that could serve many different functions? Some architects, such as Mies van der Rohe, have preferred forms of a universal nature, suitable to almost any function, while other architects, such as Frank Lloyd Wright, have tended to shape each building to its individual program. (A building's "program" is the sum of all its functional requirements.)

In thinking about a building's functions, consider not only its

obvious, practical functions (the required seating capacity in an auditorium, the number and size of offices in an office building, etc.). Architecture can serve less objective functions, such as creating a sense of grandeur, or appearing to welcome visitors, or projecting an institutional image of some sort.

How are the parts of the building organized? Are they arranged symmetrically or asymmetrically? Is there a regular pattern of equal parts or is the composition irregular? In considering these matters of form, don't focus only on the external shape of the building; analyze also its ground plan. If a drawing of the plan is not available, try to sketch it yourself, after walking around and through the structure.

Does the composition of the building have a dominant character? Is it emphatically horizontal or vertical, compact or dispersed, simple or complex? Does it have a static kind of order, or is it dynamic and suggestive of movement? Can you identify principles underlying the organization of the parts?

Consider not only the physical mass of the building — its walls, columns, roof, etc. — but the internal spaces these parts enclose. Think of these spaces as things in themselves, not just as voids. (Imagine filling the building with a fluid material like plaster, letting it dry and then removing the building itself, leaving only its solidified "space.") What are the forms and relationships of these spaces? Are they more-or-less equal in size and shape, or are they greatly varied? Do they build up to a climax or have some other kind of implied sequence? Walk through the building and experience these spaces and the effects they have on you. Do you feel tightly enclosed or is there a sense of expansiveness? Do you feel drawn in a particular direction, or free to move casually through the building? What are the proportions of the spaces (for example, are they higher or lower than they are wide)? Do these proportions elicit particular feelings or reactions? Are some spaces more comfortable or interesting than others?

How is the interior of the building lighted? Is it predominantly natural or artificial light? Is the light-level uniform throughout the structure, or are some of the spaces brighter than others -- and if so, what are the reasons for this? Besides practical reasons, there may be esthetic or psychological motives for modulating the intensity of light in a building. Does natural light come through windows or skylights? What are the shapes, positions and relationships of the openings? And how do these factors affect the nature of the illumination, the patterns of light and shadow, and our perception of the spaces?

Look at how light falls on the exterior, as well as the interior of the building. Are strong patterns of light and shadow created by the building's external parts and openings? Remember that the effects of sunlight on architecture change continually, as the sun moves through the sky during the day, as the seasons progress, and as climatic conditions vary. Ideally, one should observe a building on many different occasions to experience its various conditions of external

and internal illumination.

Having analyzed the building's shape, plan, proportions, spaces, lighting, etc., consider the relationship of these formal properties to the building's function. Is the architectural form appropriate to the function? Does it reveal a particular attitude about the way the function should be fulfilled, or about the way people should use the building?

Think about how the building was constructed. Is it supported mainly by walls, or columns and beams, or arches? (See the following section on architectural structure.) What materials are used? Do they seem appropriate to the structural form of the building and to its overall character? Are the materials that actually support the building visible, or are they covered by other materials? What kinds of surfaces and colors do the materials have, and how do these relate to other properties of the building? For example, is there a color scheme that emphasizes the regular intervals of the building's structural system? Do the colors make the building look simpler or more complex than it actually is?

What is the character of the building's surfaces? Smooth or rough, shiny or mat, plain or patterned? Does this result from the nature of the materials themselves (wood, stone and metal all have distinctive appearances), or from the way the materials are handled? Stone, for instance, can be given a multitude of different kinds of surfaces and textures. Does the character of the building's surface create certain effects or impressions? For example, a building with smooth surfaces may give the impression of having very thin walls and therefore being very light-weight, while rough surfaces may make the walls and the building look heavy and massive. (In reality, either impression may be incorrect.) As with all architectural traits, neither one of these qualities is necessarily good or bad. But one can ask whether a particular characteristic is appropriate to other aspects of the building's form, to its function, or to the image the building projects.

Does the building have ornament? Is it applied ornament, such as statuary or painted murals, or is it an integral part of the structure? Does it reinforce other architectural traits, such as a regular pattern of columns or other structural elements? Does the ornament convey a message? This may be an explicit message, as in the case of sculpture that proclaims the function of the building (a statue of Christ on the façade of a church), or merely an impression of some kind — a sense of authority, or of frivolity.

Architecture can convey significance in a multitude of ways, and not only by means of ornament. The very form of a building, and the way its parts are organized, can have implied meaning. This is often a very subjective matter (people may have strikingly different views of the "meaning" conveyed by a building), but it nevertheless can be an important component in understanding architecture. Some modern architects, for instance, have felt that symmetry signifies authoritarianism, and they have therefore favored asymmetrical designs as expressing a more liberal ideology.

So far, we have considered the building just as it is, today. But all buildings have histories, which are relevant to any architectural analysis. If a building has been altered, for instance, knowledge of its original condition is obviously necessary for an understanding of its builders' intentions. Even a newly-constructed building has a history — the story of the client's original needs and wishes, the architect's process of design and relationship with the client, and the construction process, during which unforeseen changes in the design may have occurred.

Visiting a building, we may have no access to documentation of its history. But careful observation of the structure itself can often provide clues to its past -- to additions, remodelings or other physical changes, and to changes in the way the building has been used. We can also make deductions about transformations in the building's environment: new structures that have been erected near it, affecting it in various ways; changes in landscaping; new patterns of adjacent streets or urban activity, etc. Awareness of such things will increase our understanding of how architecture adapts to new conditions over time, never remaining exactly the same.

Another aspect of a building's history is its relationship to everything that has been built before. Every building, whether designed by an architect interested in historical precedent or constructed by someone with no interest in history, is inevitably shaped by tradition. This may be simply a "vernacular" tradition -- of barn-building, for instance, in a particular geographical region. Or it may be the tradition of an historical style, used faithfully or transformed by an architect in the design of a new building. Studying architectural history can therefore increase our understanding of any building we encounter in our environment.

Bibliography

S. E. Rasmussen, Experiencing Architecture, Cambridge, MA, 1962.

Roger Scruton, The Aesthetics of Architecture, London, 1979.

Joshua Taylor, Learning to Look: A Handbook for the Visual Arts, Chicago, 1981. (Contains sections on architecture)

Bruno Zevi, Architecture as Space, New York, 1957.

ARCHITECTURAL STRUCTURE

The word "structure" can mean simply a building ("There are five structures on the farm"), but in a more technical sense it denotes a body of concepts and principles that are fundamental to architecture.

The science of architectural structure is a branch of engineering, involving physics, calculus, the strength of materials, and other subjects. Architects naturally must be knowledgeable in this field, but they still often need the assistance of specialized structural engineers. For this course on the history of architecture, no detailed comprehension of architectural structure is needed; but an understanding of some of its basic notions will be helpful.

Loads

In order for a building, bridge or other structure to remain standing, it must support its loads. There are several types of loads: dead loads, live loads, dynamic loads, etc. The dead load consists of the actual structure itself -- its walls, floors, roof and other permanent parts. Live loads are additional things that may be in or on a structure, such as human beings, furniture, movable partitions, automobiles (in the case of bridges or highway overpasses), etc. Since live loads change and are partly unpredictable, architectural design must take into account estimations of the greatest loads a structure is likely to experience -- estimations often determined by formulas in building codes.

Both dead loads and live loads exert force on a structure by their weight, and therefore act in a vertical direction. They push down on the structure and the ground beneath it. Other types of loads, however, can act in any direction. Wind load, for example, is the force exerted by air pressure, which normally acts horizontally, tending to tip a building over or bend it (skyscrapers regularly bend in the wind, their upper floors often moving several feet back and forth), and sometimes even in an upward direction. Wind load is called a dynamic load, as it can act with great suddenness and changing force, unlike the "static" dead loads and live loads. The other principal dynamic load is earthquake load, which also can exert its force in many directions, not to speak of extreme suddenness and potential risk.

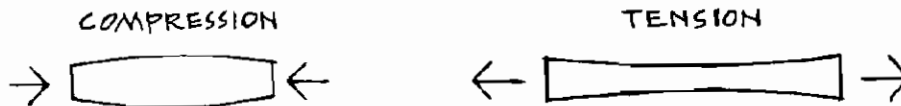
Other, miscellaneous loads include thermal loads -- the forces exerted by the expansion or contraction of parts of a building, due to changes in temperature. (This, too, can be greater than one might imagine; very long structures, such as bridges, usually require "expansion joints" or other devices to accommodate thermally-caused changes in the length of the structure, changes which otherwise would create potentially disastrous forces within the structure.)

A building is thus subject to many kinds of forces or loads, acting in

various ways and different directions. For our purposes, however, the effects of the dead loads of the structure itself are the most important to consider.

Compression and Tension

The parts of a building can experience two states as a result of the loads acting on them: compression and tension. Compression is the pushing together of an object, which tends to make it shorter or denser. Tension is the pulling apart of an object, which tends to stretch it.

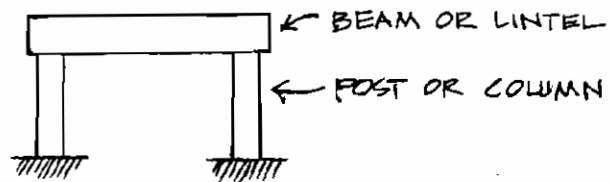


These states can be visualized most easily when thinking of a flexible material such as rubber, which can be compressed or stretched quite a lot. But all materials, including wood, stone and steel, experience similar effects when subject to compressive or tensile forces, although the degree of shrinkage or elongation may be very small. (Despite the extreme inflexibility of steel, a steel skyscraper may be as much as an inch shorter than it would be if it did not experience the compressive effects of its own weight.)

Structural systems

The most basic architectural accomplishment is to span a distance -- to create a floor, or roof, or bridge or some other spanning element. There are several fundamentally different ways this can be done. These ways, called structural systems, include the following. (They can be described best visually, rather than in words.)

POST & BEAM
OR COLUMN & LINTEL
OR THE TRABEATED
SYSTEM



ARCH
OR THE ARCUATED
SYSTEM

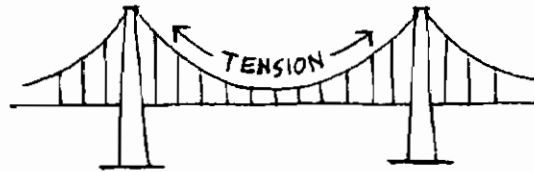


SUSPENSION
SYSTEM

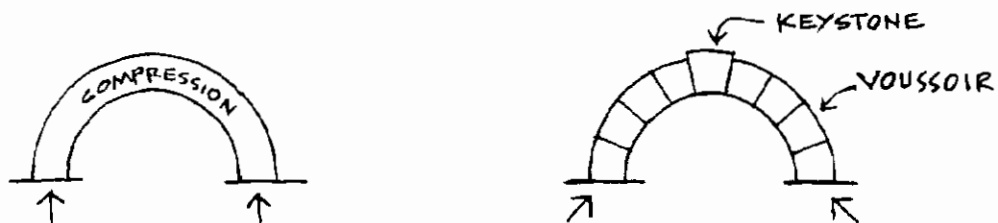


One thing that makes these structural systems essentially different from each other is that they experience different patterns of compression and tension, in response to the force of their loads.

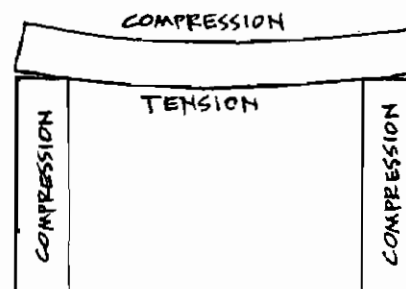
First let's consider the suspension system, as illustrated by a suspension bridge. (Another example would be a tent, in which the tent fabric is comparable to the cables of the suspension bridge.) The spanning part of the structure, the suspension cables, experience only tension. They are pulled, or stretched, by the force of their own weight and the weight of the other loads they carry, such as the roadway hung from them.



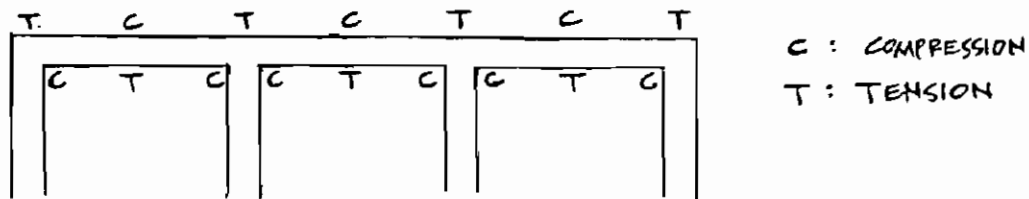
An arch, in contrast, is completely in compression. All its parts press against each other, and its total weight presses against the ground or whatever else supports it. (The force, besides pushing down, may push partly sideways; this sideways or "lateral" force will be important in understanding Roman and Medieval architecture.) An arch may be one solid piece, of steel or some other material; but traditionally arches have been composed of separate pieces, usually stone or brick. The individual pieces are called voussoirs, and the voussoir at the top of the arch is called the keystone.



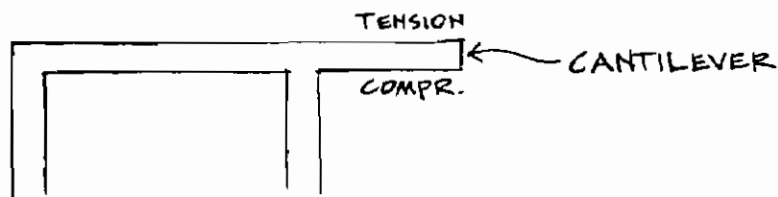
In the post and beam system, the posts are in compression, but the beam experiences both compression and tension. One can understand this best if one thinks of the beam as having an exaggerated sag (or "deflection," as architects say), due to the weight of its loads. The top part of the beam, being squeezed together, is in compression; the bottom part, being pulled apart, is in tension.



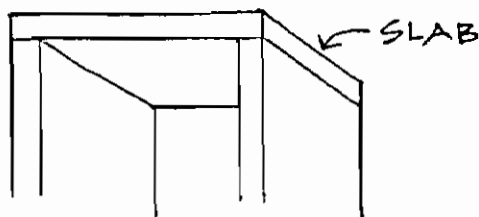
If a beam is supported by more than two posts, or if the beam is firmly attached to its posts, the patterns of compression and tension will be more complex than indicated above.



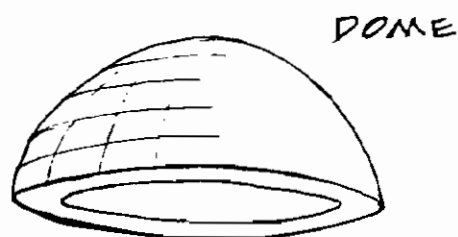
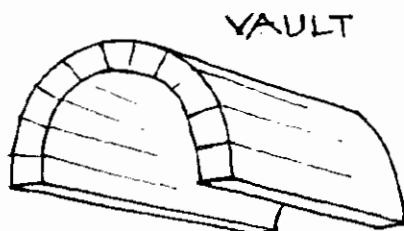
Another variation of the post and beam system is the cantilever, created when a beam extends into space and is unsupported at its end.



If a beam is extended three-dimensionally, it becomes a slab.



If an arch is extended three-dimensionally, it becomes a vault. If an arch is rotated, it becomes a dome.

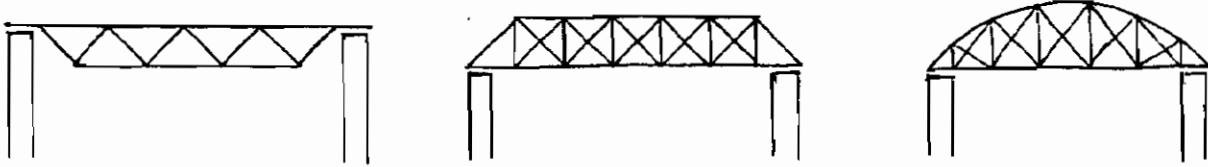


Vaults and domes are sometimes called separate structural systems, but they are best considered as part of the arch system, since they all respond to the forces of compression and tension in fundamentally the same way.

Another category of forms sometimes considered a separate structural system is the truss. But this is probably best thought of as a variation on the post and beam system. A truss is like a beam, but rather than being solid it is made up of individual pieces, with the advantages that it can be longer than an ordinary beam, and can be lighter. (A truss might be considered a beam from which much of the

mass has been removed.) The pieces at the top of a truss are in compression, the pieces at the bottom in tension (like the top and bottom of a beam). The remaining pieces are some in compression, some in tension. Many truss patterns have been devised, responding to different conditions and structural requirements.

EXAMPLES OF TRUSSES

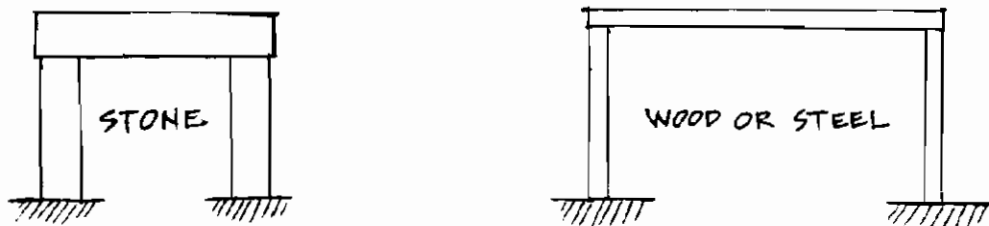


Besides the post and beam, arch, and suspension systems, there are few separate structural systems. One, developed only in recent years, is the inflated system -- in which the structure, made of fabric or a similar material, is kept as airtight as possible and is supported by air pumped into it. Although such a structure may look like a tent, it deals quite differently with its structural forces. In fact, unlike all other kinds of buildings, which press down on the ground beneath them, an inflated structure pulls up; its point of contact with the earth is in tension, not compression. (It has to be held down.)

Architectural Materials

Structural systems can be described abstractly, with no reference to specific methods of construction or architectural materials. Theoretically, any material might be used to construct any structural system. But practically, certain materials are better suited to certain structural systems. The main reason for this is that materials have different properties and respond differently to compression and to tension. Steel, for instance, is very strong both in compression and tension. Stone is strong in compression but only moderately in tension (it tends to split when stretched). Rope is strong in tension but worthless in compression. Wood is strong in tension, but only in the direction of the grain. And so forth.

Stone, therefore, is good for constructing arches, where compression prevails, but is no good for the cables of a suspension bridge, where great tensile strength is required. Rope can be used for the cables of a footbridge or a tent, but has few other architectural uses. Wood, steel and stone may all be used for post and beam construction, but the dimensions and proportions of the structure will vary, due to the differing properties of the materials. Since beams experience tension, a beam made of steel can be much longer and thinner than a beam made of stone.



Architectural materials can be merged to create new substances that combine their individual properties. The best example is reinforced concrete (formed by pouring concrete around steel rods), in which the compressive strength and the cheapness of concrete is combined with the tensile strength of steel. Reinforced concrete is therefore especially useful in constructing beams, slabs and cantilevers, which must be strong both in compression and in tension.

Only when we consider structural principles and specific materials can we talk about real architectural shapes. The forms of architecture result from the interaction of structural forces and the properties of materials — as well as from many other factors, such as function, climatic and economic considerations, and esthetic decisions.

Bibliography

Mario Salvadori, Why Buildings Stand Up, New York, 1980.

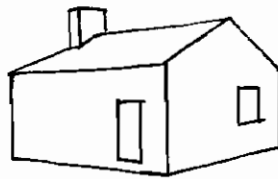
Forrest Wilson, Structure: The Essence of Architecture, London, 1979.

ARCHITECTURAL DRAWINGS

Drawings are the most important tool of the architect in designing a building, and of the builder in constructing it. Drawings are also essential for anyone who wants to study an architectural design or even a completed building. One might think that a photograph of a structure would always be preferable to a drawing of it. But in fact, drawings can often reveal more information about a building than a photo, and in some ways more than even viewing the building itself.

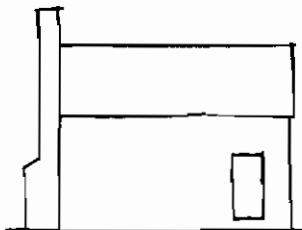
Architects often talk about "reading" a drawing or making a drawing "legible." These metaphors are just, for architectural drawing is like written language in certain ways. Neither simply reproduces reality; both employ symbolic means of communication. Understanding architectural drawings requires learning their conventions and their grammar.

Let's visualize a simple building -- a one-room house with a door and window and chimney. Most useful for giving an general idea of the house is a perspective sketch, which portrays it approximately as we would see it in reality, with the parts closest to us appearing larger than those farther away. (The nature of perspective drawing will be discussed later.)



The most basic types of drawings used by architects and builders are the elevation drawing, section drawing and plan.

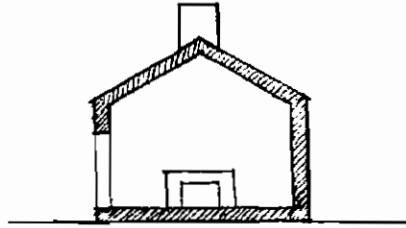
Elevation



An elevation, or elevation drawing, shows a building (usually looking straight at one side of it) without perspective diminution. That is, parts of the building that are farther away from us are drawn with the same dimensions as equal-sized parts that are closer. In the elevation above, for instance, the top and bottom edges of the roof

are given the same length, while in a perspective drawing the top edge would be drawn shorter since it is farther away. Elevation drawings are therefore abstractions, as they do not show a building as it would ever be seen in reality. Why, then, are they used? The main reason is that elevation drawings have a uniform scale, which is not true of perspective drawings. If, for example, an elevation drawing has a scale of 1" = 20' (one inch equals twenty feet), this scale applies to every part of the drawing. This uniformity is necessary for an architect or builder who wants to determine the dimensions of a building from the drawing.

Section



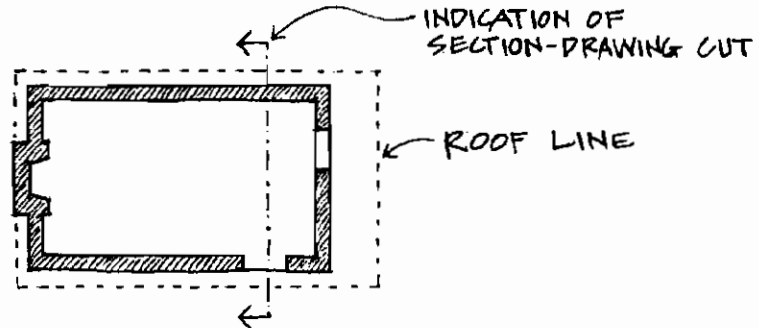
A section, or section drawing, shows a building as if it were cut with a knife and one part removed, so we can see inside and see the thickness of the walls and other cut parts. (These cut areas are usually shown in black or with hatched lines or in some other manner to distinguish them.) Otherwise, the drawing is like an elevation: there is no perspective diminution, and parts of the building that are visible beyond the cut (such as the back wall and chimney, in our little house) are shown in elevation. Since a section cut can be made at many different places in a building, there can be many different section drawings for any given building. Note that in the example above, the cut is made through the doorway.

Plan



A plan, or ground plan or floor plan, is a section drawing in which the cut is made horizontally -- as if the top part of the building were removed and we are looking down at the lower half. Again, the cut can be made at many different places (different distances above the ground). The normal convention, with floor plans, is to make the cut about four or five feet above the floor, so that windows and doors will be shown. Note the difference between the ways a window and a door are represented in a plan, due to what we see below the cut in each case.

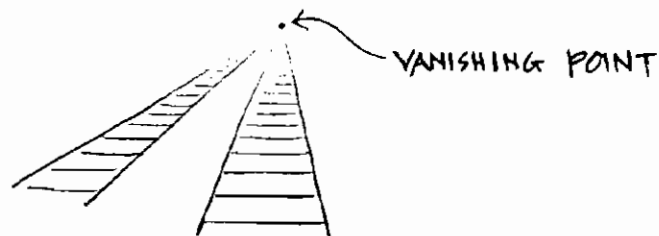
A plan may include additional kinds of graphic information. Dotted lines, for example, can indicate things that are not actually visible according to the conventions of the floor plan — things, for instance, that are above the cut, not below it. If our house had an overhanging roof that we wanted to indicate in the plan, a dotted line could show its placement. A different type of line might be used to relate the plan to another drawing — to show, for example, where the cut of a section drawing was made.



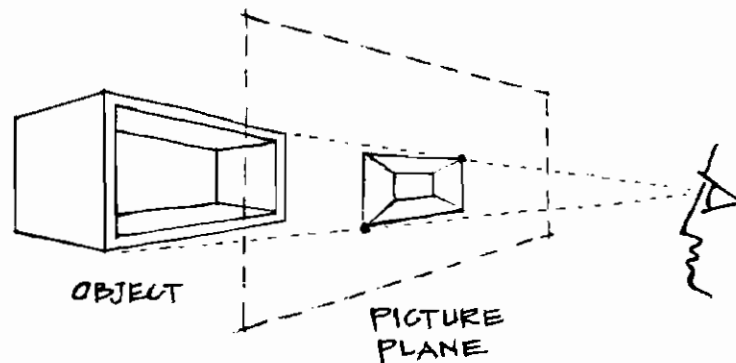
Perspective

Perspective drawing is a complex subject, about which whole books could be (and have been) written. But a few basic points can help in understanding its principles.

Perspective representation attempts to portray three-dimensional reality on a two-dimensional surface. This can be done in various ways, including the depiction (usually in painting) of "atmospheric perspective," the decreased clarity of distant objects. But the principal perspective method involves portraying objects as they appear to diminish in size as they recede in space. A basic principle here is that parallel lines, receding in space, appear to converge on a single point — called the vanishing point. A familiar example is railroad tracks.

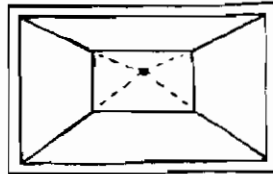


Important for understanding perspective is the concept of the "picture plane," an imaginary plane situated between an object and the observer of the object. The points where the picture plane is intersected by the sight lines from the observer's eye to each part of the object, form the perspective representation.

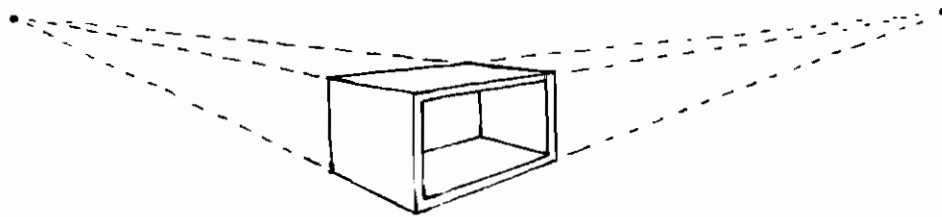


Lines in the object that are parallel to each other and to the picture plane will be parallel to each other in the perspective drawing. All other lines will be seen as receding. And each set of receding parallel lines will have its own vanishing point.

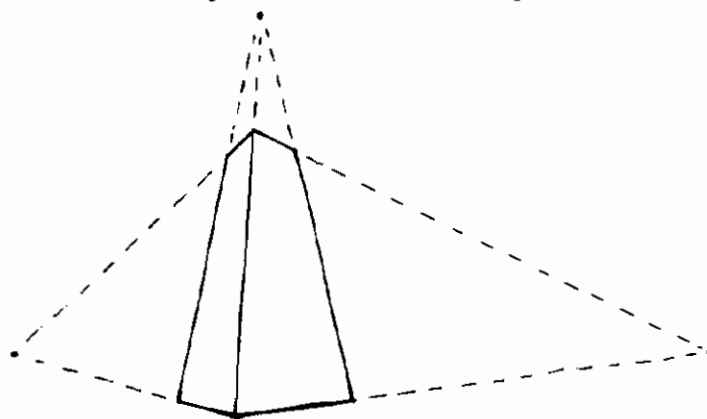
If a simple rectangular object -- with three sets of parallel edges, corresponding to the object's height, length and depth -- is situated with two of these sets of edges parallel to the picture plane, there will be only one set of receding parallel lines and therefore only one vanishing point. This is called one-point perspective.



If the same, box-like object is rotated (in relation to the picture plane), there can be two sets of receding parallel lines and two vanishing points. Two-point perspective.

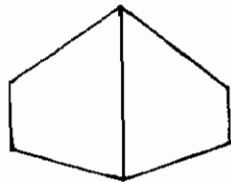


If all three sets of lines are non-parallel to the picture plane, there will be three vanishing points (hence three-point perspective). This is not common in architectural drawing, except sometimes in the case of a very tall building, depicted as it would be seen if the observer had to turn his head upward to see the top of the structure.

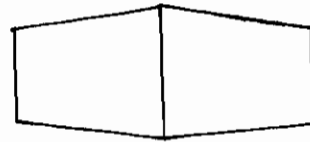


In the case of objects with more complex, non-rectangular shapes, there can be many additional vanishing points, depending on the number of sets of parallel lines in the object.

One might think that there is only one way to portray an object in perspective from a given angle. But other factors are relevant here, such as the observer's distance from the object. The perspective shape changes as the observer moves closer or farther from the object. Seen close-up, an object appears to have more perspective diminution than when seen from afar. This fact is sometimes exploited by architects to produce dramatic drawings to impress a prospective client, who then may be disappointed when the building is constructed and doesn't look like the drawing (unless one gets very close to the building). This is an example of how drawings can be misleading and must be viewed critically.



OBSERVER CLOSE TO OBJECT



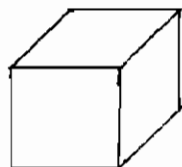
OBSERVER FAR FROM OBJECT

Since perspective drawings do not have uniform scales, they are not normally suitable for an architect's "working drawings" (the drawings a builder uses to execute a design). Plans, elevations and sections are needed here. But perspective has important architectural functions, especially during the process of design, to aid the architect in visualizing the building, and later to portray the designed structure for the client or the general public.

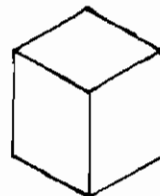
Producing a strictly accurate perspective drawing of a building can be a complex procedure. There are various graphical techniques for constructing the perspective image from the building's plan and elevations, in relationship to the observer and picture plane. (Today, the job can also be done with the assistance of "computer-aided design" programs.) But most architects become skilled at free-hand perspective drawing, and make countless perspective sketches from the conception of a building through the entire design process.

Other types of drawings

Besides plans, elevations, sections and perspectives, other kinds of drawings are sometimes used to portray architecture. One class of drawings includes types called oblique, axonometric, isometric, dimetric, etc. These drawings create the illusion of perspective depth although there are no converging lines or vanishing points.



OBLIQUE

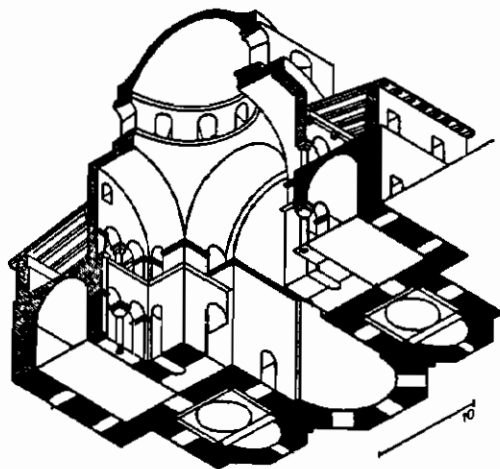


ISOMETRIC

These drawings have the advantage, over perspectives, that they are easier to construct, and also that they have uniform scale. (There may be one uniform scale, or one scale for horizontal dimensions and another for vertical dimensions, or other variations -- but in any case the dimensions can be read from the drawing, which is not true of perspective drawings.) The disadvantage of oblique and related types of drawings is simply that they do not depict three-dimensional reality as convincingly as perspective drawings. Since there is no true perspective diminution, most people tend to perceive the objects as being tipped up unnaturally, or as producing an optical illusion in which parallel lines seem to diverge rather than converge as in perspective. The drawings just don't look quite right. It should be noted, however, that cultural factors no doubt play a role in these perceptions. The use of perspective drawing has been largely a Western phenomenon, beginning in the fifteenth century. In other cultural traditions (and in the West before the Renaissance), the three-dimensional world has usually been portrayed in non-perspective ways. In the traditional art of Asian cultures, for instance, buildings are often depicted with the oblique system. The people of these cultures surely did not perceive these representations as unnatural or flawed. This suggests the subjectivity that is inherent in the perception of drawing systems and their conventions.

Composite drawings

All the kinds of drawings described above can be combined in various ways. A building can be depicted in perspective but given a cut, as in a section drawing -- producing a section perspective. Floor plans can be combined with perspectives or oblique or isometric drawings, and so forth. A single drawing can thereby contain as much information as two or more simpler drawings. Some composite drawings are so complex that they appear almost illegible at first, especially to someone not familiar with the language of drawings. But careful examination of such a drawing, keeping the principles of the basic drawing types in mind, will lead to decipherment.



ISOMETRIC, WITH SECTION
& PLAN, SEEN FROM BELOW

(A. CHOISY, HISTOIRE DE
L'ARCHITECTURE, PARIS,
1943, VOL. II, P. 42)