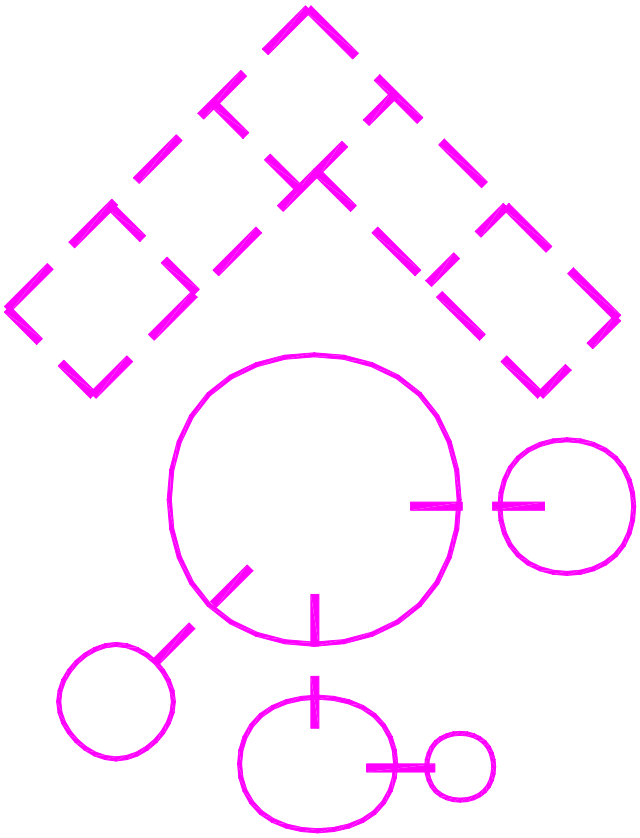
ARCHITECTURAL

DESIGN

ELEMENTS



CURRICULUM DEVELOPMENT

SECTION 7.0

Kurt Dietrich
SK85ON23

INDEX:

ABSTRACT:

Architectural design takes that which does not yet exist and creates a new reality within our built environment.

Figure 1: Neuschwanstein Castle, Germany

The means for creation lies in the careful trained implementation of design elements. It is only through proper training, experience and ultimately personal interpretation that successful solutions are provided to satisfy, enhance and validate our existence.

PREAMBLE:

The challenge of architectural design lies in the task of resolving a wide variety of functional and aesthetic requirements (the problem) into a coherent, satisfying structure (the solution). The effort to resolve the varied requirements makes use of specific design elements by assembling the properties of these elements into a coherent whole.

Architectural design is the result of solutions carried out through a design process to solve the individual issues while at the same time resolving the global issue of the building proper. It is an intense and complex mix that involves all sections of this curriculum using the design elements defined herein to fulfill the purpose of the design.

Every design has a purpose or reason for its existence; otherwise there would be no point in the existence of the solution. The purpose of architectural design is to create the potential built solution to satisfy the purpose or need of the client. The tools used for the design methodology are these design elements and principles.

Architectural design provides solutions for the human existence. The apparent success of good design will be evident in the continued use of the structure for its intended purpose. In our ever-changing worlds, flexibility is a key component of design, allowing for multiple uses of the same structure over time. The ability to adapt is a key function of human survival; the same can be said relative to the survival of our built environment.

COMPONENT INITIATIVE:

The intent of this curriculum section is to provide an understanding of design elements and principles relative to their use in the architectural design process. Within our built environment, there are specific design solutions that can create a reaction (emotional likes or dislikes) relative to our response to the structure. These basic principles work together, providing the tools and means through which to create the solution. No one principle may be solely responsible for the success or failure of a particular project as they all work in concert.

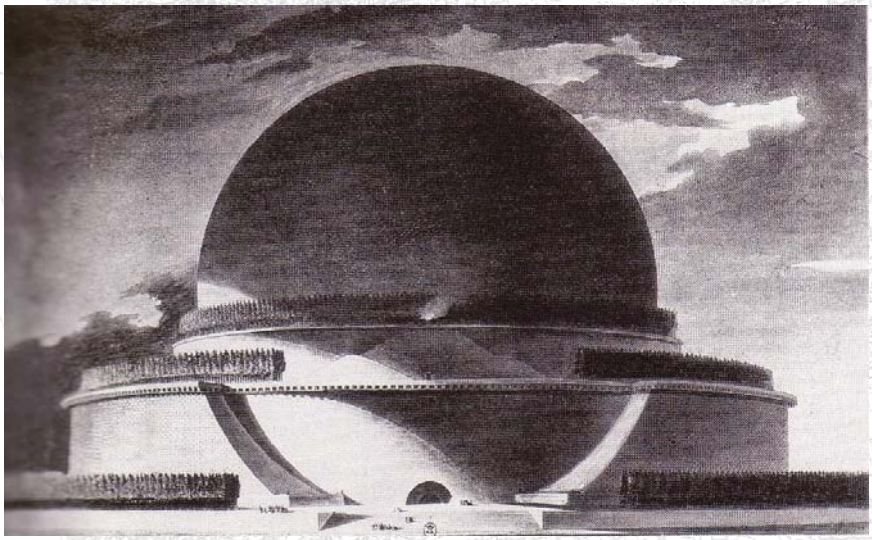


Figure 2: Cenotaph Design (Eduard Boullee)

Architectural design principles are not neatly identifiable as "fixed parameters". The reality is, they are flexible. It remains the responsibility of the architect to interpret the client needs through the use of the intended principles; allowing for variation and abstraction as required to suit the intended solution;

> *Design is a plan for arranging elements in such a way as to best accomplish a particular purpose.*[1]

[1] Charles Eames, as quoted in The Nature of Design, P. 13

COMPONENT COURSE MATERIALS:

The structure of this curriculum section presents the various elements of architectural design individually. Noted integration between the elements is discussed where applicable however, all of these elements and principles work together to provide a successful solution.

The design elements and principles reviewed provide an outline of the aspects of architectural design. The unity of these items is found in the specific theory and philosophy of the architect. There are two basic prevalent approaches to design, these being:

1. The whole is the sum of the parts
2. The whole is greater than the sum of its parts.

The latter approach follows the Gestalt theory wherein a structure will present specific properties inherent in its composition which can neither be derived from its parts nor considered simply the sum of its parts.

This section explores the specific elements and principles of design related to architecture, though the concepts within each element and principle may be applied to any act of design.

Instructional Strategy

- **Direct Instruction**
  - Lecture series with written material hand-outs.
  - Slide presentation showing design examples.
- **Indirect Instruction**
  - Lectures from visiting professionals.
  - Audio-visual presentations on design examples.
- **Independent Study**
  - Student research on design elements and principles.
  - Student completion of design folder and illustrations.
- **Interactive Instruction**
  - Design techniques, block studies.
  - Materials composition and external affects review.

Student Activities

- **Oral**
  - Presentation on design studies.
  - Class discussion related to design effects and environment.
- **Visual**
  - Graphic and physical production
  - Photographic and contextual studies.
- **Kinesthetic**
  - Production of graphic and block studies.
- **Written**
  - Report preparation/summary of design studies.

Assessment Method

- **Pencil and Paper Method**
  - Written testing on elements, principles and definitions.
  - Graphic submission in design analysis.
- **Performance Assessments**
  - Participation in class activities.
  - Presentation assessment relative to report and analysis studies.
  - Participation on group and assigned activities.
- **Personal Assessments**
  - Awareness of design elements and principles relative to environment.
  - Greater understanding of the built environment.

Figure 3: Goetheanum Boiler House, Dornach, Switzerland

Common Essential Learnings

- **Communication**
  - New terminology and definitions
  - Enhancement of non-verbal communication skills.

- **Creative and Critical Thinking**
  - Understanding of essential design components
  - Understanding of analysis and assessment of design solutions.

- **Independent Learning**
  - Research, graphic assignment, community studies.
  - Independent study of established design concepts and applications.

- **Numeracy**
  - Mathematical applications of design elements and relationships (scale and proportion).
  - Application of geometric principles.

- **Technological Literacy**
  - Understanding of composition elements, materials and design terminology (i.e.: proximity, connection, context)

- **Personal Social Values and Skills**
  - Enhanced knowledge base relative to the built environment.
  - Awareness of environment and context relative to design solutions.
  - Understanding of cultural influences relative to architectural design.

Environment

- **Classroom Climate**
  - Visual access for lecture and presentation.
  - Natural lighting, display lighting
  - Focal point classroom setting, flexible lab setting.
- **Physical Setting**
  - Student desks / writing stations for lecture areas.
  - Open areas for movement in lab to allow for group activity.
  - Drawing or assembly stations in lab for graphic production.
- **Flexible Student Groupings**
  - Large area for group assignments.
  - Research areas for student work projects.
- **Extensions Beyond Classroom Settings**
  - External site trips for community study.
  - Exterior tours around building area for local environment study.
- **Community Experiences**
  - Site trips for community study.
  - Community analysis for graphic production studies.

Materials / Resources Required

- **In-Room Supplies**
  - Audio-visual resources.
  - Graphic production materials.
  - Writing / display surfaces.
  - Production stations.
  - Photography tools.
- **External supplies**
  - Access to community environments.
  - Photography equipment.

Introduction

Design is a systematic process of organization and interpretation. The desire for order within our environment is a basic human characteristic. This process towards order can be traced in almost every cultural history wherein legend and myth detail the creation of our world, gods and civilization from the origins of chaos.

The assembly of order continues to dominate environmental design through the design of civilizations, civic planning, environmental controls and land management. Order can be found within smaller designations such as the grouping of like-minded persons into guilds, civic organization and clubs.

Architectural design is a component of the desire for order in the manner by which we choose to control our living environment; providing space for desired activities and establishing a place within the world itself.

Architectural design is the method of organizing materials and forms in a specific way to satisfy a defined purpose. Two key aspects of human involvement are contained in the design process. The first aspect relates to the architect, the second aspect relates to the user or participant of the solution.

The architect contributes to the process of creation through interpretation of the problem, inspiration in the design solution and originality stemming from personal style which defines the work as individual and unique. The user or participant contributes to the process by provision of a clearly defined set of needs as well as through the use of the completed structure, recognizing the aspects of architectural design that contribute to the success of the solution.

This curriculum section will provide intended users/participants with the opportunity to better understand, read and experience architectural design as well as participate in the design process.

The Process of Design

Architectural design as a conscious act begins with a level of organization. The specific steps in the order of this organization vary on a personal level with each individual, however a general outline for the process involves:

- Definition of the project
- Analysis of the possibilities
- Definition of the specific problem
- Examination of the alternatives
- Selection of characteristics
- Production of the solution
- Clarifications/revisions to provide a final result.

The tools and devices used in the process of architectural design can be defined as either design elements or design principles. Design elements are those which can be defined as specific "parts" of a design solution. Design principles are those items which influence, direct or resolve the overall composition of the design elements.

Architectural design elements include:

- Materials
- Colour
- Line
- Shape
- Mass
- Space
- Texture

Architectural design principles include:

- Balance
- Connection
- Contrast
- Emphasis
- Form
- Grouping
- Imagery
- Meaning
- Symbolism
- Pattern
- Placement/Proximity
- Proportion
- Rhythm
- Scale
- Unity
- Variety

As was noted earlier, these elements and principles work together to provide a final solution according to their respective influences. The impact of the final solution will depend as much on the individual elements and materials as it will on the manner by which the architect applies specific principles to the solution.

Architectural design as a creative artistic act sometimes requires defiance of established or accepted principles in order to achieve the desired result. These elements and principles noted are guidelines which, when used properly, may provide a satisfying result but they are neither flawless nor complete. The skill of the architect is found in the manner by which they apply aspects of design combined with artistic sensibility and vision. Application without interpretation or the personal sense of design is building, not architecture.

In the same way as the artist, trained in the basics of production and design, interprets to produce art, so the architect interprets to produce design. It is an interesting note that only a few persons untrained will attempt to be artists (painters, sculptor, mixed-media), yet a multitude of persons, having read a book or seen the latest design show, will provide architectural experience freely.

Section 1.0: Architectural Design Elements

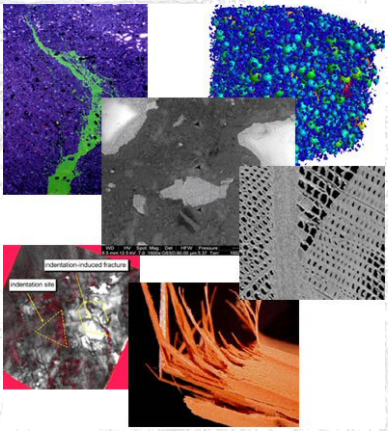
Architectural design elements include:

- Materials
- Colour
- Line
- Shape
- Mass
- Space
- Texture

Though these elements are reviewed independently, it should be remembered that they are inherently linked, acting on and contributing to each other's influence in the design solution.

1.1 Materials

The use of materials in architectural design has evolved along with the technology used to produce them. Architectural forms have also evolved, making the most out of the new materials and compositions; in some cases, even testing their limits.



Early materials consisted of available rock, hides and minor wood elements. Design at the time made use of these elements in a fashion suitable to the nomadic lifestyle.

Civilizations evolved, allowing for the increased mining of stone, production of brick and the use of cement paste and plaster. Architectural design evolved to make the best use of these available materials, creating new methods (arches and vaults) through which to expand the design opportunities.

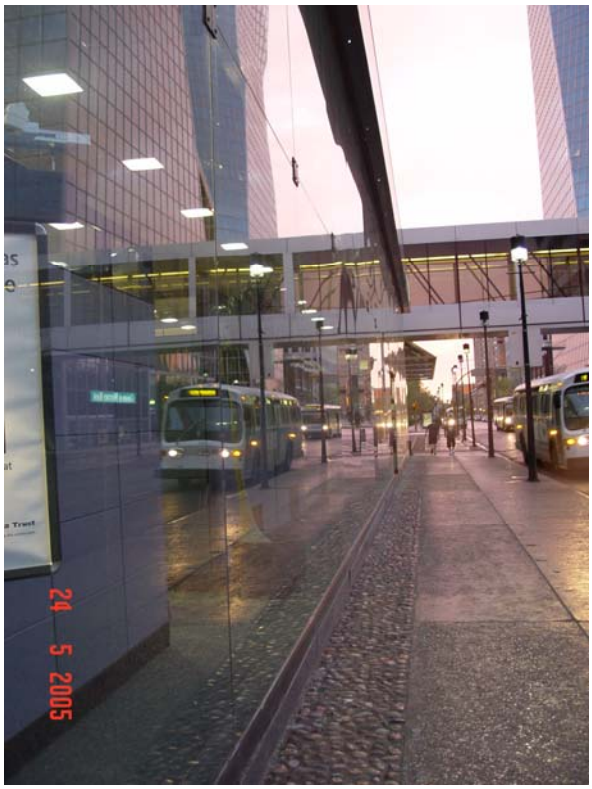


Figure 4: Modern Materials in Urban Environment

Glass, steel and concrete were developed and with them a new aesthetic. The modern building was envisioned with a new paradigm for the lifestyles of mankind.

The latest developments include metal production and the use of plastics in the materials sector. Once again, architectural design moved forward by pushing the limits through which these materials, new and old, can be assembled, shaped and formed to provide a new awareness relative to our place in the world.

An interesting point of reference, one noted throughout this section is:

- We ascribe the definition of natural elements, those of the earth to the category of materials that date back centuries (wood, stone, brick, etc.) These materials are those that provide a sense of connection with our environment, grounding us within the modern world.
- We perceive the new materials (Glass, steel, metals, etc) as finished materials providing a textural quality that is smooth and polished. These materials stand in contrast with our natural environment.

The task of architectural design is to create a new environment for ourselves using materials of both past and present. This task is aided by the application of specific design elements using the array of design principles available to achieve a successful result.

Figure 5: Museum of Civilization, Hull, Quebec

The impact of a design solution may be enhanced or destroyed through the manner by which the architect uses materials in the composition. Architecture is at its most basic level, the combination of structural and decorative design. Every design solution contains these two aspects.

Structural design is that which is ultimately necessary for the continued use of the building including installed systems and mechanics. This item also includes elements such as the insulation, vapour barrier and finishes necessary to make our structure inhabitable within the given environment.

Decorative design is that which provides the finishes and accents within our environment, including the artistic element or personal sense of place that defines the structure as distinct.

The best examples between the two extremes of these categories can be seen in a comparison between Antonio Gaudi and the Bauhaus School.

Figure 6: Casa Batllo, Barcelona

The work of Gaudi provides a clear example of total integration between structural and decorative design. The apartments at Casa Loma are constructed as built environment and also as a sculptural urban form. Interpretations abound relative to the specific influences and traits present within the structure; most notably that it is an exposition of the tale surrounding St. George and the Dragon.

The work of the Bauhaus School represents the opposite side of structure and decorative design. The philosophy of the school completely strips the design down to be a direct response to the specific function. These designs provide an environment of purpose, without incorporation of elements to impart any further meaning. It was through this design philosophy that the Bauhaus school was able to promote the theme of its design: the function of the building is simplified to the essence of its purpose, the building remaining as a machine for use, not for any decorative interpretation.

Figure 7: Bauhaus School, Dessau, Germany

The relative use of materials and the manner through which they are employed will provide the direction and emphasis on the integration of structural and decorative design. Through the use of the principles and elements defined in this section of the curriculum, architectural design provides the limits of integration relative to structural and decorative design.

1.2 Line

The use of a line represents the most basic of architectural design elements. Lines define the shape, form and volume of a design solution. They also create a sense of the rhythm and flow within a solution.

Figure 8: Kaufmann Residence, Bear Run, Penn.

The aspects of line can be used to draw attention away from or towards specific elements. Lines can be created by use of contrasting design elements (differing colours or textures) or through the definition of balance within a design.

Horizontal lines of building elements create a sense of crouching, low to the earth and grounded. Vertical lines provide an enhanced sense of height, soaring upwards, in much the same manner as balance contributes to the overall solution.

Line shapes are related to our perception of the natural and created environment. Lines that curve and appear to flow are perceived to be more in keeping with natural elements, establishing a connection between ourselves (the viewer) and that natural world. Lines that reflect straight geometric movements are perceived to be hard and rigid, the result of design imposing or dominating the natural environment.

Figure 9: Villa Savoye Staircase (Le Corbusier)

The use of lines on a design surface can lessen the massing effect, breaking the bulk down into smaller perceived pieces. Lines can also contrast with a specific form to provide emphasis or symbolism related to the design intent.

The use of lines within the design process remains an available tool for the architect to control and alter the basic solution in order to provide a clear definition of the solution.

1.3 Colour

Colour is an aspect of architectural design which provides a wide array of potential affects. Colour may be used strategically to provide emphasis to the character of a building or component, it may be used to accentuate form and materials or it may be used to separate and define distinct divisions of an overall scheme. Colour may also be used to convey the intended spirit of a design.

Colour is not, however, the solution to bad design. A paint job is merely the application of product, not a remedy to aesthetic failure. The use of colour is one of the most appealing design elements, to enhance the product, not resolve it.

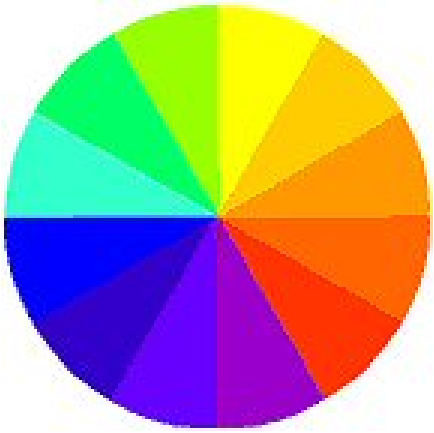


Figure 10: The Colour Wheel

Colour as an entity contains three related characteristics:

- Hue – relates to the pure state of colour, its essence.
- Value – relates to the depth of hue contained; either defined as light or dark. This definition refers to the colour value in the mix, not to the lighting applied to a surface.
- Intensity – relates to the saturation of colour: chroma. This characteristic defines the purity of the final colour relative to its original state.

The majority of natural building materials possess their own distinct colours. The colours are primarily muted tones and hues, none presenting colour in a pure state due to their composition. Materials fabricated for use in construction (drywall, ceiling tiles, flooring, etc) are devoid of natural colour thereby requiring the addition of pigmentation either during fabrication or post-installation.

The use of colour must be appropriate to the intended function and aesthetic of the design. Colour must be used in a specific balance of elements, unless deviation from a balance is desired. The other aspect to consider is the influence of fashion on colour choices and their application.

Figure 11: Los Angeles Residence (Morphosis Architects)

Colour bears specific psychological aspects to the presence of design. The definitive effects have been and continue to be studied relative to human response. A summary of the colour definition divides colour into two categories: warm and cool. Each category provides an emotional response to the colour. The psychological aspects summarized here represent an overview of the majority, not necessarily the definitive response by every individual. These colour definitions are also specific to our cultural responses, not globally accepted.

Warm colours are those that stimulate and uplift the senses. This colour range is regarded as the "advancing" series made up of the red to yellow chroma (red, orange and yellow as primary colours). These colours are related to our psychological response to colours produced by light (the sun), heat and fire.

The relationship of warm colours to heat/light define the colour range as having a cosmic influence, linked to overriding principles of life. Items finished in this colour range may tend to have more visual weight, thus appearing as dominant when compared to cool colours.

Figure 12: Art Nouveau Colors, Paris, France

Cool colours are those that sooth and calm the senses. This colour range is regarded as the "recessive" series made up of the blue chroma (green to indigo). These colours relate our senses to the natural environment; forest, green spaces, sky. The relationship of colour to the natural environment provides a sense of being grounded, of the earth, solidly planted which results in a calming affect.

The use of colour in architecture ties into the other design elements and principles. The key design element related to colour is that of texture. Separate items may possess the same colour but alternate or contrasting textures (smooth versus rough) will catch and project lighting differently.

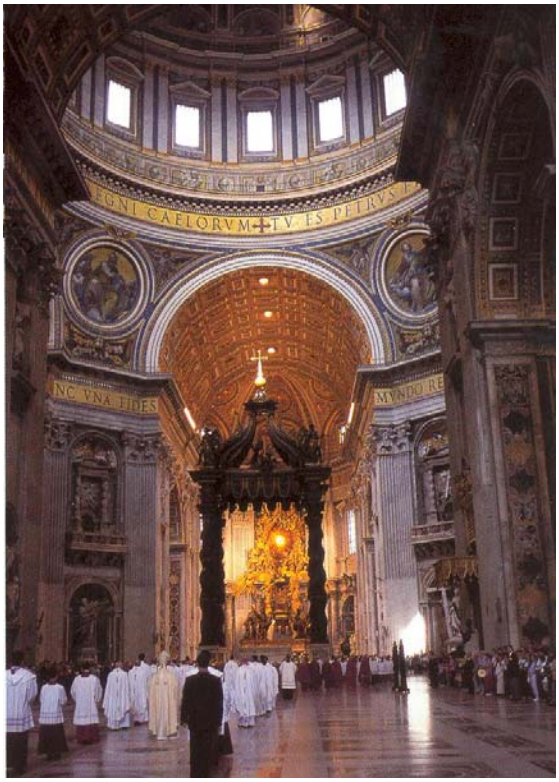


Figure 13: St. Peter's Cathedral, Rome, Italy

Lighting is an important consideration when the use of colour is considered. The influence of daylight as well as artificial lighting (specific type, intensity, focus) will alter the effect of colour, possibly minimizing or eliminating the intended result. Brilliant lighting can be focused to create emphasis relative to the colour; softer warm hued lighting casts more of a glow which will provide a calming affect. Lighting when designed in conjunction with colour and texture can greatly enhance the intended aspects of a design.

1.4 Shape

Shape as a design element relative to architectural principles refers to the two dimensional representation of form. Shape is the outline, silhouette or basic form of structure that which is the simplest to perceive in built form.

Shape evokes a responsive emotion in the viewer, providing the "first" affect of the building solution. The forms and types of shape will provide varied responses, utilized by the architect to create an emotion in accordance with the intended design solution.

Figure 14: Vanna Venturi House (Robert Venturi Architect)

Shape is categorized by four distinct types: geometric, natural, abstract and non-objective.

1. Geometric shape: This type consists of the basic shapes – square, triangle and circle. These basic shapes dominate our built environment as almost every building form can be derived from them. These shapes are common to our culture, simplistic and understood by the mass population as they are easily interpreted. They are considered to be "perfect" shapes and therefore evoke a sense of stability and order.

Figure 15: Shell Configurations in Design

2. Natural shape: This type consists of design shapes that replicate or imitate items found within our natural environment. This reproduction/imitation of the natural form is completed without artistic interpretation or aberration of the shape – it is direct. Natural shapes used may be found either in human form, animal and plant shapes as well as geographic and landscape forms. This type of shape is found within architectural design most effectively amongst the Art Nouveau movement of the early 20th century.

3. Abstract shape: this type utilizes the natural shape interpretation of form and then alters or abstracts it in order to reduce the shape to its apparent essence. The derivation of essence is subject to interpretation by the architect. There must be however the recognizable element of natural shape remaining in order for the shape to be properly perceived. In this method, the shape is transformed, though it will remain recognizable. Artistically, the paintings by Pablo Picasso represent the best example of this technique.

Figure 16: The Maids of Honor (Valasquez) **Figure 17: The Maids of Honor (Picasso)**

4. Non-objective shape: this type breaks from the previous three types to create a shape unrelated to the natural or geometric world. This type represents the extreme design form of shape. Its specific use in architectural design is to provide a distinct statement, emphasis or placement of the solution within its environment.

The use and interplay of the various shape types is an important aspect of architectural design. The principles of architectural design can be applied to various forms of shape for greater effect and resulting statement relative to the design solution.

The concept of shape as a two-dimensional object leads our analysis directly into the next level of three dimensions – the element of Mass.

1.5 Mass

The mass of an architectural design solution is the three dimensional aspect of the shapes. This element represents the geometric look, or block of the shape. Every architectural design is composed of a block, outline or sculptural form of some type. This basic form is categorized as Mass. The massing of a building has a major impact on the overall appearance and subsequent response to a design solution.

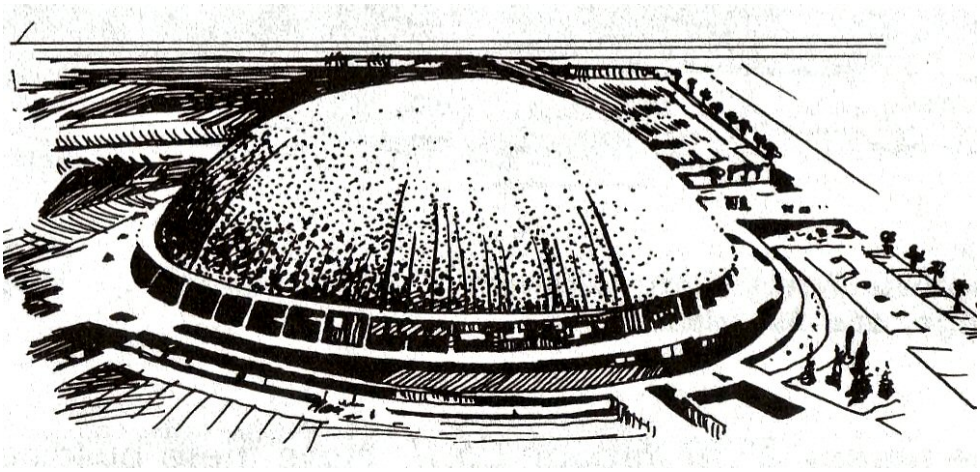


Figure 18: Massing Illustration

An architectural design that is properly resolved will present a balance of masses; parts to the whole and whole to its context through the use of the architectural design principles. Massing in design may provide evidence of primary mass and secondary mass as well as voids within the massing itself.

Primary mass is the principal form of a structure, the overriding influence that dictates its basic form. This mass is considered the bulk of the building. When something is described as "massive", an immediate response is generated, perceiving that item as something large, immovable, heavy or bulky. Each primary mass may consist of smaller components known as Secondary Masses.

Secondary masses consist of smaller, proportional pieces of the design that serve to reinforce or contrast with the primary mass. Secondary masses are also found within a primary mass through the delineation of structure, systems assemblies (floor, walls, ceilings) and even individual components. Secondary masses of this type are subservient to the primary mass, creating a compilation of part to make up the whole.

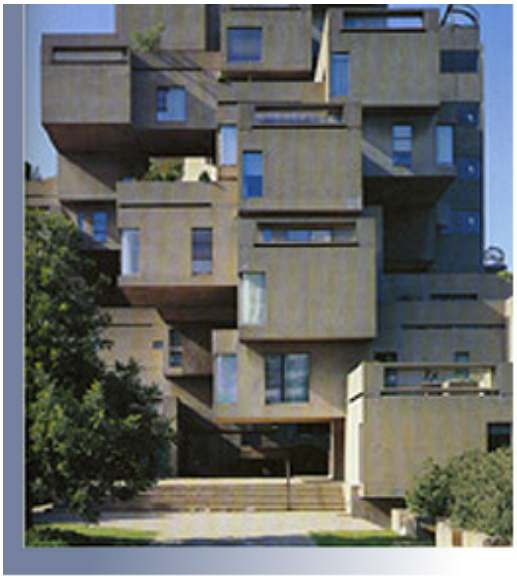


Figure 19: Habitat Residences, Montreal (Moshe Safdie Architect)

Massing is an element based on the presence of surface to create its form. Voids are the spaces within the massing form where there is an exclusion of surface. Voids related to mass may be the actual openings or breaks in the surface (doors, windows, balconies) as well as the actual interior spaces. Users of a facility are actually occupying the major void within a mass. The extent and precedence of the voids will influence the overall appearance and presence of the mass. Excessive voids will break the massing down; minimal voids will enhance the presence of the mass.

Examples of distinct massing design can be seen in the Brutalist architectural style of the 20th century. Building forms are constructed as solid blocks, defining specific wings of a facility as individual elements. Primary massing is also seen in the example of the Pyramids – one shape, one mass.

Figure 20: Pyramid of Cheops, Egypt

The type of massing styles follows the same categories as those applied to the design element Shape. Massing types include geometric, natural, abstract, and non-objective.

1. Geometric massing: this type consists of the basic shapes in three-dimensional form – cube, pyramid and sphere. These basic masses are the representation of our primary building forms. Each mass bears specific cultural responses that are reflected when applied in architectural design. The cube is visibly stable and consistent with our typical environment. The pyramid is a powerful symbol of ascension and regarded as being a solid component, grounded to the earth by a base comprised of its largest dimension. The sphere is regarded as complete, providing a satisfying perceived mass. These forms continue the sense reflected by the two-dimensional shapes: a sense of stability and order in the environment.

2. Natural massing: this type consists of forms which replicate or imitate items found within our natural environment. Natural forms have always served as a model for architectural masses, providing a variety of massing types (cylinder, sphere, pyramid, and block) that can be interpreted through design.

Figure 21: Museum of Civilization (Douglas Cardinal Architect)

3. Abstracted massing: this type utilizes the natural form interpretation and alters or abstracts it in order to reduce it to its essence. The derivation of its essence is subject to interpretation by the architect. There must be the recognizable element of the natural form remaining in order for it to be accurately perceived in the massing. In this method, the form is transformed though it will remain recognizable.

   Nature also provides a model for abstracted forms through the geographic and plant materials found within our environment. The essence of nature, the elemental components of cell structure, can also influence the massing properties of architectural design depending on the specific problem.

4. Nonobjective massing: this type breaks from all of the previous three types, to create a form in three-dimensions that is unrelated to any precedents. This type represents the extreme form of "building blocks" in order to create a design that is set apart from its immediate or natural environment.

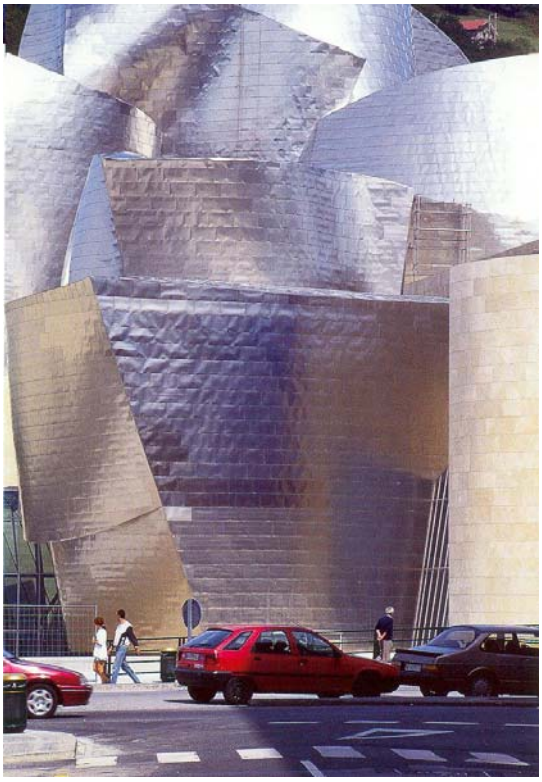


Figure 22: Guggenheim Museum, Bilbao, Spain

The massing of a design is influenced by its function. A circus structure may well be considered as non-objective massing though it is comprised of definable design elements. Massing depends on the proper use of architectural design principles in order to provide a clear statement.

1.6 Texture

Texture is a design element that relates to the surface appearance of an item. Texture is perceived architecturally in two ways: visual and tactile. Texture in materials relates to the manner by which we perceive the feeling of an item's surface: smooth, rough, soft, etc.

Figure 23: Palazzo Medici, Florence, Italy

Texture is an important element of architectural design as it will define the initial aesthetic of the building. Variations on the degree of texture will create individual effects. The transition from smooth to rough textures provides a response ranging from cool to warm, inviting to restricting.

Smooth texture creates a cool, clean pristine appearance. The presence of mankind is evident in the finishing of the smooth appearance. Rough textures create a warm natural appearance; catching light to create greater depth of field and presenting an increased visual weight over smooth textures. Textures that present a rough appearance evoke a sense of our natural environment, establishing a sense of relationship with the world around us.

The use of texture in design must be carefully considered in combination with the use of colour. Excessively rough textures may provide a crude, unfinished appearance. Excessively smooth textures may appear to be overly finished and present a "cold" appearance.

Figure 24: Wall Texture, Palazzo Medici

The architect must carefully choose the intended materials and desired textures to ensure that they will provide the necessary language for the intended solution. Materials that provide poor textural effects can be incorporated through the use of relief techniques while materials of high quality texture can present the intended smooth, polished surface. A combination of textures is commonly used in design to provide the designed look and feel to a particular solution.

The element of texture also relates to the hardness and heat retention capabilities of materials. Smooth surfaces, presented as a cool look, are perceived to be cold retention surfaces, unpleasant to withstand. Rough surfaces, taken to the extreme may retain heat, thus creating an opposite yet equally unpleasant experience. Smooth textures will be perceived as hard while rough texture may present a soft appearance (even though they may be harder than the smooth textures.)

1.7 The Concept of Space

Architectural design involves the practice of enclosing undefined space to serve a defined use or need. Architecture as an entity contributes to the richness, effectiveness and variety experience of human life within the spaces created.

> *There is sensation in every inch of it* (Living Architecture)*, and an accommodation to every architectural necessity with a determined variation in arrangement, which is exactly like the related properties and provision in the structure of organic form.*[2]

The concept of undefined space is sufficiently vast to encumber the mind in limitless thought. Space stretching on outside our borders and world into infinity defies the imagination. It may be said that space exists in the absence of form. We do not begin to grasp the concept of space until it is enclosed by form.

Figure 25: Dome of St. Maria del Fiore (La Duomo), Florence, Italy

[2] John Ruskin, The Seven Lamps of Architecture, P. 153

Space as a psychological concept may be understood, though its influence on the mind can render lives unbearable. Claustrophobia is a psychological condition brought on by the fear of enclosure – the absence of space. Agoraphobia is a psychological condition brought on by the lack of enclosure – the fear of exposure in open spaces. These conditions are very real, existing in many persons relative to their specific environment and spatial arrangements.

The limits of space, the actual enclosure, are applied by the means of design to create enclosed spaces (voids) within the larger constructed solution. Design uses forms and shapes, creates a unique relationship between these elements and space, and provides the effect of positive or negative space.

Figure 26: Exterior Space Enclosure: St. Peter's Square, Rome

A positive space is one that presents the enclosure, the actual form. It contains a measured volume of enclosure that is visual and tangible. A negative space is the void enclosed by the form. Negative spaces may be said to be the interior volumes of a design.

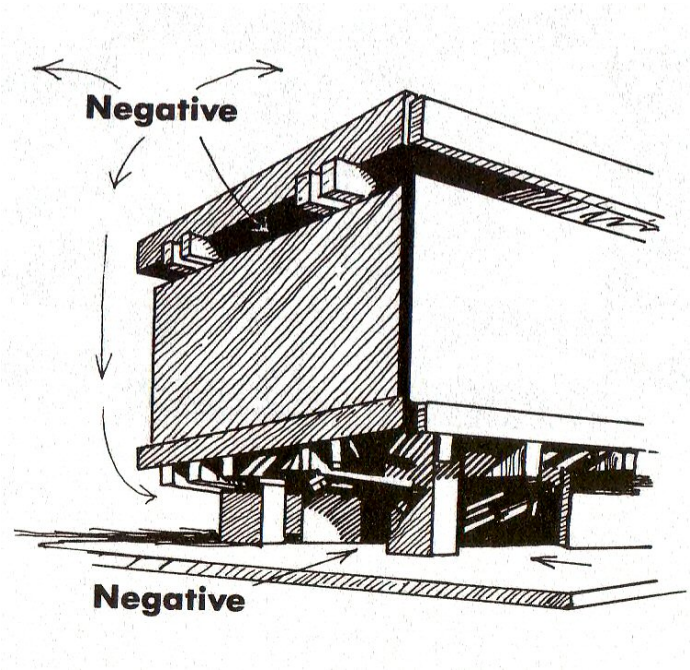


Figure 27: Negative Spaces, Positive Faces

The use of light provides an easy means to define positive and negative spaces. Positive spaces reflect light from their surfaces, negative spaces allow light to pass through undisturbed as there is no surface to reflect it.

Architectural design makes full use of positive and negative spaces to create the form punctuated by the voids that will define the shape and mass of a design solution.

Section 2.0 Architectural Design Principles

The list of architectural design principles includes:

- Balance
- Contrast
- Form
- Connection
- Emphasis
- Grouping
- Meaning
- Symbolism
- Imagery
- Pattern
- Placement/Proximity
- Proportion
- Rhythm
- Scale
- Unity
- Variety

These principles, a basic listing as there are others that may be defined through interpretation, work together to provide a final solution. The overall impact of the final solution will depend on the manner by which the architect applies specific principles to the solution.

A challenge is constantly present relative to these principles as they undergo interpretation and re-integration throughout the design process. This challenge is the means by which architectural design grows, matures and prospers in our ever-changing world.

2.1 Balance

The principle of balance is a key design principle relative to the architectural design process. Balance occurs when opposing forces or visual weights appear to be equal and harmonious. The need for order seeks a balance in life and nature so that harmony with the environment can be achieved. Balance is also one of the design principles that is both the easiest and most difficult to resolve.

Balance can be achieved though the use of three application strategies: symmetry, asymmetry and radial balance.

1. Symmetrical Balance

Symmetrical balance is achieved when the solution presents equal or mirror image appearances across a central vertical (visual) axis.

Figure 28: Twin Tower Symmetry

This type of balance is perceived most often in nature as well as the human form. The perception relative to the use of symmetrical balance is that the solution is stable, grounded and solid. Solutions of this type are those most often found in history as public, authoritative structures; therefore we ascribe the values of dignified, authority and formality to this means of expression.

Symmetrical balance is the one that is easiest to achieve, though it must be carefully considered relative to the architectural design requirement. It is rarely the situation where a design program will provide for equal distribution of the same functions to provide two halves of a design solution.

Figure 29: Villa Capra (Palladio)

The use of symmetrical balance is a technique that must be strictly followed in order to achieve the desired result. If symmetry is deviated from, it must be done so with clear intent to change the image. Deviation from symmetry will provide an asymmetrical result. Deviation that is merely the result of alteration to one side (without foresight or intent) will result in upsetting the balance, losing the impact of the design. An intended symmetrical balance when thrown out of symmetry will only appear haphazard and unplanned.

2. Asymmetrical Balance

Asymmetrical balance occurs when distinct parts that have equal perceptual weight are arranged across a vertical (visual) axis. This type of balance presents a solution perceived as dynamic in form, illustrating active characteristics. This type of balance being deemed as "informal" based on the formality ascribed to symmetrical balance through historical reference.

Asymmetrical balance is most common within design solutions, generally a result of the requirements of the architectural program. This type of balance presents the greatest challenge to the architect since effort must be extended to ensure there is equitable weight of opposing sides.

Figure 30: Government Centre, Brasilia, Brazil

Asymmetrical balance may be achieved through the use of design elements and principles including:

- Colour (focal points, values)
- Shape and mass
- Scale and proportion
- Orientation and placement
- Materials (size, texture, qualities)
- Light and dark values (dark values appearing "heavier")

3. Radial Balance

Radial balance is achieved through a balance of elements around a center focal point. This type of balance is most often found in nature, very infrequently found within architectural design due to the nature of the way we inhabit our environment.

Figure 31: Proposed Ashram City, India

Balance is a principle that remains especially difficult to resolve. The challenge is to balance design solutions in both two and three dimensional perceptions, creating visual coherence of the solution. Balance can be achieved through the careful use of design elements and principles in a manner that provides a positive, equitable result. Balance within a building solution may also be enhanced by consideration of that which is not built – the voids or openings with the structure as these aspects of the appearance also provide visual weight.

2.2 Contrast

Contrast is a design principle used to provide specific emphasis to a particular piece or section of the solution. Its purpose is to create a greater sense of the element in relation to its surroundings. This act of contrast provides focus for the participant in the process of "using and reading" the building. Contrast may also be used to create a focus within a solution, relative to the intended function. Strong contrast can be used to provide theatrical like effects for strong impact.

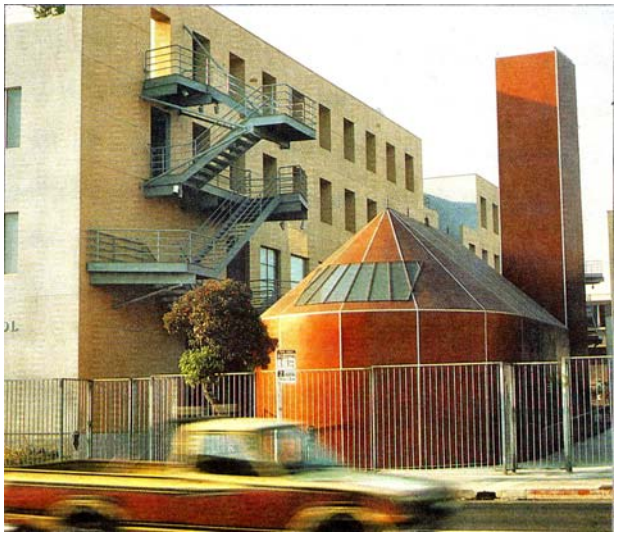


Figure 32: Loyola Law School Addition (Frank O. Gehry Architect)

The use of contrast can be found through variation of design elements within a structure including:

- Size
- Shape and mass
- Colour (hue, value, intensity)
- Texture and pattern
- Lighting (natural or artificial)
- Placement or proximity within the design.

Contrast may be ineffective if the application or technique used remains too subtle to provide a recognizable difference relative to the surroundings. Our inherent search for order will provide the means to establish a visual hierarchy within a space, keying off contrasted elements to discern the intended focus of a space.

Figure 33: Neue Staatsgalerie (James Stirling Architect)

2.3 Emphasis

Emphasis is an architectural design principle that provides a focus within the design solution. The art of emphasis is achieved by providing a point of climax relative to a specific feature or element. This point of achievement may be specific to the height, colour, texture or sound.

The purpose of emphasis is to provide a sense of the underlying theme or context of the design solution. The focal point is often the item, space or element that the remainder of the design keys off or centres around. Any element that contrasts deliberately with the overall composition will automatically be sensed through our perception as a focal point, a distinct element requiring our attention.

Figure 34: Retail Entrance (Frank Lloyd Wright Architect)

Emphasis may be provided through the use of:

- Size, scale and proportion
- Proximity
- Colour
- Texture

There has to be a balance between the design solution and individual elements in order for each to support the purpose of the other. This relationship, coinciding with the principles of balance discussed herein, remains the task of the architect.

2.4 Form

The use of various forms, their shape, size, scale and surface characteristics will provide a perception of weight, being either heavy or light related to the remainder of the composition. This perception is derived by the participant based on their impression of the sense of effort required to install the specific form.

This perception is responsible to the physical process of manipulation, a process of construction. It is often that we feel deceived if our perception proves false. Rock climbing walls present a perception of solidity and weight yet the reality is that they are fabricated of fiberglass and plastic, merely painted to mimic rock formation. Sometimes, it is best to live with our perceptions rather than ask for an explanation; explanation may often eliminate the experience of the fantasy.

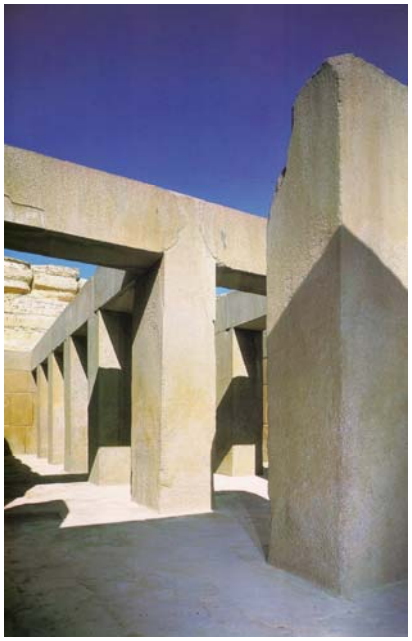


Figure 35: Temple of Khafre, Giza, Egypt

The use of materials to create form must be completed in an honest fashion; using materials for the purposes of their capabilities, not creating a false sense of form and material in order to trick the perception into believing something other than what is true.

> *Architectural deceits are broadly to be considered under three heads:*
> *1. the suggestion of a mode of structure or support other than the true one; as in pendants of late gothic roofs*
> *2. the painting of surfaces to represent some other material than that of which they actually consist (as in the marbling of wood, or the deceptive representation of sculptured ornament upon them)*
> *3. the use of cast or machine-made ornaments of any kind.*[3]

[3] John Ruskin, The Seven Lamps of Architecture, P. 39

2.5 Meaning

Meaning is a design principle closely associated with the principles of symbolism and imagery. The intended meaning of a design solution is one that must be carefully defined and thoughtfully provided. The difficulty in ascribing meaning to an inanimate object (structure) is that no two persons will "read" it in the same context and manner.

Meaning is dependent on a multitude of influences, many of which change over time. The meaning of a "corporate" environment is different today than even fifty years past. Even the meaning of "Church" has changed over time, though we typically ascribe the design ideology historically associated with churches whenever the question of meaning is raised.

Figure 36: Catholic Church, Waldsee, Germany

Meaning is dependent on the cultural influences of time, place and people relative to the design solution. The true measure of good architecture is the provision of consistent meaning that will endure changes in time, society and culture.

The act of design relates to the solving of a specific problem. The solution will only be possible through careful analysis of the problem, the requirements and the desired meaning of the solution. Some solutions are relatively easy to resolve, some appear impossible. In order to evoke the intended emotional response to the meaning of a design, to provide for accurate reading and interpretation of the meaning, the architect must carefully consider the cultural aspects of design elements.

Design at this level relates to the process of communication: communication of the building's function, communication of the participant's value in the process of using a building, and communication of the client's desired meaning. The sociological influences discussed in Section 4-0, Sociology and Architectural Design become the primary tools that an architect can use in the design process to achieve the definition of the intended meaning.

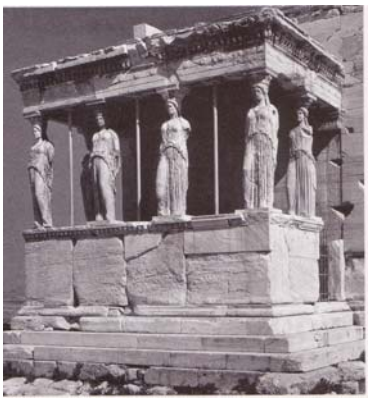


Figure 37: Porch of the Maidens, Greece

Meaning as a design principle is created through the use of symbolism and imagery.

2.6 Symbolism

The use of symbolism is a crucial component in establishing the means and methods through which architectural design is read and understood. Symbolism establishes a form of communication by incorporating complex and abstract ideals into a built form using design elements and principles. Typically, symbolism in architecture provides a simplified image or the pure essence of a concept, derived from a complex system or philosophy.

Figure 38: Cologne Cathedral, Germany

A symbol involves the use of a design element or principle to stand for a separate concept. The purpose of symbolism is to provide the palette that is to be perceived by others, therefore the primary use of symbolism relates to the public or outside world.

The use of symbolism in architectural design may be bold or subtle. Clear examples of symbolic applications can be found in historic and current architectural designs including:

- Cathedrals: tall spires aspiring or pointing the way to heaven; columns said to symbolize the heavenly forest holding up the sky canopy (ceilings often painted in images of heaven); verticality felt in the use of columns extended to lift the eyes upwards; the rose window, often extremely large, to symbolize the sense of eternity through its round never ending shape, reflecting the eye of Good looking down upon the congregation from the heavens; the floor plan itself, revised in 381 a.d. according to the Milan Edict, to reflect the form of a cross, symbolizing the manner through which Christ died for our sins.

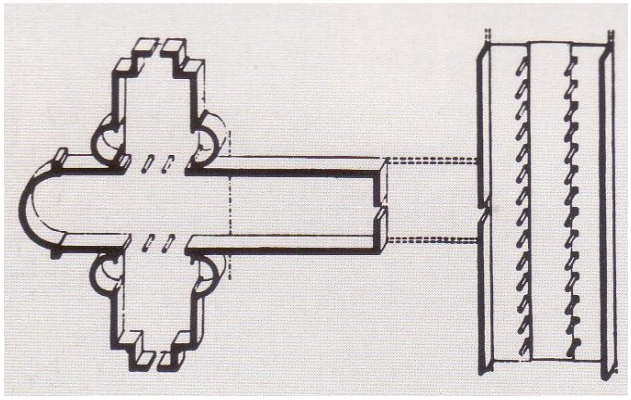


Figure 39: Catholic Church Plan, Milan Edict

- The Parthenon, Athens: symbolized the greatness and solidity of Greek civilization through its placement on a prominent hill, designed according to the principle form of mankind and constructed according to "true" proportions using solid materials of the earth.

- High Rise Corporate Headquarters: symbolize the power, influence and status of Western civilization corporate entities. The bigger the tower, the more powerful the corporation.

Figure 40: Lever House, New York

Symbolism may also be incorporated through the use of universal symbols relative to cultural beliefs. Universal symbols include items that are culturally specific yet abound world-wide or they may be cosmic, religious or distinct icons. This type of symbolism may incorporate items to provide a link to a greater reality outside of the building itself, linking it to the world and celestial heavens.

Figure 41: Ste. Maria Novella Church, Florence, Italy

Examples of alternative symbolism found within architectural design include:

- Solar symbols – the sun and moon
- Signs of the Zodiac – related to the celestial environment
- Specific religious symbols – cross, star of David, Wheel of Life
- Cosmic balance symbols – Yin-Yang symbolism (Yin representing the male form of light, heat and dryness, Yang representing the female form of darkness, cool and wetness), the use of Feng Shui
- Magical symbols – based on cultural beliefs or myths prevalent at the time, such as those used at Stonehenge.

Symbolism may also be found within specific cultural entities related to:

- Geometric forms – triangle relating to religious beliefs of the Triumvirate (Father, Son and Holy Spirit), circle representing the sense of wholeness
- Status symbols – based on the specific cultural ideology
- Patriotic or political symbols – governing principles of culture
- Commercial symbols – based on the corporate environment and status of the time
- Psychological symbols – based on cultural expectation and influences, such as the little red brick school house typology though schools were not required to be constructed of red brick (size being a result of student population)
- Personal symbolism – personal beliefs and philosophy that may be exposed through the use of design elements and principles.

The use of symbolism is prevalent throughout the design process. Symbolism as it may be incorporated into the final solution relates to the architectural design principle of Imagery.

2.7 Imagery

Imagery in architectural design involves the use of symbolism to create an image that contains the meaning relative to a design solution. Imagery includes the use of symbolic elements (symbol types) to translate the intended meaning into a usable form.

Figure 42: Column Capitals, Hospital Innocenti, Florence, Italy

Two types of imagery are present in architecture: perceptual and conceptual.

1. Perceptual imagery.

   Perceptual imagery relies on a memory response to a learned or experience item reflected in the design. This type of imagery is based in real life experience, relying on the past knowledge or experience to provide the background necessary to relate to the image. Perceptual imagery relates to items or issues in the real world that either do or did exist at some point.

2. Conceptual Imagery:

   Conceptual imagery relies on the emotion, fantasy or vision of the participant to relate to the image presented. This type of imagery depends on the belief system as well as the emotional response of the viewer in order to evoke a response. Conceptual imagery is that used to provide an image of heaven or Hades; places we have never experienced but believe strongly in.

Conceptual imagery also relates to the use of motif and pattern. The repeated use of images relative to specific cultures will reinforce the application of their use within architectural design. The feather symbol is commonly associated with the First Nations culture; therefore its use within design will provide a sense of that culture.

Figure 43: Retail Outlet, Florence, Italy

Imagery may change over time, resulting in a shift of perception or loss of the specific symbolism. The candy-striped pole, once used to symbolize a barber shop is no longer in fashion; the use of three gold spheres, once the image of a pawn broker, has also been lost over time.

Shifts in imagery also occur. The best example of this action is found in the image of the Swastika. The form and shape of a swastika dates back centuries through European civilization, once being quite prevalent in the cultural symbols. The swastika in today's culture produces an emotional response to an image associated with Nazi Germany and the politic of Fascism. This symbolic image is denounced in today's culture as representing a society of evil and hate, yet its origins contained none of these emotions.

The use of imagery within architectural design can enhance the viewer's perceptual or conceptual response to a design, providing for an emotional reaction to a design solution.

2.8 Rhythm

The use of rhythm within architectural design implies a melodic response incorporated into the built solution. Architecture and musical expression have often been defined in similar terms, rhythm being a key component of both artistic streams.

Figure 44: Exterior Columns, SaskPower Building (J. Pettick Architect)

Rhythm in architecture relates to a regular occurrence (rhythmic) of similar and like effects. Rhythm may be perceived through the sense of movement (line and shape), sequence and patterns incorporated into the design solution.

As in all design principles, the correct and sensitive application of rhythm must be controlled, lest the sense of chaos be the only result. In order to be effective, rhythm must be perceived through its appropriate and evident use. The affect of rhythm as a design principle can provide a sense of heightened or enhanced energy relative to the actions within a space.

Application of rhythm can be achieved in many forms including:

- Structure: the use of column spacing, size and proportion
- Pattern: the duplication or repetition of like elements to lead the visual motion within a space. When an overall pattern is reduced to a point insufficient to create consistent rhythm, the appearance of texture may continue the rhythmic sense.
- Texture: may be used to create or enhance a rhythmic cadence in coordination with pattern. Textural variance can also contribute to the sense of unity and variety within a design solution, making it a most valuable design element.

Figure 45: Palazzo Vecchio, Florence, Italy

The use of rhythm in architectural design is subject to the same arbitrary nature of design principles. Overly overt rhythm may overpower the spaces whereas a rhythm too subtle may not be perceived and is subsequently lost. Rhythm must be consistent in its application to be felt, however its application may be more evident in situations where the rhythm is disrupted.

Disruption of rhythm is a technique that can be used to provide "punctuation" or emphasis related to the disrupting element. This deviation is one that must be applied with intention to create an alternate design emphasis. The application of a disrupting element may serve both purposes: to expose the actual rhythm that has been truncated and to emphasize the specific element imposed.

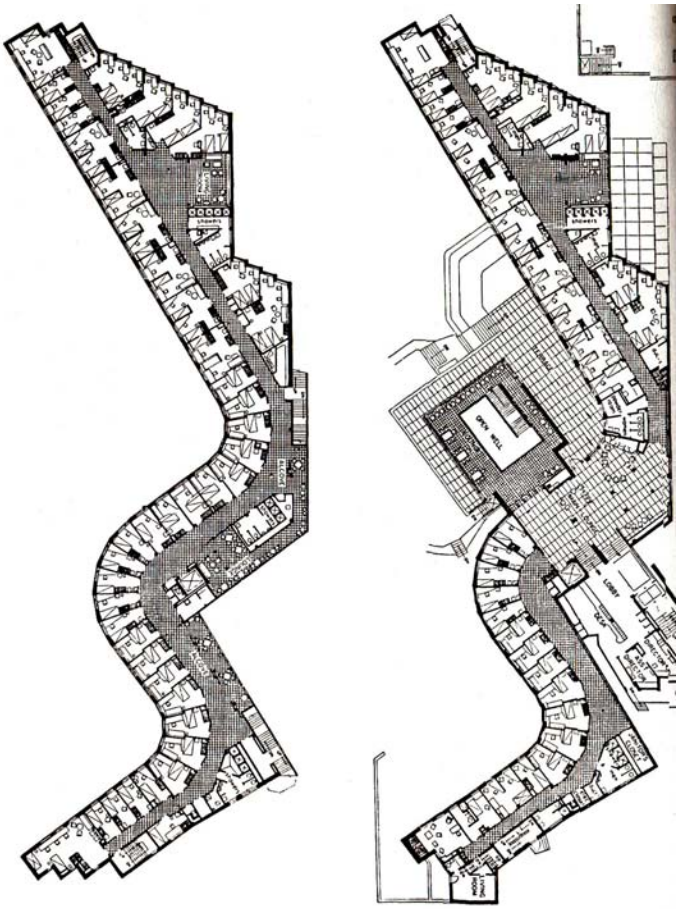


Figure 46: Baker House Dormitories (A. Aalto Architect)

Rhythm is closely associated with texture and pattern within architectural design principles. A balance between these three principles will provide a satisfying accomplishment in the establishment of rhythm.

2.9 Pattern

When a texture, symbol or image is repetitive or decorative, it is referred to as a pattern. Pattern, like texture, is a surface item used to provide variety and unity through visual interest.

Items in cadence (regular rhythm) create a sense of rhythm; rhythm repeated creates a pattern. Almost all architectural designs contain some form of pattern, though in some examples the actual pattern may be hard to define. Pattern may be found in regular or irregular sequence using elements of line, colour, texture, form, shape and light.

Figure 47: Uffizi Gallery, Florence, Italy

As our sense for order relates to rhythm, so it also relates to pattern. Architectural pattern may be carefully planned or random but we will naturally look for it while experiencing an architectural space.

> *It is therefore clear that patterns play a concrete and objective role in determining the extent to which we come to life in any given place.*[4]

[4] Christopher Alexander, The Timeless Way of Building, P. 115

Architectural design may invoke pattern to unify the overall composition, create or maintain a balance between distinct elements or reinforce the sense of movement (rhythm within a given solution). Even distinct building elements may be drawn into a pattern to create an overall sense of the total composition.

The use of pattern in design must be carefully restrained. Too much variation and rhythm will detract from the overall solution, drawing the focus away from the design to follow only the pattern. Too little emphasis will result in a pattern difficult to find and maintain.

Figure 48: The Capitol Plaza, Rome, Italy

Pattern as symbolism must also be carefully considered in order to appropriately use it to reinforce and support the design intent. A careful integration of pattern into the design solution is required in order to achieve a cohesive, clear result.

2.10 Scale

Scale in architectural design relates closely to proportional development. Where proportion refers to the size relationships between elements, scale refers to the size relationship of the element itself to a known or established standard. Scale is the size of the element; proportion is the ratio between elements.

The use of scale in design requires a size comparison to a known/common standard. The most commonly used standard is the human form. The use of scale in design will determine the potential responses and emotions we generate relative to a design solution. Scale will also provide emotional or perceptual aspects to a building's interior space, related to a comparison with the human form.

Figure 49: Main Entrance, St. Maria del Fiore Cathedral, Florence

Examples relative to the use of scale provide the best method of understanding its potential affects. These examples include:

- Great Cathedrals: constructed of a gigantic scale which is intended to be overpowering. This use of enhanced scale was meant to glorify the awesome power and majesty of God as compared to the sense of being "small" as a human within the space.

- The Pyramids: another example of monumental design, meant to exemplify the power of the pharaohs and high priests. This method equates scale relative to the human form as a sense of size equals power and importance. We adhere to this concept within our own society as we equate a big house to someone who is "obviously" wealthy, important and successful. The pyramids themselves are large in scale relative to human form yet small in scale relative to the vast context of the design.

Scale is a principle which must be taken in context, in comparison to its surroundings to obtain the correct sense of relative size and comparison. An example of scale can be found within your own residence or historically within the Parthenon.

- The Parthenon: derived from elements of human scale. Though large and majestic in its overall mass, this structure provides a sense of comfort and placement relative to human form, thus it is considered to be of "appropriate" scale within our culture.

Figure 50: The Parthenon, Athens, Greece

Scale, as with the other noted principles, may be extrapolated for effect and emphasis. The careful application of scale will provide effects suitable to the intended nature of the design solution.

2.11 Proportion

Proportion relates to a perceived equality or ratio between elements of architectural design. An understanding of proportion combined with its effective use will aid the architect to create aesthetically complete compositions. The goal in proportional development is to create a sense of order, emphasis, scale and meaning relative to the overall design solution. Proportion establishes a consistent set of visual relationships between the building's individual components, the components to the whole and the whole composition to its context. Proportion in design is most often perceived when it is consistently applied in a regular fashion.

> *Wherever Proportion exists at all, one member of the composition must be either larger than, or is some way supreme over, the rest. There is no proportion between equal things. They can have symmetry only, and symmetry without proportion is not composition.*[5]

The principle of proportion is most closely related to the principle of scale in architectural design. Both of these principles relate to the relative size of the element or composition. The difference between the two principles is:

- Proportion refers to the size relationships of elements within the overall composition. It is the specific relationship that provides the sense of proportion. The proportional ratio may be of a mathematical format or it may be relative to aspects of nature.
- Scale refers to the actual size of a specific element. Scale may involve the perceived size relationship of two specific items, elements to the whole or the whole to the viewer.

[5] John Ruskin, The Seven Lamps of Architecture, P. 121

Figure 51: Building Proportions, St. Maria del Fiore, Florence

Our culture provides us with two methods of proportional and scale determination:

1. Our experience with typical or standard elements in buildings. This method uses applied standards as the basis by which we interpret a new experience. We all feel that a door should be of a specific size relative to our average height and are therefore emotionally responsive when confronted with an element that breaks from this standard as is felt when approaching a door of larger or smaller than "normal" dimensions.

2. The Human Form relationship is the proportional and scale relationship relative to our own size and composition. This perception relates to our response relative to balance, rhythm and context as well as proportion and scale.

Proportional relationships may be used to provide enhanced imagery (emphasis or contrast) or to establish the particular function of a specific element (main door is larger than secondary doors). It is important to continually respect and apply a consistent proportional method throughout an architectural design solution; otherwise the result may appear to be random and chaotic.

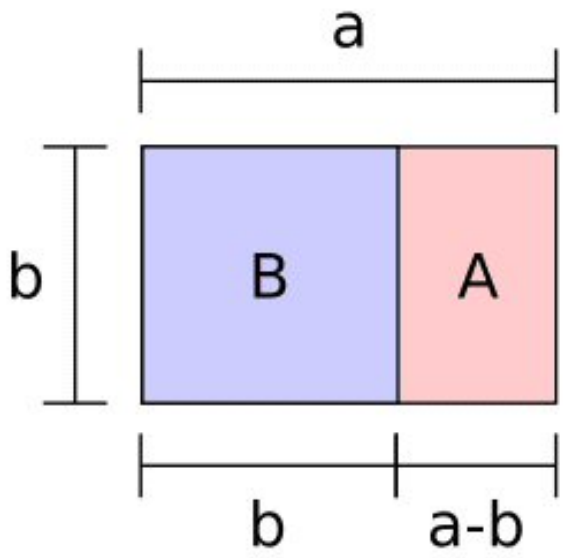


Figure 52: The Golden Rectangle

Proportion may be applied in several methods, relating to mathematical concepts in each case. Proportion refers to a ratio in size, thus requiring the use of math to establish and maintain the desired ratio. The various methods of establishing proportion include:

- The Golden Section: this application is reviewed in the Mathematics portion of the curriculum. Applications of this type relate to a 1:1.6 ratio of size as a specific means of geometric proportion. Historically, this ratio has been used to design structures that consistently provide a pleasing proportion.

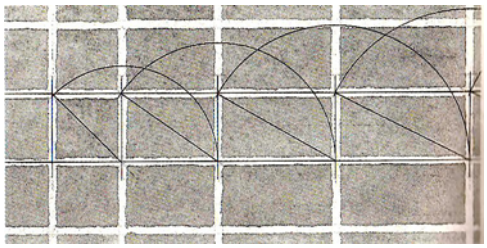


Figure 53: Planning Geometry, Grenade-sur-Garonne, France

- Numerical Harmonies: This application applies the use of derived mathematic or geometric formulas that may be site specific, used for the single project only. This method is very much like creating your own formula for design. The crux of the matter is that once created, the formula must be consistently applied so that a perceived order may be possible. An example of this application may be seen in the town planning concept of Grenade-sur-Garonne, located in France. Each city block was determined by measuring the diagonal of the previous block and using its length for the length of the next. This method provided a steady progression of growth as one perceives the affect.

Figure 54: Urban Photo, Grenade-sur-Garonne, France

- Use of direct or exponential ratio: This application is another mathematical application using either direct ratio (1:1) or exponential growth (2:4:16:256). The use of a direct ratio will provide for enhanced unity in elements being of the same size, though the variety is now limited due to consistency. A direct ratio (1:1, 1:2) implies stability within the design but limits the contrast. Exponential growth provides a quick means to establish the relationships, though the scale may exceed the relationship quickly due to the rapid expansion of areas or size.

- Use of the human form: this application is similar to the Golden Section since the human form has consistent 1:1.6 ratio relationships. The human form as a ratio generator was adopted by the Humanist Movement of the Renaissance period, as is discussed in the Architectural History section of this curriculum. This application will provide resolution consistent with the proportion of the intended participants based on the averages of human form and size. The use of this method will assist in creating environments that are suitably sized and proportionally pleasing. It must be carefully considered during the design stage if this "comforting" affect is the one specifically desired.

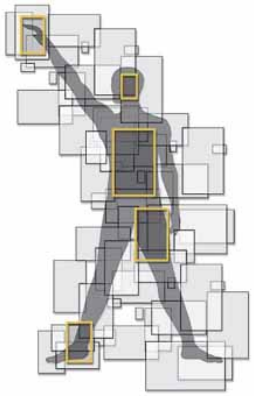


Figure 55: Human Figure Ratios

The use of proportional developments involves the belief of an ideal that is being sought in the design solution. Proportion, combined with the principle of Scale, will stimulate an emotional response within the participant. The sociological aspects of the potential response must be considered when determining the best method of proportional application.

As in all architectural design principles, the use of proportion may be altered or deliberately deviated to provide a greater effect. Design by feel will provide the necessary ratio of parts to the whole and whole to context, though this path is a very tenuous route. Proportion in this manner may relate more to imagery or intended function rather than to compositional elements. Aesthetic proportion is artistically based as qualitative as opposed to the mathematical proportion which is quantitative.

2.12 Grouping

The process of grouping refers to the assembly of distinct parts to create larger "sections" or pieces within the whole composition. Grouping stems from the creation of order within the solution to draw together like elements to provide a sense of unity. Spacing and proximity relative to grouped elements and adjacencies define the extent of unity and variety perceived within a solution.

Figure 56: Chateaux de Chambord Detail, France

Grouping of individual elements is a natural characteristic or trait of human nature. Our inherent need for order creates the perception to assemble pieces to become a perceived whole, a sum total of pieces (i.e.: wood studs are "grouped" and thus considered a framed wall, floor joists are "grouped" and thus become a floor system, etc) the individual act of "reading" a structure will naturally seek to group elements so as to define order within the visual image.

Figure 57: Notre Dame du Haut, Ronchamp, France

This principle can be defined through the reference to the visual image of the windows of the Ronchamp Chapel (Le Corbusier). While the exterior view provides the image of distinct window locations, the interior perception is that of a "wall of light" The grouping of windows into a perceived single wall plane accurately provides the basis of this principle.

The architectural design process uses grouping in a controlled manner through applications such as:

- Use of similar pieces (shape, size, texture) since the human trait will naturally "group" parts together.
- Repetition of similar design elements such as colour, size, texture and shape.
- Placement of design elements within close or perceived proximity (location)
- Overlapping or truncating design elements (line, shape, texture)
- Unifying distinct elements through the use of border or enclosure, whether the border is distinct or implied.

A distinct component of grouping relates to the manner in which the groups are connected within themselves and to the larger composition. This component refers to the architectural principle of Connection.

2.13 Connection

Architectural design as a means of assembling disparate parts uses the principle of Connection to create a sense of the whole. Connection may involve many different levels and complexities within the design solution. The aspect of connection includes the building, individual parts and the environment.

Figure 58: Gate, Eames Lodge (H.H. Richardson Architect)

The specific matters of connection within architectural design include:

- Connection to the earth: this connection must be clearly defined as being consistent or distinct, potentially evoking an emotional response relative to the context of the solution.
- Connection between interior and exterior spaces: this connection brings the sense of place within the building solution and ties it to the natural environment. A connection of this type may be achieved through finishes, landscaping, built elements or perceived extensions of the building/environmental connection.
- Definition of the connection as a part of the design solution: the connection may be distinct and defined or it may be subtle and integrated, though its existence serves as a transition point in both instances.

> *No house should ever be on a hill or on anything. It should be of the hill; belonging to it. Hill and house should lie together, each the happier.*[6]

Unlike other design principles which may reach emphasis due to interruption or a break in continuity, connection is a principle which must be established and maintained in order to be effective. The architect must avoid situations of weak, unresolved or ambiguous connections as well as instances where connections are overlapped. These situations weaken the composition, lowering the perception or recognition of order within the solution.

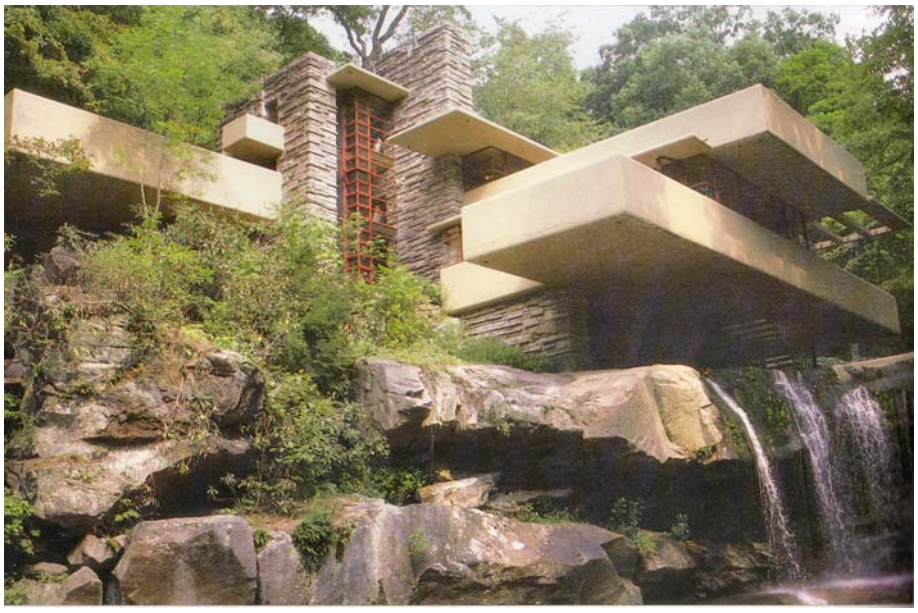


Figure 59: Kaufmann Residence, Bear Run, Penn (Frank Lloyd Wright Architect)

Groupings and connections are designed with respect to their Placement or Proximity to one another as well as to site elements.

[6] Frank Lloyd Wright, as quoted in The Nature of Design, P. 63

2.14 Placement (Proximity)

Placement relative to architectural design refers to the location and orientation of design components as well as the overall composition. The relationship that is perceived between the parts and the whole, the whole and the site and major groupings to each other will be determined by the use of proper placement.

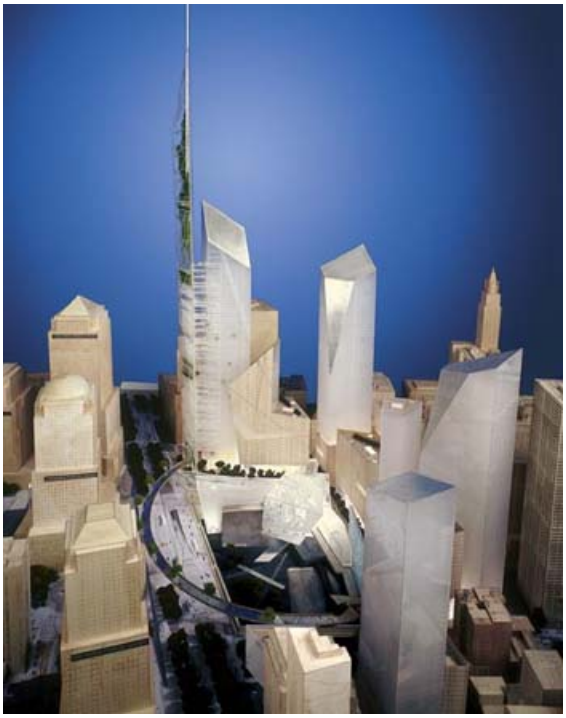


Figure 60: World Trade Centre Concept (Daniel Liebeskind Architect)

Orientation is a key component of placement. The design method through which components are arranged both within the composition and relative to the participant involves the use of orientation. Three specific styles of orientation may be used either individually or in conjunction with each other to provide a desired affect. These styles are:

1. Parallel orientation: This style is where components are arranged with parallel forms. This style reinforces the rhythm of a design, creating a consistent pattern and promoting visual unity.

2. Diagonal orientation. This style arranges components in an angular orientation to create a contrast of elements or groupings. Contrast when applied using this method may enhance the emphasis or define specific groupings. This style creates a greater sense of variety, though it may lessen the perceived unity. Diagonal orientation implies a greater sense of movement through perceived kinetic energy, thereby increasing the emotional level of excitement within the participant.
3. Random orientation: this style arranges components in what appears to be a haphazard, undefined method. This style is a very difficult one to apply, carrying with it a high degree of potential failure in the cohesion of the design.

   Random orientation relates to the perception of a scattered or unplanned arrangement, though success can be achieved if the effort has been extended to ensure that a balanced composition has been designed. This method is used to provide greater emphasis, distinction of specific groupings, elevated contrast and a much greater variety than the previous two styles. What may be lost in this style is the overall unity of the composition as well as any implied connections.

The use of a modular grid system to provide alignment for placement coordination is a proven technique. Alignment and proper placement relative to the intended solution will bring about a greater sense of order to the overall composition.

Figure 61: Neue Staatsgalerie (James Stirling Architect)

Placement must also be considered relative to the planar location of elements. This requirement refers to the horizontal and vertical orientation of elements to provide specific affects.

Horizontal lines, planes and volumetric compositions create a sense of weight, grounding the composition in our sense. This sense of grounding is most likely due to our perception (constant awareness) of gravity and a pull to the earth.

Vertical elements, lines, planes and volumes are perceived as those that defy gravity, soaring upwards by thrust from the earth. These elements create a sense of kinetic energy, excitement and movement.

2.15 Unity and Variety

The act of architectural design illustrates an attempt to create a definitive solution, implying a "conscious attempt" to provide order. The principles of unity and variety are opposite and must be implemented with sensitivity or else the resulting solution will create an image of chaos, the opposite of order.

The correct balance of these two principles will provide a design solution that contributes visual interest, variation of form and texture and a subtle complexity that remains controlled. The use of these two principles prevents a boring solution which may respond to the basic problem statement, yet not reach above that goal to the level of architecture.

The application of unity and variety stems often from the functional program of the design parameters. A design problem for a warehouse or stadium box presents a single requirement, yet through the use of variety, variations may occur to provide a higher level of interest and complexity.

Figure 62: Chateaux de Chenonceaux (Unity/Variety), France

These two elements are discussed in concert since:

- Unity represents whole creation through sensitive application of variety. Unity may be achieved by linkage between differing elements such as:
    - repetition of distinct shapes, patterns, textures and sizes
    - visual and textural harmony through the use of colour, materials and shape
    - the use of a border (physical or implied) that encloses elements within a framework.

- Variety provides the visual interest within unified elements through the use of different techniques including shape, size, colour, texture, material and pattern.

Variety in some applications may be considered as an element of contrast, though its application must be controlled to retain the sense of the whole. There are applications wherein variety creates distinct contracts as a guiding principle in the architectural statement. These applications illustrate those moments where principles are reversed in order to achieve the intended solution.

Figure 63: Private Residence (Robert Venturi Architect)

Variety is one of the most visual characteristics noted within architectural design. It is easily one of the most apparent traits.

Variety may be controlled through the use of harmonic characteristics of unifying elements in order to maintain a sense of the whole. The inherent task when considering the application of these principles is to maintain a balance of harmony and opposition, establishing unity between the solution, site and environment.

3.0 Additional Design Considerations

3.1 Function

Every design is completed in order to serve a defined functional aspect of our existence. The success of a design solution is evident when it resolves the problem by providing a suitable environment. The failure of function is evident when the design does not achieve this goal.

Figure 64: Millennium Concert Shell, Chicago (Frank O. Gehry Architect)

Function relates to the essence of the design solution. Function also has to respect the rhythm of life relating to those who occupy the spaces.

A house is meant to provide shelter from the elements and security or protection from others. These two aspects are the basic function of a house. A house also has to provide a place for the functions of gathering, play, work, retreat, exposure, worship, celebration, consolation, etcetera. All functions of daily life must be accommodated into the essence of a residence for it to fully serve its purpose. The same issues can be described for our educational, institutional, corporate and public environments. It is a tall order to consider all of these aspects relative to architectural design; an order that architectural practice endeavours to satisfy constantly.

3.2 Time

The dimension of time is the fourth cognitive dimension applicable to architectural design. Time plays a crucial role in the manner through which architecture is experienced, appreciated and understood.

In order to properly experience architectural design, which is in fact an inanimate object, a participant must be able to spend time in and around the building to provide:

- Time to walk through and experience the size relative to your passage.
- Time to flow within the structure to experience the interplay of space resulting from your movements.
- Time to observe and experience how the design is best suited for the intended function.
- Time to observe the forms, solids and voids as well as textural effects and colours within the spaces.
- Time to observe the lighting conditions, how they change during the days and seasons, how the effects within the structure are altered by the lighting.
- Time to experience the acoustics within the spaces; echoes, stillness, reverberation, muffled sounds.
- Time to experience the design with all of our senses, establishing our presence and sense of being within the design.
- Time for the building to exist through the years of mankind, establishing itself as a work suitable for the mantle known as Architecture. This statement does not mean that anything old will be classified as architecture since bad design does not necessarily improve with age (nor does bad wine).

Architectural design provides a historic tableau through the passage of time that documents our lives and reflects our existence to future generations.

> *Architecture is to be regarded by us with the most serious thought. We may live without her, and worship without her, but we cannot remember without her.*
>
> *There are two duties respecting national architecture whose importance it is impossible to overrate; the first, to render the architecture of the day historical; and, the second, to preserve, as the most precious of inheritances, that of past ages.*[7]

The passage of time creates a distinct bond between architecture and the user. We remember places, buildings and experiences based on the space and time in which it occurred. Our childhoods are made up of memories, many of which centre on the architecture we experience or inhabited at a certain point in time. Architecture as an enclosure element creates the opportunity for experiences; time as it passes creates the memory of architecture relative to our experience.

> *Those of use who are concerned with buildings tend to forget too easily that all the life and soul of a place, all of our experiences there, depend not simply on the physical environment, but on the patterns of events which we experience there.*[8]

[7] John Ruskin, The Seven Lamps of Architecture, P. 169
[8] Christopher Alexander, The Timeless Way of Building, P. 62

Figure 65: Queen Anne Style Residence

The most intimate connection between structure and mankind may be found in our perception of Home. Through the passage of time, we bond with our personal environment; creating and changing it to suit our needs at the time but always relying on it to serve its basic purpose (shelter and protection) while providing us the opportunity to use it for our own purposes. At the end of our time in the home, we often personify the house as "family", going far beyond the reality that the house, though perhaps modified and aged, remains the same entity as it was at the time of construction. The house remains a compilation of building materials arranged in such a way as to enclose space. This compilation (the house) has through time become a part of our reality and existence.

3.3 Lighting in Architectural Design

The aspect of lighting relative to architectural design is crucial to ensure success. The atmosphere and aesthetic of space and form can be obliterated by inadequate or improper lighting.

Figure 66: Courtyard du Murier, Ecole des Beaux-Arts

This portion of the design process involves the discipline of electrical engineering to provide data and background, participating in the fixture selection and design to provide lighting suitable to enhance the user's experience. This process relates to the integration of artificial lighting. The process of day lighting is a more difficult one to control.

> *Those divisions (divisions of the design itself) are, necessarily, either into masses of light and shade. The power of architecture may be said to depend upon the quantity (whether measured in space or intenseness) of its shadow:*[9]

[9] John Ruskin, The Seven Lamps of Architecture, P. 82

Figure 67: The Pantheon, Rome, Italy

Day lighting in architectural design is difficult to adequately control yet it is essential to our own well-being and subsequently to the experience of the design itself. Daylight is constantly changing as the solar path is never repetitive, nor is the weather on any given day or time in the year. The design must strategically locate the necessary voids (windows, skylights, clerestory windows, doors) in order to capture and direct daylight to provide the desired affect. These affects, when properly achieved, may add a sense of theatrical ambience to the space.

3.4 Acoustic Influences in Design

The acoustic influences relative to architectural design are an important concept. To ignore acoustic properties of space, form and texture will run the risk of creating environments that do not serve their intended function. To provide for this consideration will enhance the ambience and experience of a design solution.

Acoustics respond to our sense of scale within a space, even with the lights off. Human nature through experience is able to tell the relative size of a space solely by the sound of footsteps on the floor surface.

The generation of sound is enhanced or limited by the size of the space, forms, textures and surfaces and the type of materials used throughout. This consideration has created a new discipline of Acoustic or Environmental Engineers that study the specific properties of sound.

This discipline of Acoustic Engineering provides input to the design process to aid in the resolution of the acoustic ambience intended. Performance and practice areas require separate treatments from lecture and office areas; classrooms need proper sound attenuation for spoken word while auditoriums and gymnasiums may require the addition of specific directional sound systems. Each of these instances will have an impact on the design solution and must be carefully studied during the architectural design process.

The influence of sound and space can be found in the inflection of religious ceremonies. Original cathedral designs, as noted in the History section, were based on Roman Basilica plans; a large central space with parallel narrow aisles. Celebrants were required to cast out their voices in order to carry the sound throughout the interior space. This loud sound however created a rhythmic echo, causing a reverberation of the sound off the wall, floor and ceiling surfaces. Audibility of a monotone, non-rhythmic prayer was lost due to overlaps in sound coming from the celebrant and repetitive echoes. It would seem like many people were saying the same thing at different points in time, all blending together in a chaotic sound pattern.

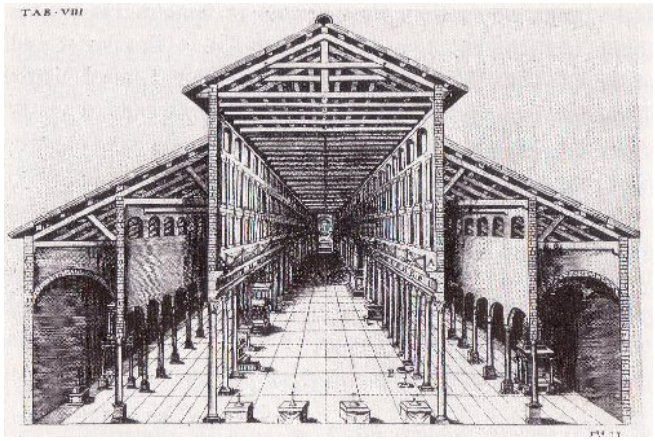


Figure 68: Early Church Basilica, Rome, Italy

To overcome this audible deficiency, the modulation of the prayers and chants were established, emphasizing the crucial components of the text and celebration, minimizing or making use of the potential echo. These rhythmic intonations are still in use today, respected as the manner through which celebrations are conducted. This current aspect of religious services is a direct result of the attempt to overcome the acoustic deficiencies of early church design.

Modern technology now provides the means and methods to test spaces, prior to construction to ensure that proper acoustics are achieved. It is known that hard surfaces will reflect sound and soft surfaces will absorb sound. The type of material used, the texture and even the shape of the form will be used to direct, control, augment or absorb sounds based on the intended use of the space.

3.5 Architecture and the Environment

Architectural design makes a conscious choice when creating structure within the natural world. The choices available are to either harmonize with the surroundings (natural or constructed) or to stand apart from them.

To harmonize with the environment is to blend in, sympathetic to the nature of the landscaping or adjacent structures, becoming a coherent component within the contextual area.

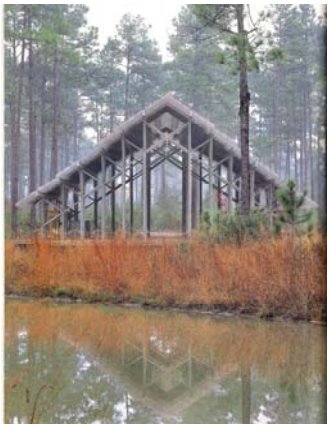


Figure 69: Rural Chapel

To stand apart creates a distinct statement relative to the design solution. This statement includes the isolation of the design solution within the built environment, setting it apart as a focal point within the greater area. To create in this manner within a natural environment constitutes the statement of mankind's impact on the world; dominance, manipulation and focus being the resulting perception.

> *The value of architecture depends on two distinct characters: the one, the impression it receives from human power, the other, the image it bears of the natural creation.*[10]

[10] John Ruskin, The Seven Lamps of Architecture, P. 100

The environment itself may be urban or rural, depending on the specific commission. Whether architects choose to follow either of the two paths, they must remain aware of the environmental conditions. Never, in any situation, should consideration of the environment be ignored.

The natural environmental considerations are covered in greater detail within the Geography section of this curriculum. Briefly described, environmental considerations should include:

- Natural topography (land formations and types)
- Natural landscaping
- Surrounding or adjacent building themes that exist
- Land use/area (industrial, residential, corporate)
- Climate: this element incorporates a vast array of considerations including energy use (green building concepts), natural lighting, water usage and solar orientation.

Figure 70: Speyer am Rhein, Germany

Architectural design must be considered in its context that is relative to the intended location, time and space. Good design is only good for a one time specific use application – repetition elsewhere without change or modification will not achieve the same successful result. Along with this consideration, one must realize that no design solution exists in isolation for there is always a contextual element present. A design solution that is completed relative to its contextual application is more likely to be accepted (judged) as appropriate. A design solution completed in contrast to its context must be done so with intent.

The task is to engage the design problem at all levels, considering the application of design principles, to fully resolve a successful solution.

> *Always design a thing by considering it in its next larger context – a chair in a room, a room in a house, a house in an environment, and environment in a city plan.*[11]

[11] Eliel Saarinen, as quoted in The Nature of Design, P. 93

3.6 Landscaping and Architectural Design

Architectural design is a process that involves the design of the structure as well as the surrounding context. The landscaping elements adjacent to or leading up to a design solution contribute a great deal to the user's perception of order, pattern and development. Design must strive to create a transition between interior and exterior spaces, unifying the overall composition into a whole and blending structure with the environment. Without this effort, the structure is laid bare upon the site like a rock dropped on hardened soil.

> *It follows that a building which is whole must always have the character of nature, too. It will have the same balance of repetition and variety that nature does.*[12]

The element pertaining to landscape design and integration are the same as those reviewed in this section relative to architectural design principles and elements. Landscape design involves:

- Line to establish the flow and geometry (natural or rigid) on the site
- Horizontality provided by walking surfaces, ground walls, hedges and shrubs
- Verticality provided by trees and constructed site elements
- Texture provided by plants and material surfaces
- Variety in constructed elements and plant life
- Unity provided by consistent and complementary materials, forms and textures.
- Repetition in forms, shapes, colour and texture
- Pattern providing a visual rhythm and cadence for movement

[12] Christopher Alexander, The Timeless Way of Building, P. 149

- Emphasis for focal points and the structure itself.
- Balance between site elements, structure, colour, texture, massing, proportion and scale.

Figure 71: Housing, Interlaken, Switzerland

Constructed site elements provide the opportunity to reflect the structure around the site, reinforcing the symbolism and imagery, adding colour, line and shape as well as movement of line around and within the site. Colour is a specific aspect which must be considered relative to its impact in all seasons (summer through winter) in order to provide a consistent site relative to the structure.

The process of landscape design forms a distinct component of the design profession. This component of Landscape Architecture must be understood and implemented by the design architect through the concept to ensure that the completed structure is a total integrated composition within and around itself.

Figure 72: Landscape Fountain, Boboli Gardens, Florence, Italy

NEW TEXT DEFINITIONS:

{A listing of new architectural definitions provided by this component}

APPENDIX 'A'

List of Images

Reference tags:

A: Image by Author
B: Architecture is Elementary
C: Architecture Source Book
D: Design Through Discovery
E: Experiencing Architecture
G: Internet Image
T: The City Shaped
N: The Nature of Design
W: Buildings that Changed the World
M: Architecture Timecharts
P: Architecture: Prehist-Postmodern.

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APPENDIX 'B'

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