CHAPTER 1

Architectural language

This chapter establishes a foundation for architectural education. It is divided into a series of units that describe in detail architectural drawing types and representation methods while establishing the fundamental architectural language necessary for future success in the profession. Preparation for the profession begins with the introduction to each communication tool, coupled with the identification of your intended audience.

Knowledge of the fundamental architectural language is necessary for clear communication of architectural ideas. The units in this section define the basic concepts, representation types, and conventions used to create and communicate architectural ideas. You will learn about architectural representation, to whom architects want to communicate, why they draw and make models, and what implements they use to create those representations.
What is architecture?

This unit encourages you to think about the built environment in a more critical way. What is your definition of architecture? What is your definition of building? How are they similar and different? Can architecture be art?

The word “architecture” derives from the Greek word *arkhitekton*, meaning “master builder or craftsman.” The contemporary definition given by Webster’s New Universal Unabridged Dictionary states that architecture is “the profession of designing buildings, open areas, communities, and other artificial constructions and environments, usually with some regard to aesthetic effect.” Those in the profession state unambiguously that architecture and building are not the same. Buildings are often referred to as anything that is constructed, while architecture is usually defined as having been influenced by aesthetics.

The qualification of aesthetics that creates a distinction between buildings and architecture elicits the question, “Can architecture be art?” Can something that is functional also be art? Some would question the ability of architects to create something artistic while fulfilling a functional task. Artists never have to contend with function as a requirement of their art, while architects must consider that in every architectural task.

Architecture or building?
The application of aesthetic considerations distinguishes architecture from building. This definition recognizes that there is a distinction between a shed and a cathedral.

The following definitions of architecture were suggested by a group of new students:

“Architecture is structures built for human needs. Being an architect is having the spirit to build for people.”
T. Wen

“Architecture is the design of spaces that can be fundamental and beautiful.”
L. Miggins

“Architecture is the design of buildings and landscapes with the intentions of being both aesthetically pleasing and functional.”
B. Pierson

“Architecture is the poetry in building in which communities are reinterpreted and refined in varying degrees. However, it must maintain its purpose in its design for human use.”
K. Patterson

“Architecture is the process of taking a concept or function and giving life to it structurally.”
A. Brown

“Architecture is an expression of an artist’s beliefs, feelings, or surroundings through a structure, landscape, or object.”
B. Newell

Read this!
Laugier, Marc Antoine
*An Essay on Architecture*
Hennessy & Ingalls, 1985.
(Originally published in Paris in 1753.)

Vitruvius
(Originally written around 27 BC.)
You should define architecture for yourself—now, and then again after reading this book. This question is left open to allow you to modulate and transform your own definition of architecture as you read the book and continue your architectural education.

The design of the built environment takes on many forms and scales. Over many centuries, architects have taken on the role of architectural designer, landscape designer, urban designer, product designer, and furniture designer. The scope of work available to architects has even grown to include graphic and information design. Frank Lloyd Wright, for example, in many of his houses, designed every aspect, down to the furniture and the cutlery. He was even known to return to his clients’ homes and move the furniture back to its original placements.

Architects design buildings, spaces, campuses, landscapes, and even entire cities. Regardless of the nature of the setting—urban, rural, or suburban—buildings have a context. In designing architecture at all scales, the architect should recognize this context both physically and intellectually.

Alvar Aalto

Alvar Aalto’s (Finnish, b. 1898 d. 1976) early works were influenced both by the Nordic Classicism of Scandinavian predecessors such as Gunnar Asplund and by the ever-growing Modern Movement. His library in Viipuri (1929–32) clearly reflects both of these influences and his humanist manner. The interior was carefully designed with warm wood details and a thoughtful manipulation of natural light.

Aalto believed in gesamtkunstwerk, a synthesis of the arts. That is to say, he carefully orchestrated the design of not only the building, but also of the many furnishings such as light fixtures, door handles, chairs, and so on within it. He has a number of chairs and household goods credited to him. Aalto was a prodigious builder, completing well over 100 projects throughout Europe and North America.

In architecture school, the most important course for a design student is the studio course. This is where you are introduced to different processes of design.

The structure of a studio course is much different than that of the typical lecture course. In studio, student ideas are typically discussed in the company of the professor within a preset context—that is, within a given program or topic. This dialogue differs greatly from the monologue typically associated with the lecture course. As a student in the studio course, you meet in groups and individually to discuss ideas directly with your professor. Professors provide direct feedback in these settings, including suggestions on how to proceed or precedents to study. This direct dialogue between student and professor is fostered in the open studio environment. The one-to-one interaction with the professor is unique to architecture and other creative professions. Students, however, also learn from one another in this type of atmosphere. The working environment provides a place in which to interact with other students.

Design projects developed in the studio course are evaluated during a “review,” often with guest critics in attendance. These participants are generally other academics or design professionals. The design work is displayed for review. The student then verbally describes his intentions, using the graphic material as visual support. The reviewers critique the work based on the clarity of the idea and its relationship to the representations. Student comment and participation is encouraged because this environment is meant to foster learning.

UNIT 1: What is architecture?
In reality, architects produce representations of buildings, not actual buildings. In many instances, drawings and models are the closest an architect comes to constructing a building. These methods of representation require careful thought and articulation. This unit focuses on the art of drawing.

Drawing, as an artifact, is a two-dimensional representation used by architects. It is a form of visual communication, based on a common, agreed-upon visual language that conveys ideas, depicts existing conditions, and creates as-of-yet unbuilt environments. Drawing transposes three-dimensional images, both real and imagined, onto two-dimensional surfaces.

Technical or architectural drawing operates under an established set of conventions and rules. It serves to provide visual representations for the discussion and understanding of design ideas and intentions. Just as a common set of codes and symbols allows us to communicate verbally with one another, a common language in architecture makes it possible to communicate ideas.

Drawing, as a skill, improves with practice. Contrary to a common myth, it is also a skill that can be learned. Though some people seem to have a natural inclination for drawing, everyone can be taught the skills to create informative, competent, and beautiful drawings. However, repeated construction of drawings will not necessarily result in becoming a good draftsman. Therefore it is also necessary to motivate and exercise the creative mind while learning the skills to craft drawings.

Representation breakdown
Digital programs provide an additional method of generating architectural representations—but manual representation will always be a valuable, necessary skill.
Le Corbusier

Le Corbusier (Swiss/French b. 1887 d. 1965) was undoubtedly one of the most influential architects of the 20th century. His Five Points of Architecture challenged previous methodologies of designing, namely the Beaux Arts tradition, and reshaped the built environment. These five points included the piloti, ribbon window, free plan, free façade, and roof garden. This approach to architecture was formalized in many of his residential designs. He is not only credited with designing some of the most important buildings of the 20th century, but also for influencing the instruction and curriculum of countless architecture schools around the world. His paintings and sculptures were equally renowned and respected.

Plan as the generator
Le Corbusier has been credited with the notion of the “plan as the generator.”

Sketchbooks

- One of the tools that you will want to keep handy at all times is your sketchbook. Having multiple sketchbooks can be useful—a small one about 3½ x 5½ in (89 x 140 mm) is convenient to carry in your back pocket, and a mid-sized one about 8½ x 11 in (216 x 279 mm) allows you to work in a larger format.
- The smaller sketchbook should travel with you everywhere. It is the place to record ideas, sites that interest you, and architecture that excites you. The other sketchbook is ideal for working out ideas regarding your own projects and collecting images for your image folder.

Design intentions
Different drawing methods are used to represent different design intentions. Charcoal drawings (such as the one shown on the left) can capture the mood of a space while line drawings (such as this sectional perspective, above) provide a more precise technical depiction of a space.
Representational intention

Architects envision, design, and think through drawing and modeling. They record ideas, test scenarios, and produce lines that capture thoughts. These representations can have meaning beyond a purely functional one of displaying the project. Drawings and models can reinforce a designer’s idea through representational intention.

This intention—the methodology and choices behind the representation—has the potential to create a more meaningful connection between project depictions and the architectural idea, making possible a stronger argument for the project. By asking the questions, “What will the drawing convey? What is the design idea that needs to be narrated through the representations? What types of drawings best convey those architectural ideas?” you begin to establish the criteria required to reinforce the architectural idea.

For example, in perspective drawing, the vantage point of the viewer can strengthen design ideas. A dramatic effect can be reinforced by placing the vantage point lower on the page. This lowered viewpoint, in combination with a closeness to the object, emphasizes the building’s monumentality.

Intentions that support architectural ideas can also be conveyed through an editing process. When making considerations about a drawing, what you leave out is just as important as what you include. You should be aware that every line you construct is part of the decision-making process.

Ideology

The exaggerated low viewpoint in this Russian Constructivist perspective drawing reinforces a political ideology as well as an architectural one.

Frank Lloyd Wright

Frank Lloyd Wright (American, b. 1867 d. 1959) is one of America’s most recognizable architects. His buildings are characterized by flowing spaces and a rich palette of natural materials such as brick, stone, wood, and glass. His early houses, known as “Prairie Style,” were organized around the hearth, both symbolically and spatially. Wright later designed a series of houses, known as the Usonian Houses, that he hoped would create an affordable, democratic, distinctly American house type. Wright’s important works include not only residences, but also churches and temples, office buildings, and museums.

Connection with the land

The horizontally-oriented perspective representation of a house reinforces Wright’s interest in low, horizontal designs that hug the land.
Fold and crumple

In this assignment, you will take a limited set of materials and use them to express your intention: to represent a specific space that you have experienced. This assignment is meant to get you interpreting and making at the same time. You will be thinking through the act of doing. This is your first of many spatial exercises.

Make a representation of your home. Begin by defining the term “home.” You do not have to think literally about the term. You can and should interpret this place through the act of making. The model you create will be a representation of this interpretation.

Assignment rules

1. Be creative—you don’t have to be literal. Try to capture the essence of the space.
2. You must be able to pick up the creation with one hand and NOT have anything fall off—meaning all the items must somehow be integrated and physically connected.
3. Think about the intention of your representation.
4. You cannot tear any pieces once you have them sized to the given dimensions.
5. Give yourself 15–20 minutes to create your abstract representation.
6. Understand that there is no wrong answer or wrong model to make. This is solely about your interpretation of the assignment.

What you need

- Three sheets 8.5 x 11 in (216 x 279 mm) regular opaque copy paper, each cut into six strips 1.5 x 11 in (38 x 279 mm)
- Two sheets 12 x 12 in (305 x 305 mm) trace or other transparent material
- Hand-torn piece of newsprint—approximately 8 x 10 in (203 x 254 mm)

Two finished representations (above and right). The volumetric representation on the right is more abstract than the model above.
Study the sketch

Myth: A good drawing must be beautiful.

A successful drawing is one that clearly conveys intentions and ideas. It does not have to be rendered in an artistic, beautiful manner for it to be "good."

One method to help you understand the successful nature of drawing is to study sketches by master artists and architects. The study of these drawings provides you with insight into the mind, abilities, style, technique, and subject matter selected by the artists and architects.

Drawing techniques have different associated intentions; therefore not all sketches appear to be beautiful artistic renderings. Very clearly conceived sketches by some of the most famous architects are not always the most beautiful. During the drawing process, each artist edits or omits information that does not support the intention of the sketch.

This editing process allows the artist to emphasize a particular aspect of the view or design, clarifying the idea.

Find two sketches, one from each category listed below. Reproduce the renderings by hand in your sketchbook by copying the method of sketching. The purpose is to replicate the sketching technique used by the artist. Do not trace the sketch. Attach a copy of the original sketch into your sketchbook adjacent to your own sketch.

Examine the technique of sketching while you copy the work. Notice the medium of sketching, the sketch surface, and the size of the sketch.

Sketches to study:

**Architects**
- Louis I. Kahn
- Alvar Aalto
- Le Corbusier
- Tadao Ando
- Michael Graves

**Artists**
- Michelangelo
- Leonardo da Vinci
- Raphael
- Rembrandt
- Fra Angelico

▲ ▶ Edge contours

Note the various techniques used in these drawings by Leonardo da Vinci (right) and Raphael (above). Profile lines in conjunction with hatching patterns clearly define the edges of the figure.

▲ ▶ Line and rendering

The rendering of this Frank Lloyd Wright drawing emphasizes the form and mass of the building.
Sketching with lines

Lines vary greatly among sketches. Transparency and contours provide objects with form and shape in these drawings by Michaelangelo (left) and Rembrandt (above).

Spatial quality

The spatial quality of the architecture is captured by this sketch. The energy and orientation of the linework reinforces the character and quality of the space.
Types of drawing

Architects give their ideas physicality through drawing. They employ a variety of different drawing types, typically selected based on the criteria of design intention and the audience.

Two-dimensional drawings, referred to as orthographic projections, include plans, sections, and elevations. Perspective and axonometric are examples of three-dimensional drawing types. Drawings that overlap or combine linework with photographs, color, or some other graphic material are referred to as collage. Any of these drawing types can be constructed as hardline drawings or as freehand drawings.

- **Multiple sections**
  Multiple sections depict the changing conditions of the light in the space. Each section captures a wall elevation showing the changing nature of the poche (or thickened service) zone. The darkest areas depict the deepest parts of the poche.

- **Site collage**
  Constructed perspective drawings can be combined with existing images through collage techniques. The spatial continuity of the bathhouse design with the adjoining park pathway system is depicted in this collaged image.
**Finding scale**
Interior and exterior perspectives can be linked through colors indicating the same spaces viewed from different vantage points. The interior perspective (left) abstracts glazing as a blue film. The blue additionally indicates a subtractive move, carved out of the solid mass of the building. Abstract figures provide scale in both images while the blue coloration provides another reading of scale when considered from the exterior (right).

**Exploded axon**
Details of construction and material patterns are exposed in this exploded axon. Repetitive material patterns are grouped and pulled apart to demonstrate the parts relative to the working of the whole.

**Perspective rendering**
The graphite-rendered drawing showcases material transparencies and light qualities in spaces. In the perspective, the depth of the interior space is discernable even from an exterior view of the building.
Using an architectural scale
(Metric)

The triangular scale rule, usually having six measurement gradations, is commonly used for drawing and modelling constructions. Most use increments of one millimetre to create a wide range of scales. The appropriate scale is used to take measurements from the drawing in metres or parts thereof.

Along this line of measurements, every 2 cm is equal to 1 meter. The scaled numbers are already indicated on the measurement line. Note that the numbers on each scale correspond to a complementary set of scales.

Each scale is indicated as a ratio at the far edges of the measurement increments. For instance, the 1:50 marked on the far left indicates the scale of 1 cm being equivalent to 50 cm on a drawing scaled at one to fifty.

Other scale rules are a more conventional flat format. They generally have two scales on each edge, one being 10 times the size of the other, i.e. 1:20 and 1:200. Specialist rulers are available to read measurements in meters from old imperial scales, i.e. 1:96 (¼ in. to a foot) or 1:48 (½ in. to a foot).

On some scale rulers, smaller increments are marked outside the “0” mark. Therefore, it is necessary to measure the meters and add on fractions of a meter outside the mark.

Scale and level of information
The type and amount of information conveyed by a drawing depends on its scale. A drawing at 1:100 scale requires less detailed information than one at 1:50 or 1:20 scale. For example, the delineation of brick at 1:100 scale may be abstracted as horizontal lines, while at 1:50 or 1:20 scale the details of the individual bricks are more appropriately drawn.
This assignment provides you with an opportunity to collect images of things that you like, find interesting, or are curious about. Build a folder of images of spaces, materials, and construction techniques to influence and inspire your design work. In developing your image folder, ask yourself not only what you like, but why you like it. Try to boil it down to a single idea. Use the following representation categories as a guide to help you maintain a variety of drawing examples:

- plans
- sections
- elevations
- axonometrics
- one-point, two-point, and three-point perspectives
- freehand sketches
- ink drawings
- graphite drawings
- computer drawings
- renderings
- physical models.

In all, collect any image related to drawing and representation that is aesthetically appealing to you. These images will be a resource and inspiration for your own designs.

The focus of the assignment is on representation, so do not use photographs of existing buildings. Take images from books and magazines. Include the source of each image, the name of the magazine or book title, and the publication date. By recording this data, you will discover which books and magazines most appeal to you. Keep your images in a clearly organized binder or in your sketchbook.

It is important that you expand your knowledge of representational methods. By seeing what others have done before you, you can learn to develop your own style.

Website
Professionals create their own image folders in a variety of ways. New York architects Tod Williams and Billie Tsien include on their website a link to a section called “things”; representing a collection of images and objects that inspire them.

www.twbta.com

Research tip
The physical act of looking for information in books and magazines in the library encourages a kind of exploration that the Internet has not quite offered yet. The Internet, though good for searches in which you know what you are looking for, is limited in making non-linear connections.
Models as representations

Drawings and models are both abstract representations: they provide methods for expressing architectural ideas and concepts. Drawings are typically constructed on two-dimensional surfaces, while models provide a three-dimensional abstraction of space and form.

As in drawing, both the process and the presentation of ideas are recorded in models. In comparison to drawings, models provide a clear representation of space, operating in three dimensions. Because of their abstract nature, do not attempt to make them too realistic. For instance, models made out of basswood are not meant to indicate that the building is made out of wood. The model is used as an abstract representation of the space and form of the building, not the materials. If material distinction is necessary, abstract those as well.

As in drawings, models can reinforce architectural intentions, be they spatial, formal, or tectonic. For example, the base of a model can be exaggerated to reinforce a connection between the building and the ground. By enlarging the depth of the model base, there is a greater emphasis placed on the rooted quality of the project with the earth. Architects can also edit the information in a model. This enables control over the model’s intention which can result in the reinforcement and clarity of the design ideas.

Model practicalities

Questions to ask yourself:
- What material should I use?
- How can I successfully abstract real building materials?
- At what scale are the materials to be depicted?
- Is the whole model made out of the same material?
- What are the limits of the site versus the limits of the model? Is it the property line, or the strong edge in the neighborhood? The context provides a comparative element to judge your own building against.
- At what scale should I make the model?
- What do I want to show? Remember, entourage can be included to demonstrate scale in a model.

Site connection

The exaggerated base of this model of the Newton Library by Patkau Architects emphasizes the connection between the building and the site. The angle and form of the exterior columnar system is carried through in the depth, form, and articulation of the model base.

Parasitic design

Material distinction establishes clarity between existing and new elements. This design intervention is constructed of basswood and inserted into a model of chipboard and corrugated cardboard to represent the existing building.

Detail model

This large-scale model depicts structural and framing systems. Abstract models of this nature force you to become familiar with actual construction techniques. They allow you to understand the tectonics of the building and how components join together. These models can also inform the design process. This means that once these models have been built, you can study and reevaluate the construction and make changes to the geometry, proportion, and scale of the design.
**Study models**
The study model is a type of model meant for the assessment of ideas. These models can be manipulated and remade quickly. They provide opportunities for discovery, inspiration, and investigation. You should consider these types of models as developmental and not final renditions of the idea; they are part of the iterative design process. Therefore, you should feel comfortable manipulating and molding these models. Don’t be afraid to rip them apart to test different ideas.

**Massing model**
A massing model depicts the volumetric qualities of a building without much detail. Massing models are used to assess and compare the relative form and scale of a building to the adjacent building context. Contextual information is often included in these models to show how new buildings and spaces interact with the existing conditions.

**Presentation models**
Presentation models are used to show final design ideas for either your own projects or studies of other precedent examples. In the profession they are used for client and community meetings. These models are not about process but product; they are usually the most well-crafted models produced for the project. The model shown above represents a precedent study of Le Corbusier’s Maison Cook. The model on the left shows a room for repose, using hydrocal and wood.

**Topographic model**
Topographic models depict the changing landscape of the site. The scale of the model determines the thickness of each contour depicted on the model.
Physical vs. digital models

During the design process, there are several benefits to making a physical model over a digital model. Physical models let you experience the building as a three-dimensional material object, allowing the design to be understood simultaneously through all of its parts and as a whole. There is tactile immediacy to grasping and understanding the form visually and the composition through physical movement and rotation. This process compels the designer to be empathetic to the force of gravity and encourages him or her to think of the material connections and their tectonic implications for the architectural idea. In essence, the designer responds to his physical connection with a handcrafted model.

While the digital model also allows a type of visual immediacy through the rapid selection of views, these views are ultimately limited by the screen size and the limitations of the software interface. The designer needs to input a command using the keyboard or mouse in order to rotate, move, or modify the image. There is a type of hesitation to the designer’s engagement with the concept. However, digital models can also provide opportunities to simulate travel through and into spaces, providing views that a physical model might not allow.

Material construction

These two images depict transparency studies of the same architectural project through the use of a digital model (below) and a physical model (left). The digital model is more diagrammatic, emphasizing the continuity of spaces, while the physical model allows the viewer to understand the massing of the addition (in basswood) with greater clarity.

Typical modeling materials

Models do not have to be made from a single material. Using two materials can distinguish between existing and new, or between materials.

**Chipboard**
- **Pros:** no grain, easy to cut, cheap, consistent color and material throughout, comes in different thicknesses, comes in large sheets
- **Cons:** doesn’t look as refined, slight variations in color

**Basswood**
- **Pros:** grain can emphasize directionality of materials, more refined look, easy to cut, comes in sticks, sheets, and blocks
- **Cons:** has grain, sheet size is limited, costs more than chipboard

**Modeling clay**
- **Pros:** good for carving and landscape models
- **Cons:** dries out quickly, messy, imprecise

**Museum board**
- **Pros:** easy to cut, no grain, comes in big sheets
- **Cons:** hard to keep clean, not always consistent material throughout, more expensive than chipboard

**Foamcore**
- **Pros:** for making large scale models, comes in a variety of thicknesses
- **Cons:** not consistent material throughout, need to adjust edges when joining pieces together
Case Study: 1

Architectural mock-ups

Architects should be conscious of the impact of their design ideas on a site. Smaller-scale representations can be limiting in presenting the full considerations of the design project.

In some cases, architects support deeper investigations by constructing full-scale mock-ups to test impacts on a site, constructability, or material effect. The following images demonstrate a full-scale mock-up of the Northeastern University Veterans Memorial. The scale of the Memorial Wall, along with its placement on the site, was being tested.

Some mock-ups can be made using non-traditional materials to replicate the design impacts while others require real materials to be tested. The wall detail mock-up is typically constructed on site at full scale to test the construction techniques, color, and pattern choices relative to the context.

Defining wall
The relationship of the wall to the surrounding context and the relative size of the space being created were verified with a full-scale mock-up. The height of the wall was altered when tested on the site, while the location and length were found to be appropriate.

Combining materials
The plexiglass depicts the existing house while the basswood is used to depict the house addition. The plexiglass allows the connectivity between the two wood masses to be seen.

Plexiglass
Pros: provides a transparent material allowing interior views, can model curtain wall easily
Cons: difficult to cut, especially holes in the middle; transparency is sometimes misunderstood

Cork
Pros: comes in rolls and sheets, looks finished, easy to cut, used as contours or landscape
Cons: expensive

Styrene
Pros: highly-polished smooth surface ideal as a mold for casting plaster, comes in a variety of sheet sizes
Cons: more expensive than basswood

Corrugated board
Pros: affordable and accessible material, can use boxes and other packing material
Cons: quality of material is rarely sufficient for final presentation models; must consider exposed edges in model

UNIT 5: Models as representations
Depending on the audience to whom they are presenting ideas, architects produce different types of drawings. Through representations, architects try to convey their ideas and intentions. There are three main audience groups: the fellow student, academic, or architect; the builder or contractor; and the client.

Presenting to architects and students
Architects understand the abstract nature of representation; therefore, the presentation of your ideas can be made using the full spectrum of representation techniques—freehand and hardline, conceptual and realistic—and using all of the drawing techniques. In addition, these representations can reveal the process of your design thinking. The design process is stressed as a presentation component in academia. It is not only the design that gets evaluated; it’s also the process of arriving at that design that is critiqued and assessed in school. School is one of the best places for learning and experimenting with design process representations. Be creative, adventurous, and inventive. Design feedback is provided in this arena.

Planning board/community group
Architects need to be able to communicate directly to the public. In an age of greater community involvement in the design of many public and private buildings, an architect’s ability to communicate clearly and effectively with this group is key to the success of a project. A variety of presentation-style drawings are used in the public forum. Architects use these representations to convey their vision to the audience. In this role as community liaison, architects need to learn how to listen to their audience. The public generally wants to understand how the project might benefit their community through improved landscaping, reduced traffic congestion, increased accessibility, and façade treatment, to name a few. Similar modes of representation techniques presented to the client, including perspectives, models, and sketches, are also those that the community understands.

Conveying ideas
These two plans for a veterans’ memorial, were created for two different audiences. The rendered plan (left) was presented to a design review committee. It demonstrates the qualitative aspect of the project. The monochrome plan (above) is a construction document. It delineates clearly the qualitative description including exact number, type, and location of all the building elements so that the contractor can construct the project.
Design decisions

This example demonstrates the decisions an architect makes when determining the appropriate representations for a specific audience. The variety of drawing types associated with the design process in a professional architectural office is explained.

Pre-design
In this phase, the architect can assist the client in establishing the program and site. Zoning issues are explored, including maximum buildout due to Floor Area Ratio (FAR). FAR is the total building area that can be constructed on a site. For example, a site might have a FAR of 2, which means that a building two times the area of the site can be built. This does not limit the number of floors; it limits only area. Other factors, such as setbacks, participate in defining the maximum building envelope. The FAR is established by zoning codes.

The program is the project statement that often includes specific room types and associated square footage areas. Some architecture firms specialize in helping clients establish project programs and square footage requirements.

This part of the design process is sometimes the least graphic and often includes interviewing user groups who will occupy the finished building.

Schematic Design (SD)—sketches, study models, perspectives
Architects generate lots of ideas through drawing and model-building during this phase. Some architects work simultaneously at a large scale, exploring the form of the building relative to the neighborhood, and at small details like material selection. This phase of work is typically generative and exploratory. The architect explores the possibilities and limitations.

Design Development (DD)—drawings, models, perspectives, mock-ups
Architects generally describe, through drawings and models, the project in more detail during this phase. Often, drawings increase in scale from 1/8 in or 1/4 in to 1/2 in for more detailed information.

Construction Documents (CD)—full-scale mock up, details developed at larger scales
These drawings graphically depict the instructions to the contractor. They explain the design intentions of the architect. They constitute legal documents for the design project, emphasizing the importance for clarity and legibility in visual representation. The scale and number of drawings increase during this phase.

Construction Administration (CA)—on site
During the construction process the reality of site conditions, changing availability of building materials, and cost issues may require that changes to the original construction drawing set be made. Architects often use sketches to depict these desirable changes, thus modifying the original construction document set.

Presenting to clients
As an architect, communication with your client is critical. Their feedback is necessary to the development of the project. Two-dimensional representations are difficult for most untrained people to understand, since they are unfamiliar with the conventions of the drawing language. Typically, the most challenging representations for clients to grasp are the orthographic projections like plan and section, due to their abstract quality. It is difficult for some people to translate information from two-dimensional lines to three-dimensional space. Therefore, it is imperative that you learn to communicate with clients in a manner that is lucid and understandable to them. Since plans and sections are typically more challenging for clients to understand, architects often use constructed perspectives, sketches, and models. Seeing spaces and forms is clearer with these methods. Ultimately, clients want to understand spaces being created relative to their desired program and project statements.

Presenting to builders and contractors
Architects communicate with builders through the construction drawing document set. These drawings are considered the instructions that convey the design intentions to the builder through detailed prescriptive drawings. They are part of the legal documents that explain to the builder what the architect wants built, and how. Builders are well versed in architectural drawing and understand the representations made in the construction document set.

Digital communication
Digital technology is changing the ways architects and contractors communicate. For example, the use of computer-aided design (CAD) software, computer-aided manufacturing (CAM) systems, and Building Information Modeling (BIM) have modified typical standards for communication. CAD software and CAM systems create more functional connections between the architect and the manufacturer or fabricator. This streamlined process of production promotes effective organizational structures and helps to reduce inefficiencies of data transfer. BIM ties three-dimensional modeling to the data information of each component part of the building. BIM is a relatively new paradigm to the design and building industry which has the potential for creating a more seamless transition of information between architect, contractor, and subcontractor.
Concept

Purely functional solutions to problems often lead to the design of buildings, not architecture. When generating ideas about possible architecture solutions to a given problem, consider both the functional and the artistic/spiritual aspects.

A concept is a generating tool; it is a way to organize the component parts of the project under a single idea.

There are many ways to arrive at a concept. There are formal approaches, tectonic approaches, intuitive approaches, analytical approaches, narrative and metaphorical approaches, and site responses, to name a few. You can derive architectural concepts from just about anything: a folded piece of paper (Rem Koolhaas), a jumble of pixie sticks (Coop Himmelblau), analysis, or whatever works for you.

Even within a single approach there are many methodologies of generating ideas. For example, a system of analysis is one way to grasp as many tangible existing conditions as possible that then might provide the generating idea for the project.

You can analyze the site, context, program, or relationships between these topics and others to generate a concept. You can start developing a conceptual idea by asking questions. Start with what you know—program and site. Analyze these to understand what each might mean for the given project. Then ask the question: “what is important and why?”.

Generating ideas

- Too many ideas do not make a better project.
- Simplify your ideas; simple does not mean boring.
- Represent your ideas graphically.

Conceptualizing an idea

Imagine being asked to design a pencil holder without any further design parameters. Here’s a possible method of conceptualizing the idea:

- Research the pencil (ask the pencil what it wants to be).
- Consider how many pencils will be held.
- Analyze precedents—what form do other pencil holders take; what questions do they answer? By looking at precedent you can think about what questions the previous designer asked and answered.
- Study the hand—this is the one element that will be interacting with the pencil.
- Consider the ergonomic relationships of the hand to pencil when removing it from the holder.
- Ask: how long are the pencils? How thick? How heavy?
- Think how you can organize the space related to each pencil. How do you want the pencils to sit: vertical? horizontal? What material to use?
- Investigate form relative to the given pencil.

Documenting thoughts

Recording your ideas is a vital part of the design process. Brainstorming can generate a series of ideas and sketches that lead you to other investigations. Recorded images allow you to react visually to a concept. Do not limit your conceptualization process to just words or images—use both.

Design does not occur in a vacuum. Ideas can be generated from other projects. Understand that ideas are not sacred; that is, similar ideas can be copied from other architects and buildings. These ideas can then be translated into your own design. The key to borrowing ideas in architecture is to translate them and make them your own. Learn from precedents and apply your own design sensibilities to the knowledge you have gained.

When trying to arrive at a conceptual idea, it is helpful to try to think physically about the idea. For example, you should sketch the idea, model it, or draw it. It’s important to remember that the idea is not the architecture—it provides a way to arrive at the architecture.

Research is a vital component of the design process. It provides you with a more in-depth understanding of a project. Research can involve a number of possible investigation methods. You can research the history of the building type, the history of the site, contemporary versions of the building type, or even similar-scale buildings with a different program. You can also research the program itself.
Iterative process
Once you have a conceptual idea, you need to develop it into architectural forms and spaces, details and materials, circulation and experience. The process of design is one of iteration; that is, a repetitive process of development that changes over time. Each successive iteration builds on the lessons from the previous one. The iterative process emphasizes an exploration of several options before settling on one single manifestation of a project. Through an iterative process of problem solving, you will be graphically and theoretically testing potential design solutions.

In every phase of the process, ask yourself why—Why that form? Why that space? Why that location?

Diagramming form
Folded colored planes depict the floor plates for a natatorium (left). The overlapping quality represents the conceptual idea: a connection between swimmer and spectator. The material continuity, represented in the diagram as the continuous plates, connects the water in the pools with the spectators. The folded plates are visible in the constructed perspective (above).

Realizing intentions
In the iterative process of design you are ultimately trying to translate what you are saying and thinking to what you are making. The process requires you to be critical of your own work. It is important to analyze your own design throughout the process. Synthesize your concepts into simple reductive drawings, or analytical diagrams (see Unit 21, page 78).

Simplifying ideas
Diagrams describe the essence of the idea. These diagrams are used to describe the various elements of one project. The sectional diagram provides the main idea for the project, one of the continuity of the ground plane as it extends into the bathhouse project. Secondary diagrams simplify additional supporting ideas.
Tools for success

Some basic tools and techniques are essential for well-crafted drawings and models. As with any skill, technical ability comes with practice. The challenges met with the first drawing and first model will disappear with experience.

Papers and pads

Sketchbooks
One spiral-bound hardcover sketchbook 8½ x 11 in (216 x 279 mm) and one 3½ x 5½ in (89 x 140 mm).
Keep a sketchbook with you at all times. Use it to record things that you see around you, ideas for assignments, or anything else that inspires or interests you. Think of the sketchbook as a "diary" of your observations and architectural thoughts.

Large perforated recycled pad
9 x 12 in (229 x 305 mm).
A drawing pad is ideal for sketching assignments where pages need to be removed for presentation.

Newsprint pad
18 x 24 in (457 x 610 mm).
A newsprint pad is ideal for quick sketches. The quality of the paper is not suitable for finished drawings or for the preservation of drawings. This type of pad is not ideal for use with charcoal.

Large-format drawing pad
18 x 24 in (457 x 610 mm), 100# paper.
A large-format drawing sheet is ideal for figure drawing and still-life drawing. Backed by a clipboard, this drawing pad can be taken into the field for on-site sketches. The paper quality in this drawing pad is much more durable than in the newsprint pad and is therefore better for more finished types of work. This pad is ideal for use with charcoal and pencil.

Vellum roll or sheets
24 in (610 mm) roll 20 lb.
Vellum is a semi-transparent material. It is relatively easy to erase and is a durable material to construct presentation drawings.

Roll of cream, yellow, or white tracing paper
12–18 in (305–457 mm) wide.
Tracing paper is ideal for sketching and working in overlays. Overlay your trace on top of other drawings to make modifications and change ideas.
Tools for freehand work

Large box
For carrying and storing tools.

Pencil sharpener with shavings receptacle

Charcoal sticks

White charcoal pencil

Spray fix
Use this to seal your charcoal drawings.

Kneaded eraser
Use a kneaded eraser to dab lines when you want to dilute their strength or weight.

White eraser

Pencils
Hard: 2H, H; Mid: HB;
Soft: B, 2B, 4B, 6B.
The ideal pencils for sketching include the range from HB to 6B; softer leads give you a variety of line weights and types. You will need to develop a rapport with the pencils to establish your own line weights.

Colored pencils
Start with primary colors, then experiment with others.

Tools for hardline work

Swing-arm lamp
Lighting is key to creating beautiful drawings and models. Use task lighting to highlight your desk surface.

Drafting board
32 x 48 in (813 x 1219 mm) minimum; a hollow-core door or other smooth portable surface. Your drafting board must be sturdy and smooth without nicks or dents. A large surface is ideal for flexibility of drawing sizes. A lightweight board is ideal for carrying.

Drafting surface and board cover
A self-healing vinyl membrane covers and protects your drafting board and is ideal for drawing on. It is not a good idea to draw directly on wood or other hard surfaces.

Double-sided tape
Use this to attach the drafting surface to your board.

Leadholders
Having multiple leadholders lets you use a variety of thicknesses simultaneously without exchanging leads.
Tools for hardline work (continued)

1 box of each of the following leads: 4H, 2H, H, F, HB, and B
The leads for drafting range in the H, with a few darker leads of HB and B. The harder leads offer more precision and sharpness of line.

Lead pointer
Use a lead pointer for sharpening your lead. To sharpen, pull slightly outward, using centrifugal force when rotating the lead around in the pointer.

Tweezers
In model building, use tweezers to help you connect small pieces together.

Erasing shield (with small slots)
Use a shield to erase short lines or specific lines in areas where there are lots of other lines you want to keep.

Drafting dots or tape
Use dots or drafting tape to attach drawings to the board. These adhesive materials won’t leave residue on your paper.

Drafting brush
A drafting brush prevents smudging. Use this tool rather than your hand or sleeve. Oils from your hands must be minimized on the drawing surface.

Parallel edge
42 in (1,067 mm) long with rollers on underside. Use the parallel edge to construct hardline drawings. Never use it as a guide to making cuts—preserve and protect it at all times. Make sure each time you come to your board that it is aligned properly. You can test this by bringing the edge down to the bottom of the board.

Compass
Use this for constructing circles.

Sandpaper (200-grit)
Use sandpaper to clean the edges of any wood surface. A sanding block is helpful to maintain 90-degree corners on wood. You can make a sanding block by wrapping the sandpaper around a scrap piece of square-edged wood. Light sanding can remove pencil marks and minimize joints between two pieces of wood. Too much sanding, however, can round the edges of the model. You can also sand plexiglass to change the transparency to appear translucent. Reduce the amount of scratches apparent in the plexiglass by sanding on both sides.

Drafting powder
Sprinkle drafting powder onto the vellum to protect the drawings from smudging.

6-inch (152-mm) metal-edge ruler
A metal ruler is good for measuring and cutting smaller model pieces.

Permanent marker
Use a marker to label your tools.

18-inch (457-mm) 30/60/90° triangle
14-inch (356-mm) 45° triangle

Triangular scale
Use the scale for measuring and dimensioning your drawings.

Aluminum or plastic push pins
Use pins to hold your work up for display or reference.

10-inch (254-mm) adjustable triangle
Use this to construct axonometric and perspective drawings.
Tools for model making

**Blade holder**
Use a blade holder to cut most model making materials. Thicker materials require either more cuts or the use of a utility knife.

**Blades (x100)**
Buy blades in bulk, since you will be replacing them often.

**Utility knife**
Make long cuts with a larger knife. Cutting into thick surfaces like foam is easier with a long blade that is adjustable up to 4 in (102 mm) long. Remember when cutting with large knives to score the material first with a light stroke. In general, aim to use less pressure and more strokes. Change blades often.

**White glue**
White glue dries clear and is very strong. Use in small amounts to maintain a clean appearance.

**Acrylic glue**
Use this for gluing acrylic materials.

**Cutting mats**
18 x 24 in (457 x 610 mm) and 8 x 10 in (203 x 254 mm). Cutting mats are designed to “heal” after cuts. It is useful to have more than one size. They protect your tabletop and drafting board.

**36-in (914-mm) long metal edge with cork backing**
A cork-backed metal edge provides a slip-resistant tool for cutting. You can also use any straight-edged metal object like a metal triangle. Plastic triangles and parallel bar edges are susceptible to nicking and should never be used to cut along.

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Caring for equipment

It is important to maintain your equipment in a careful manner. Properly stored and cleaned tools provide a strong foundation for crafting high-quality drawings and models.

**Optional tools**
- **Portfolio** for carrying drawings, and/or a **drawing tube** (tubes are not ideal for Arches paper)
- **French curve**
  - **Triangles**, 4–6 in (102–152 mm) long and 16–20 in (406–508 mm) long:
    - 30/60/90˚, and 45˚ triangles
- **Triangular engineer’s scale**
- **Calculator**
- **Scissors**
- **Electric eraser**
- **Cleaning solution** to maintain your drafting board
- **Circle template** (inking bumps optional)
- **Oval template** (inking bumps optional)
- **Measuring Tape** (25 ft [7.6 m] or longer)
- **Graphite sticks** (6B or softer)
- **Clamps and fasteners**: binder clips, small clamps, and rubber bands. These can be used to hold pieces in place while glue is drying.
- **Miter box and saw**
- **Wax paper**: useful as nonstick gluing surface.
- **Chopper**: used for making repeated accurate cuts across the grain of the wood. Used most often with stick basswood pieces.