Contemporary Practices in Architectural Drawing and Illustration

COPYRIGHTED MATERIAL — DO NOT DUPLICATE, DISTRIBUTE, OR POST

Contemporary Practices in Architectural Drawing and Illustration

Volume I

FIRST EDITION

Eric Inglert

University of Cincinnati, ~~Cincinnati~~

cognella
SAN DIEGO

Bassim Hamadeh, CEO and Publisher
Jennifer Codner, Senior Field Acquisitions Editor
Skyler Van Valkenburgh, Project Editor
Jeanine Rees, Production Editor
Jess Estrella, Senior Graphic Designer
Laura Duncan, Licensing Coordinator
Natalie Piccotti, Director of Marketing
Kassie Graves, Vice President of Editorial

Printed in the United States of America.

cognella® | ACADEMIC PUBLISHING
3970 Sorrento Valley Blvd., Ste. 500, San Diego, CA 92121

COPYRIGHTED MATERIAL — DO NOT DUPLICATE, DISTRIBUTE, OR POST

Brief Contents

COPYRIGHTED MATERIAL — DO NOT DUPLICATE, DISTRIBUTE, OR POST

Detailed Contents

Introduction to Design Communication Media

Foundations

The very first line of this textbook is the author admitting a naming bias for the kind of course toward which this textbook is geared.

Why name this study Design Communication Media? It is because

- the learned skills support *design*;
- the goal is *communication*; and
- students should learn several *media* along the way.

History: Though Not That Long Ago

The author began his study at the College of Architecture and Planning at Ball State University in the early 1980s. Design Communications Media (DCM) was one of the first classes in that curriculum. The course still has the same name. We received a handbook on that first day of classes in September 1983.

> … it is necessary for architects to take advantage of this media in the schematic design and design development stages. The purpose of this handbook is to describe a range of media techniques which are applicable to visualization and graphic presentation tasks, and which can reduce the amount of time and energy needed to produce effective results. (Eggink & Laseau, 1982, 1)

One of the first assignments was a *blind contour drawing* with felt-tip pen on paper. Students of architecture everywhere in the world probably do some variation of a blind contour drawing, either of a still life or as you will see in this text, several drawings of your hands. It is one of the most eye-opening and often *painful* exercises! It strips away any preconceptions of symbolism or prototypes you have gathered and stored about how things *should* look. You are left only with documenting one-to-one what you are seeing, and without sneaking

a peak until the end, you must concentrate in earnest. One of our first lessons is therefore to abandon *how* your preconception of how things *should* be and instead challenge yourself to see *what* you perceive things actually *are*. This course is the beginning of a paradigm shift away from prejudgment and toward open, critical, and precise *vision*. Toward the end of that five-year bachelor of architecture (B.Arch.) program in the middle of Muncie, Indiana, it became only slightly clearer what one of the professors meant when he left that enigmatic note:

> *Learn to Live with Ambiguity.*

Education: A Contemporary View of Architects Learning to Draw

We will return to this aggravating epigram later in the text. The author still works on that enigmatic advice today! For the moment, let's turn our attention to what your course might be called and why your professor may have selected this textbook for you. A non-random survey of seven architecture and architectural engineering programs listed the following course names in 2021, all of which the author believed covered topics in this textbook.

1. Architectural Skills
2. Communication Skills
3. Design Communications Media
4. Representation: Freehand Architectural Drawing and Media of Representation
5. Architectural Representation
6. Graphic Media
7. Foundation Course

The descriptions for all these seemingly distinct courses were surprisingly aligned. Goals for the courses and examples of assignments and teaching methods were closely matched. While University faculty commonly assess transcript equivalencies for transfer students from other schools and programs, this author has found the comparison an easy task. Here are questions you might ask about the comprehensive nature of an architectural skills course:

- Does the course teach some freehand drawing that promotes critical *seeing*?
- Are students exposed to how architects and engineers are trained and practice?
- Are principles of documentation, scale, measurement, and technical descriptions covered?
- Do students learn several methods to translate and project the 3D world to the 2D image plane, screen, and paper?
- Does the teaching include contemporary imaging, simulation, and prototyping technologies that keep students current with professional practice?

The most important question to ask, which is more difficult to assess and perhaps more subjective, is whether the course prepares a student to communicate design ideas in both the

context of an academic design studio and the context of an internship or cooperative education experience in a professional firm.

Theory

We begin with a discussion of theory—foundational principles in architecture. We will consider drawing as a deliberate process, as documentation, and as design. Then we will look at hand drawing versus digital drawing.

A Deliberate Drawing Process for Architecture, Engineering, and Construction

Here is a philosophical and maybe a moral idea: We should be deliberate professionals and avoid relying on the sublime, on uniquely personal preferences, and on "happy accidents." The television phenomenon and painting artist Bob Ross said, "We don't make mistakes. We just have happy accidents." I predict your future clients will not be amused if you trot this phrase out as an explanation, and neither will your studio professor during a critique of your project or drawings. You will want to find solutions that have generalizable appeal and interest.

You will read below that art is often assessed in subjective terms. Let's test an alternative hypothesis to this idea. How would you assess the following statement?

> *This painting is done correctly and is therefore true!*

That is an absurd statement! On the other hand, we can all agree that the solution to one of your calculus problems is always assessed in objective terms. Let's have some fun and try to say something absurd about a calculus problem.

> *The derivative of the function of the cyclist's speed relative to the grade of the climb up Le Mont Ventoux feels inspiring!*

These two examples are surreal because the contextual framework is confusing. These kinds of statements can be humorous, especially when used in a comedic context. An excellent example of this is the answer that took *Deep Thought* seven and a half million years to compute in *The Hitchhiker's Guide to the Galaxy* by Douglas Adams.

> "All right," said Deep Thought. "The Answer to the Great Question ..."
>
> "Yes ...!"
>
> "Of Life, the Universe and Everything ..." said Deep Thought.
>
> "Yes ...!"
>
> "Is ..." said Deep Thought, and paused.

"Yes …!"

"Is …"

"Yes …!!!…?"

"Forty-two," said Deep Thought, with infinite majesty and calm."

Forty-two! Hmm …

A deliberate drawing process for architecture, engineering, and construction proposes a workflow consciously aware of the wide variety of skills and media that are available and includes a mindset that is intentional about what ideas that you are putting forth and the goals and objectives you set out for the project. It is slow. It is methodical. Drawing is a craft. Design thinking is a developed skill rewarded by "time on task."

Drawing as Documentation: Understanding and Interpreting

Recording and documenting experiences, places, people, and events, etc. has never been as easy as it is now. We all carry a very capable phone, computer, and camera in our pocket. Soon we may wear continuous recording devices, giving us a 360-degree document of our life. Would it surprise you then to hear someone propose that never have they been more forgetful, distracted, disorganized, and overwhelmed by their environment? To hear that they just want to put on dark sunglasses and noise-cancelling earbuds, shut out all the stimuli, and disappear into doom scrolling social media? What has happened? Is it overreaching to suggest that there is an inverse relationship between the ease of documenting something and the utility of that information for increasing our understanding of what we are recording?

The recommendation for you is to go slowly. Complex phenomena require a cycle of saturation, apprehension, reflection, and review. The best tools are the ones we have had at hand for a long time. Thinkers have been writing text with a pen in their own hand on a page, making corrections by crossing out but not obscuring, without erasing, considering the geographic juxtapositions of ideas, and collecting those pages in a journal or sketchbook. Accompanying these text thoughts with diagrams, perspective vignettes, and multi-view orthographic drawings comprehensively deepen your understanding and interpretation—drawing and redrawing until you really get it. Let's try a thought experiment.

When you try to understand a complex system such as a new technical device, often the best first approach is to draw the various machine flows as a block diagram that looks a little like a flowchart. Close your eyes and consider how you might diagram the following description: A synthesizer produces a bass track and all the drums for a repeating eight-bar loop. Additional equipment includes a recorder, a keyboard controller and several audio and MIDI cables. Each individual audio track is a separate synth patch. There are two main machine paths to consider in parallel, the audio and the MIDI. The audio path is a combination of two source modules, a voltage-controlled oscillator for pitch, and a noise source for texture combined in a mixer module. Audio flows to a voltage-controlled filter

modulating which frequencies pass through and controlled by the keyboard opening the ADSR envelope generator module for the timbre, and finally the sound is amplified to line level by a voltage-controlled amplifier and to the recorder. User control with a keyboard and MIDI language has inputs and outputs for clock tempo, pitch and envelope durations all used to design sounds of the audio path.

You could look this diagram up on the web or in a book. You might try to look up the unfamiliar terms. Define what each does. Several hours later you may have forgotten your initial musical idea, being lost in the details, reading the manual … still no sounds made … no music. Or you can do your best to translate the words into a block diagram, start plugging in cables and make some noise! Architects and engineers develop the drawing skills to understand very complex phenomena. No camera, audiovisual recorder, textbook, website, or computer is the equal of a good sketchbook when first encountering something new. Once you have an initial grasp of the system, then bring out all the modern conveniences. The point is not to skip the slow work.

Design Drawing: Imagination and Invention

Volume 1 of this two-volume textbook focuses primarily on documentation skills. In Volume 2 we make design drawings. For architects and engineers, these are the two foundations and uses of drawing. We document existing conditions. We make improvements with design drawing. Once the design proposal is accepted by the team, then we document the design with construction drawings. This cycle constitutes a kind of knowledge construct—analysis through close observation and synthesis through imagination and invention.

Through the first course of study in Volume 1, we will make observational drawings of anatomy, a still life, multi-view orthographic drawings at several scales (e.g., furniture, interior architecture, and exterior architecture) and perspectives that begin to test our imagination as we transform documentation drawings into inventive design-type drawings. Exercises and sketches build on previous learned skills. The second course in Volume 2 tests your skills with a simple project called Workshop in the Woods. Imagination and invention are most believable as a design proposal if they are grounded in documented phenomena. Therefore, our design drawings will borrow from our learned skills of documentation, and we will transform and transcend an existing space into an improved sense of place. We will touch on design theory and organizational principles; however, our main goal will be to *discover* our designs for the workshop by a progression of drawing propositions—design through drawing.

Hand-Drawn vs. Digital: A False Dilemma

The average person on the street may take it for granted that architects and engineers exclusively use the computer to make digital drawings. A positivist view regarding the changing of our profession and practices might even use a word like *evolution* to propose how we have transcended the old, slow, hand-drawn ways. You will learn in this course that there are many advantages of digital workflows. You will also learn that there are many enduring values and

advantages to analog hand-drawn workflows. Most architects and engineers experienced in practice agree that both are needed, both are valued, and it is nonsensical to debate which is better. This is not an *either-or* kind of book. This is a *both-and* book.

If you are an honest intellectual, then you can readily admit your preconceived biases. Below you will read about an argumentation process that builds in such integrity of thinking by making qualified statements and acknowledging rebuttals to the main claim. Therefore, the author freely admits a bias of the time spent coming of age in the profession of architecture. The late 1980s was a time for great upheaval in how drawings were made in professional practice. AutoCAD became a dominant drafting tool and superseded hand drafting in less than a decade. In an even shorter period, 2D CAD was replaced with 3D BIM in offices. What are these strange acronyms? All will be revealed as we progress through these two volumes. The author's bias is that at no other time was a generation of architects and engineers witness to such profound changes in how drawings are made. Ours is the last generation trained in the values and processes of traditional techniques, open to the coming wave of computers, and now researching the future of how professionals do our work. You may forgive our generation if we owe allegiances to both camps. We are the bridge, and in our view the traffic flows both ways!

How This Course Is Organized

Chapter 7 is entitled, "Electronic Modeling Frameworks and Workflows for Illustration." The chapter is of course mostly about electronic modeling. The chapter name also has a context of *frameworks* and *workflows* in the title. "Frameworks and Workflows" could be the title of a book. It is a very broad domain of knowledge. Architects and engineers use several shared frameworks and workflows in practice. They are important for collaboration between disciplines and for personal productivity. Examples include the following:

- International Building Code
- Building Information Modeling
- Schematic Design, Design Development, Construction Drawing, and Contract Administration
- CSI MasterFormat Material Specification Divisions
- Integrated Project Delivery

You can think of frameworks as a structure and an organizational tool that guides our disciplined progress on the several and various workflows that propel our projects to completion. During your architectural studies, there may come a time very soon where the magnitude of the work you need to complete and the several parallel deadlines that you need to service create conflict and fatigue. It is easy to become overwhelmed. The author can confirm that this feeling does not ever really go away; rather, you can develop rules of thumb and coping mechanisms to help you control your feelings. The work does not get easier as you progress.

However, you can develop into a more resilient professional with practice. Healthy experimentation with frameworks and workflows can help you with this.

Systems Thinking and the OOPs Paradigm

Another important influence for this work is a computer language programming framework, model and paradigm known as object-oriented programming, or OOPS. An object can contain some characteristics (e.g., data, attributes, or properties). It can also contain instructions and procedures. It is well beyond the scope and expertise of this text and author to describe much more about this complex subject, except to say that there are several useful analogies available from this rich paradigm.

In the most generic form, an *object* is an instance of a *class*. If an architectural prototype is like a class, then perhaps your design project is an instantiated object containing both physical properties (i.e., parametric data) and energy flows (i.e., procedural relationships). We can make comparisons to other features of this model. An object can be self-referencing and self-modifying. Your design project, in one example of *self*, could actively adapt to energy flow sensors and minimize cooling load demand by moving shading devices responsively as *programmed*. Another parallel is the idea of inheritance, whereby subclasses inherit the properties and methods of the classes above them. While the child classes inherit data and procedures from the parents, unique properties and methods can further be added to the new child object without affecting the parent objects. This reuse principle resonates throughout architecture and reminds us of the importance of modularity and repeating patterns of use.

Architects and engineers are comfortable working with modular systems. The *atomic unit* for construction in the United States seems to be four inches. The author has tried throughout this book to be agnostic about which measurement system, imperial or metric, dimensions are given in. Both are shown in rational units where possible. One exception follows in this section due to the specific module of four inches. Modules are fundamental to the metric system too (i.e., the meter for instance is based on a ratio of the precise realization of the speed of light).

A 2" × 4" wood stud is milled to a standardized slightly smaller dimension (i.e., 1.5" × 3.5"). Accepted practice is that each wall stud is placed at 16" on center axis of each unit. The stud is 8' high. The sheeting material whether plywood, oriented strand board, or gypsum drywall is made in sheets measuring 4' × 8'. Insulation materials are slightly smaller than 16" wide to fit between the studs. On and on building materials resolve primarily to a least common denominator of four inches. There are significant advantages to manufacturing to a standardized system. Architects and engineers practicing in the United States intuitively come to understand this module, and it is hard-wired into design. For those of us who travel overseas and have the privilege of working on international projects, the differences are too subtle for most people but are immediately sensed by working professionals. Modularity is therefore universally acknowledged and appreciated. Each inherited example of a building system, like an interior wood stud partition, can be modified with infinite variation, and yet the influence of the four-inch module persists through all wall system elements.

Modular Approach to Learning

Most professionals consider modularity an organizing principle of good design. When the practicing architect or engineer spends all day working in a modular dimensioning domain, modularity can transcend the physical product of our designs and be applied to the working processes themselves. This book takes a modular approach to learning where each module builds on the previous one, sharing inherited principles. What follows is a description both of a research-based framework that guided the development of this textbook and that you may find useful as a taxonomy for organizing information (framework) and a specific tool (workflow) for developing your ideas critically and avoiding designer's block (i.e., writer's block).

Zins's Taxonomy

It is beyond the scope of this book to detail the work of Dr. Chaim Zins of Bar-Ilan University, Israel, except to identify the original purpose of his research entitled "Knowledge Map of Information Science."

> ... aimed at exploring the foundations of information science ... presents a systematic and comprehensive knowledge map of the field. ... The map has 10 basic categories: (1) Foundations, (2) Resources, (3) Knowledge Workers, (4) Contents, (5) Applications, (6) Operations and Processes, (7) Technologies, (8) Environments, (9) Organizations, and (10) Users. The model establishes the groundwork for formulating theories of information science, as well as developing and evaluating information science academic programs and bibliographic resources. (Zins, 2007)

The *taxonomy* was adapted from his paper to structure the exercises and sketches that are an important learning proposition for this textbook. The book can be thought of as a large collection of studio projects that are woven together in a sequence with progressing connections building on each other. Other textbook authors will often structure books by first defining the drawing types and methods and then, often in an appendix, offer a collection of suggested exercises and sketches. For this textbook, the focus is inverted, which gives primary attention to the student work. The exercises and sketches have all been written in a way that allows faculty to redesign, omit, or add to them, and to alter the sequencing based on the individual curriculum goals. The inclusion of rubrics and encouragement of an electronic portfolio approach aspires to a self-learning course of study too. Could a student pick up this book and progress outside of a college curriculum?

Here is an outline of the exercises and sketches adapted from Zins's taxonomy:

- **Introduction:** defines foundations of theory, research, and history
- **Learning:** maps overall foundational education goals for project

- **Scenario:** identifies subject-based categories, such as who (mediators and workers), what (content matters), why (motives and applications), and where and when (environments and organizations)
- **Materials:** identifies what tools (media) are used
- **Steps:** overview that describes how (methods) of operations and processes and means (media) of technologies
- **Video:** multimedia demonstration that expands "steps"
- **Tips:** expands "steps" to include supplemental means and methods
- **Criteria:** expands foundational education goals and encourages self-assessment
- **Related:** maps current project context to other related projects and skills

"toolman"

As above with the work of Zins, it is beyond the scope of this text to expand on the importance of the seminal book, *The Uses of Argument* by Stephen Toulmin (Toulmin, 1958). Within the context of the discussion above about frameworks and workflows, Toulmin was a valuable resource for creating ideas and arguments that situated the textbook writing firmly within the domain of "a deliberate drawing process for architecture, engineering and construction." The author wrote a simple python program (toolman.py) for convenience, which included simple prompts for writing *ideas* in a propositional and structured *argument* format. Structured arguments are not finished writing and are very dry for students to read! However, whenever you feel stuck or unclear about how to support your design ideas, toolman can be a good place to start. In a nutshell, it is not much more than some leading questions designed to progressively develop thinking about concepts you may want to include in your verbal presentations, written support statements, or written proposals.

- **Data:** What is known and can be observed about the phenomenon?
- **Warrant:** What have you got to go on? How do you get there?
- **Backing:** What is the reason one should accept the above connection?
- **Qualifier:** To what degree does the warrant imply the claim: definitively, presumably, possibly?
- **Rebuttal:** What exceptions exist that limit the implied connections between the data and the conclusion?
- **Conclusion:** What idea or claim is being made and suggested by observable phenomena?

As an illustration of "toolman," let's return to the annoying epigram that I mentioned above, *Learn to Live with Ambiguity*.

> **C:** Design is an expansive process of asking creative questions about how to improve existing conditions. **D1:** Reductionism implies that phenomena are reducible to fundamental elements. **D2:** Gestalt theory implies that an organized

whole is more than the sum of the elements. **W:** Creativity involves thinking with both objectivity and subjectivity. **B:** The complexity of problem-solving defies simple, tidy, and singular explanations. **Q:** Confidence and buy-in from others about your solutions to a problem increases proportionally to the expansiveness and inclusivity of your processes. **R:** While problem definitions can benefit from reductive and simplifying processes, design solutions often ask more questions than are answered, which can be uncomfortable.

If we were to concatenate these sentences and call them a paragraph, it might not sound very fluid when read aloud. This is a structural framework and a scaffolding. And like scaffolding, it only suggests the form underneath. Like a structural framework, it only implies the story supported by it. It is weaving together these ideas and filling the gaps that completes the story you want to tell.

All creative activities are variations on storytelling. How we assess creative works and the work of creativity has evolved from a simple quest for the beautiful and the sublime. This ambiguity surrounding how to think about creative work is too often explained away with the word *subjective*. Art sometimes is solely expressed as a uniquely personal exploration of an inner psychological quest. If we release the constraint that this is an art class, then the path becomes much clearer for us. Sure, you will develop artistic skills, yet this work is in the service of the architectural story you want to tell. This is an applied art. There are objective things that we can say about architectural drawing. There are reliable systems that guide the student to professional mastery. Our drawings should tell a story of improving existing conditions and of experiential habitations. One thing that almost all stories and ideas share is the tension and release paradigm. To use an analogy, the Western music tradition that is most familiar to you relies on the idea of a *cadence*. You hear when the dominant seventh chord resolves to the tonic. It feels at first tense and a little up in the air and ambiguous, but then you are led to a release and the feeling of resolution. Just like the *drop* in electronic dance music, it is a powerful feeling!

In architectural design we often use the term *juxtaposition*. A path leads down some steps at a building entrance, the ceiling lowers considerably and feels like it's pressing down, almost like we've entered a cave, then—boom!—we pass through the door to an interior foyer that explodes upward in ceiling height, and light, and unexpected expansion. This design paradigm is called *compression and release*. In another example, a narrow and shaded cobblestone alley twists and turns in a Tuscan city, you walk with that uneasy feeling that you might be lost, and suddenly you are thrust into the warm sunlight and broad expanse of a piazza. Time for a gelato!

Architectural drawings should work to tell such juxtapositions and stories. Here is a sampling of some of the dramatic devices and characters in your toolbox:

- Figure-Ground
- Repetition
- Background, Middle, and Foreground

- Scale Variation
- Grid and Datum
- Thick, Medium, and Thin Lines
- Contrast and Similarity

Your Electronic Portfolio

As you will read in Chapter 6, we will use a learning methodology based on an electronic portfolio of your work. Students of architecture have long demonstrated professional skills and design development with a portfolio of personal work curated for telling the story of professionalism and creativity. The process today involves publishing as email attachments or as a link on a website. Whether you are using this textbook in a design communications media course at a university or as self-study, your journey will be much more comprehensive if you begin early to document, archive, curate, and demonstrate your work to others with an electronic portfolio.

References

Adams, D. (1989). *The hitchhiker's guide to the galaxy*. Harmony Books.

Eggink, H., & Laseau, P. (1982). *Visual communications media handbook*. Ball State University.

Toulmin, S. (1958). *The uses of argument*. University Press.

Zins, C. (2007). Knowledge map of information science. *Journal of the American Society of Information Science and Technology*, 58, 526–535. John Wiley & Sons, Inc.

COPYRIGHTED MATERIAL — DO NOT DUPLICATE, DISTRIBUTE, OR POST

Line Is the Shortest Distance

Introduction

We learned early in our education that a line may be defined as the shortest distance between two points. In Chapter 3 we will expand this discussion and derive something called a Cuboid Generalization Analogy. In that discussion it is presupposed that a point has only one meaningful attribute, its location in an x, y, and z coordinate system. A point has no dimension or mass. May we infer that a point has little pragmatic meaning to us without its context or relationship to another element?

On the other hand, a line has direction. Outside of the realm of pure mathematics, it also has several useful qualities that we propose below in a discussion, What Is Line Quality? Consider line as the fundamental syllable we utter in this language called *drawing*.

Volumes = Shapes: Transformations from 3D World to 2D Page

Architectural drawing communicates a story about our shared spatial and experiential world. The act of drawing is a snapshot that filters the element of time and filters the element of depth. Here is the magic of a good drawing: it reinterprets experiential time and space onto the flat plane of the drawn surface, not by surrendering to those reductions in depth; rather, drawing has the potential to amplify those dimensions of time and space. How, you ask.

The first transformation has to do with scene selection that is evocative of our shared experiences about interacting with the built environment. Let's lay this aside for the moment, knowing that this will be covered in later chapters. The second transformation is obvious to say and less obvious to represent convincingly. Three-dimensional volumes are translated to shapes. Spheres are circles. Cubic volumes are polygonal shapes. The principal is that an image plane is implied between the viewer and the viewed object(s). Lines, vertices, and curves project onto and intersect with the imaginary image plane. Drawing is projection. The direct mechanical analogy here is a camera. The sensor of the camera (e.g., either unexposed film or a CCD) is a physical image plane that captures projected and reflected light.

FIGURE 2.1 De Herepoort, Amsterdam. Sketch in Ink and Colored Pencil

This course in architectural illustration and design visioning is concerned with these two transformations, and it challenges you to answer two basic questions:

1. Temporal: How do I communicate the experience and feeling of this built environment?
2. Spatial: Can I invite the viewer to move around an imaginary three-dimensional construct?

The most common anxiety students have in this course revolves around the fiction of inherent artistic ability. The fallacy of the natural-born artist assumes that one cannot overcome the head start that artistic students enjoy. This view is too narrow. It underestimates the *time on task* that so-called natural artists have dedicated to developing their skill in the past. It overestimates

the extent to which architectural drawing is *art*. Finally, it equates the act of architectural illustration with artistic skill, which is also a definition too narrow. For our purposes, may we suspend these preconceptions for a moment and also separate the act of marking on a surface and the deliberate recording of an image and idea? Trusting instead in your ability to learn new things may make your success in this class more a function of deliberate practice (within your control) than talent (outside of your control).

Exercise 1: Breathing Lines

Introduction

FIGURE 2.2 Exercise 1: Breathing Lines. Example in Felt-Tip Pen on Bristol Board

This drawing is called breathing lines because the simple exercise of making marks should be no more stressful than breathing. There are just two rules for this assignment. The first rule is that no line shall cross another line. The second rule is that a line shall be consistent in all respects. For example, each line shall have a consistent width. Also, each line shall be consistent and unbroken from the top of the page to the bottom of the page. The process for making this drawing involves making a 1/2-inch border inside an 11" × 14" piece of paper. Adhesive tape shall be placed along the top margin and along the bottom margin. While doing the drawing, it is helpful to breathe out continuously and quietly, as in the film that we saw with John Franzen (Franzen, 2015).

Learning

This assignment module contributes to the following design learning outcomes, which finish the sentence "As a successful student in this course, I am now able …"

- … to control line weight and consistency (e.g., width, continuity, and control).
- … to abstract a simple line exercise that evokes a complex topography.

Scenario

Our sole focus in this assignment is to make the most consistent marks on a page that we can. Working slowly and with purpose and care, we allow the pen or pencil to glide from the top of the page margin to the bottom in one continuous motion. We are free-flowing in our mind and body. The challenging part of drawing is not mark-making; rather, it is effective *seeing*.

It may surprise you that a contemporary understanding of the phrase *fine art* has less to do with a quality of *fineness*. It has more to do with the finality of its purpose. Most definitions of fine art have suggested the term derived from the French, *Beaux Arts*, concerned with aesthetic beauty and implied agreeableness. Yet we know that much important fine art of the last 75 years and more is neither aesthetic nor beautiful, nor agreeable! Consider a complementary French translation of *Fin Arts*, or art that is an end in and of itself. For guidance we can refer to scholarship about the philosopher Immanuel Kant.

> Works of fine art, Kant is saying, like products of "agreeable art" (angenehme Kunst), are objects designed with a view to producing a phenomenological and physiological effect in the spectator, namely the sensation of pleasure. But unlike "agreeable art," a work of fine art is produced in addition with a view to engendering a certain kind of reflective activity in spectators ("the end of the art is that the pleasure should accompany the representations … considered as *modes of cognition*") … "advancing the culture of the mental powers in the interests of social communication." (Haskins, 1989, 44)

While beautiful architectural illustrations are compelling and yet may seem unattainable at your current place in your studies, freeing yourself from the yoke of misunderstanding about artistic limitations and the role of illustration in our profession will help relieve you of the burden of anxiety surrounding work in the studio. After you complete this project, I hope you will agree with the simple proposition that you can *draw* effectively, inasmuch as you can make *beautiful* marks on a page. Then we can proceed with the challenge of helping you to *see* more deliberately and to *translate* your vision effectively to the page.

At times, you may be compelled to think of this as an art class. We will discuss in later projects an alternative view of this studio course. Architectural illustration borrows from artistic skills, from graphic design, from psychology and sociology, as well as from computer

arts. We will engage theories of perception, of color, and of persuasion. For the present, let us accept the proposition that this is *not* an art class. There. Does your technically inclined brain feel more comfortable? Good. Now let's learn some things together and find your vision.

Materials

- Pencil or felt-tip pen (0.25 mm or 0.35 mm)
- 11″ × 14″ (279 × 356 mm) sheet
- drafting tape

Steps

1. Select a good quality paper. For this assignment you may want to use something like Strathmore 300 Bristol with a Vellum Surface (270 gsm.) As this is a heavier paper, you may find it is more comfortable to leave this not taped to your board.
2. With a light pencil line, measure a 1/2-inch (12 mm) border around the sheet on all sides. Align and place drafting tape along the longer axis at the top of the page and at the bottom of the page.
3. Selecting the thinnest pen that you are comfortable using, place the pen nib down within the tape border area, and draw the first line on the left border margin if you are right-handed and on the right border margin if you are left-handed. Draw on top of the pencil border line you have made. At the end of your first stroke, continue beyond the margin of the tape and only lift your pen within the tape border margin. This minimizes the "wicking" effect of the pen on the paper and results in a precise and implied border.
4. Continuing across the page, make your next freehand line about 0.25 mm or less away from the first line—as close as you dare without touching the previous line. Continue this process and welcome the small variations that begin to oscillate through your process.
5. Take periodic breaks to keep your mind and eye fresh and attend to the consistency of the ink pen, which may dry up over time. Introducing a new pen to finish the drawing next to "dry" lines could be too abrupt.

Tips

- It may be helpful to keep your drawing clean with the use of a scrap of tracing paper naturally adhered by the oils on the side of your palm.
- This can also ease the uncomfortable feeling of friction that you may experience over time between your palm and the paper.
- The most pleasing effect combines a combination of very closely spaced thin lines and an oscillation effect that suggests topographic maps of steep mountains.

Criteria

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Craft	Illustrator demonstrates exemplary attention to work product and excellence.	Illustrator demonstrates good attention and care toward work product.	Illustrator completes work, but the product seems rushed to completion.	Illustrator demonstrates attention toward work product, but work quality is poor.
Rendering	Illustrator uses line to hold the viewer's attention. Image is controlled and evokes both power and subtlety. Image is descriptive and/or symbolic and supports compositional goals.	Illustrator's linework demonstrates several professional attributes. Rendering style does not distract the viewer and generally supports compositional objectives.	Illustrator's use of line is somewhat effective. Rendering style is consistent and competent. There are some non-contributing attributes.	Illustrator attempts to use line descriptively. Rendering is inconsistent and lacks attention to craft.
Professionalism	Student completes the work on time. Work demonstrates exemplary attention to learning objectives.	Student completes the work on time and demonstrates a good work ethic.	Student generally completes the work at a minimum level of expectation.	Student is missing parts of the work and makes a plan for completion of the remaining assignment.

Related Assignment

- Exercise 2. 100 Lines

A Professional Ethos for Drawing

Professional architects and engineers have developed distinguishing characteristics and guiding ideas about what makes good drawing practices (i.e., process), and in turn what makes a good drawing (i.e., product).

> Life is process. … To be concerned for improvement suggests a concern for methodology … developing skill in using the techniques that enhance the enjoyment of process. Products are but moments in time. Their value and meaning derive from process and are reapplied to future process. … For those who solve problems for others, as in a profession, documentation of process is part of the responsibility of such professional practice. (Koberg & Bagnall, 1981, 100)

A good drawing communicates meaning through linework. What is good linework? Good lines are consistent, purposeful, and clear. A consistent line has specific width appropriate to its purpose. A consistent line is rendered for meaning and can range from unbroken end-to-end

to a kind of *hit–skip* line that suggests the influence of light. A consistent *squiggly* line is not an accident of technique or failing of confidence, rather it is an intention of mood and character. A purposeful line communicates with the directness of all the parts of speech and grammar that we employ in good writing and speaking. There is a drawing vocabulary with accepted rules of usage, not dissimilar to the way we employ words. A purposeful line communicates meaning. Clear lines have a *purity* on the page that show we have taken care to keep our drawings clean. Also, clear lines have a *simplicity*, which demonstrates we have taken care to be economical in our expression.

Architecture and engineering drawing borrows ideas and ideals from the sciences and the arts. Our sketching and illustration can often seem like we are striving for the artistic. We can be inspired by the works and words of someone like the artist Jim Dine, who said,

> A drawing is a labor for me, not in a bad way, but in an intense way. I am able to search through drawing … a total connection between my hand and my eye. … I don't think hard work makes a good drawing. I have had a lot of students who worked very hard. … Drawing is not an exercise. Exercise is sitting on a stationary bicycle and going nowhere. Drawing is being on a bicycle and taking a journey. For me to succeed in drawing, I must go fast and arrive somewhere. The quest is to keep the thing alive—the drawing and the state of grace. (Brodie, 2004, 28)

We can just as easily lean into the words of documentation and drafting and be inspired by the statistical sciences.

> Graphical excellence is the well-designed presentation of interesting data—a matter of substance, of statistics, and of design. Graphical excellence consists of complex ideas communicated with clarity, precision and efficiency. … Graphical excellence is nearly always multivariate … [and] requires telling the truth about the data. (Tufte, 1983, 51)

One area of particular interest to architects, engineers, and landscape architects is the U.S. National Park Service's Heritage Documentation Programs. Several standards address the qualities of drawings for documentation, including the Historic American Building Survey (HABS), the Historic American Engineering Record (HAER), and the Historic American Landscape Survey (HALS).

> As such, these guidelines represent more than 75 years of comprehensive experience in building documentation practice. Individuals and teams wishing to submit documentation for inclusion in the HABS Collection at the Library of Congress should review this document closely and are required to follow the procedures described therein. (National Park Service, 2008)

It can be tempting for a student to believe that *good drawing* is a matter of subjective taste. Indeed, many people think that assessing the qualities of aesthetics, and by extension drawing, is much like trying to guess what color the professor is thinking of right now! Burnt Sienna.

Throughout this book you will read about the history and theory of architectural illustration and drawing. From this, the author has distilled some principles into rubrics that we can use together to establish definable goals and objectives to make your drawings more professional. It turns out that there are more things that architecture and engineering professionals agree upon with respect to effective drawings than perhaps any other area of our projects. This is another reason for setting aside the mistaken belief that what we endeavor to learn here is about the fine arts, or even about being artistic. Let's learn to be professional and effective communicators through drawing!

Craftsmanship: Mark-Making as Second Nature

For an architect or engineer, mark-making is second nature to our craft. A *maker's mark* was historically struck into metal by a goldsmith and identified his/her personal mark. It was a sign of distinction and pride. It signified a high level of skill and craft.

The maker's mark is a powerful metaphor of quality and can be inspiring for our work in this studio. We can aspire both to improving our skill and craft and someday make our mark on the profession. The very act of mark-making (i.e., drawing on paper) is the discipline we practice every day to achieve this goal of high craftsmanship. You can find many examples of how this idea transcends the craft of the goldsmith.

You may not have considered the connections between professionalism and craftsmanship. A profession is often distinct from a vocation in our society. A doctor tends to the body, is licensed to practice, and is only called a doctor after years of academic study and internship in a medical setting. A mechanic tends to vehicles, may be uncredentialed, and may or may not have gone to school or apprenticed to a master mechanic. Both the doctor and the mechanic can nonetheless exhibit excellence and skill with their hands and with their craft.

> Given the intrinsic richness of manual work—cognitively, socially, and in its broader psychic appeal—the question becomes why it has suffered such a devaluation as a component of education. (Crawford, 2009, 27–28)

The nobility of work must therefore accrue from some other place than social capital, earned degrees, or how much money one makes. Making excellent things takes time and attention to detail. Craft is the process for making.

Craftsmanship is an ethic and an approach to making that transcends the divide between the ideal of the idea and the reality of the realization of some object. Architects and engineers should attend to craftsmanship with the same attitude as the goldsmith who strikes a mark in a finished piece with an equal measure of humility about the experience embedded in the

work and pride for the appreciation of a job well done. Our maker's mark is in the linework and rendering of light on the page.

What Is Line Quality?

As we discussed, it can be tempting to think of quality as a subjective judgment and an opinion or a personal preference, especially in an aesthetic context. There are accepted principles of quality linework, and we can first state them and generalize to a useful model of line quality. Once we have established a few *rules* or principles for architectural linework, then we can plot these ideas on a continuum ranging from beginner to developing, to proficient and advanced. These levels will form the basis of rubric assessments of the learning objectives that can be applied to each assignment. First let's establish some goal statements about quality linework.

Definitions and Aesthetic Goals

- *Line weight* refers to both line width and opacity.
- Line weight imparts meaning through dynamic tension. A useful analogy for that quality is what volume is to sound.
- *Line continuity* implies both constant width and opacity.
- Since both line weight and continuity can be varied, we can assess linework within a framework of deliberate intention.
- Differences in line weight and continuity that follow a coherent system give meaning to a drawing.

Goals vs. Objectives

Goals are idealized and aspirational and describe outcomes that we hope to accomplish over a longer time frame, for instance the length of this course or even your university education. Goals are more open, less focused, and do not describe the processes or methods you will use to reach the goal. A goal statement in its most structurally basic form can be stated as a *verb–object* phrase such as these:

- Graduating university
- Achieving professional licensure
- Starting a professional practice

Objectives are measurable, more within our control and by their nature iterative components of a larger system pointed at achieving our goals. You can think of an objective as a to-do list item that you have a high probability of checking off in a shorter time frame. An objectives statement can be written in the form of time–action–object–metric. Here are some examples:

- Before the scheduled deadline, complete each drawing assignment using the provided rubric as a guide.
- Each night for the next couple of months, study one chapter in preparation for professional registration and take the practice exams at the end of the chapter.
- Before talking to the bank manager, write a business plan that analyzes the competitive market for the professional services you want to offer and ask five professional colleagues to read and assess the plan.

What makes a good objectives statement for line quality? You will see many objective statements that imply good line quality as you read through the exercises. For example, here is one from an upcoming exercise, stated first in the time–action–object–metric scaffolding, and then verbatim as it will appear in the assignment:

1. Before the scheduled deadline (time)
2. Control (action)
3. Line weight (object)
4. Consistent width, continuity and strength (metric)
   - Learning objective: As a successful student in this course, I am now able to control line weight and consistency (e.g., width, continuity, and control).
   - Rubric assessment: Illustrator uses line to hold the viewer's attention. Image is controlled and evokes both power and subtlety. Image is descriptive and/or symbolic and supports compositional goals.

Line Quality Implies Meaning

Line is a powerful rendering tool. Architects and illustrators can create meaning solely with the use of this dynamic tension of linework. As we will see in later chapters, modeling our illustrations with tone value and color are exciting tools to render as well. Beginning students can conflate the term *render* to mean only these tone and color lighting effects. The exercises you will do in this chapter study the primary impact of line on representing form and shape. As you work through these, try to be deliberate and systematic in your line choices. Understand that accidental line variance, or conversely, monotonous unvarying lines, can confuse meaning and signal inconsistent thinking about your designs.

Professional Results: Tips for Photographing Work

The most underestimated skill for success in architectural drawing is training yourself to see effectively. The second most underestimated skill must surely be documenting your artwork effectively. This can be as easy as taking a photograph with the capable smartphone in your pocket. Two cliches come to mind:

- The devil is in the details.
- Garbage in, garbage out.

Achieving devilishly good images is definitely in the details, in preparation, and most importantly, the quality of the light. Editing your photographs in a software program also comes into play, as we will discuss here. One great advantage of our contemporary study of drawing is the ability to upload digital images to a content management system (e.g., Blackboard, Canvas, etc.) for assessment. Students have routinely needed to photograph original work for a portfolio that could be shared either in print form, or digitally as an attachment to an email or download from a hosted website.

How to Get Consistently Good Photos

Lights

1. Taking photos outside is a great choice if weather permits (e.g., dry, low wind, moderate temperature). Aim for the greatest light levels without glare. Often this means one of two things: shoot on an overcast day or shoot in the shadow of a building.
2. When taking a photo inside, control the light sources. Use a similar color for your lamps. New developments in LED technologies yield high output and good color rendition. A soft diffuser or something as simple as translucent tracing paper (white, not yellow) can improve even spread of light.
3. The two greatest enemies of photo correction are shadows and uneven light. A search on a camera light stand shows that the standard design is to point two oppositely positioned and evenly lit light sources at a 45-degree incident angle to the artwork. This reduces shadows and promotes even lighting.

Camera

1. If your smartphone has multiple cameras, then use the one with the least *barrel distortion*. If you can barely fit the artwork in the frame, that is probably the zoom lens.
2. To clarify the point above, it is not advisable to use the *digital zoom* feature of your camera; rather, use the *larger glass* lens.
3. It is most typical for a smart camera to have the ability to set the focus and the exposure separately. This is optimal. Focus by touching the screen in an area of detail and contrast. Set the exposure by finding a middle value (i.e., gray, if possible) and touch the screen for exposure.
4. The brighter the lighting, the higher the implied *f-stop* of the camera lens, the greater the focus depth, and the less noise or grain. Conversely, the darker you shoot, the more inconsistent results: (a) gray, instead of white backgrounds; (b) color aberrations and digital noise in the shadows; (c) shallower depth of field with more chance for focusing issues, etc.
5. Using a gray card positioned outside of the *crop* area is a great idea. If you do not have a gray card, it is easy to make one with a white piece of paper and a pencil. Shade a box with the edge of a pencil and set your exposure as suggested above to this *known* 50% gray.

Action

1. Beginning photo editing starts in the camera. Here is a proven workflow that yields consistent results:
   - Straighten the image using guidelines and a rotation tool.
   - Crop the image and remove unwanted artifacts outside the borders.
   - Use either a *curves* or *levels* tool. Look for the eyedropper icon that is middle gray. Typically, there is a white, black, and gray dropper. Touch the eyedropper to your gray card or pencil mark. If you have neither of these available, find something that is reliably "gray" in color to touch with the gray eyedropper. This is a powerful color correction. Finish with either the white dropper or the black dropper (not both) and correct for the dominant issue.
   - If setting the white point or the black point yields poor results, then reach for the brightness and *contrast* or alternatively, the *exposure* tool.
   - Scale the image (down) for the selected output. The most important consideration is pixel width and height.
     - Screen resolution: Full size at 72 ppi. An example would be an 11″ (279 mm) × 17″ (432 mm) original artwork, which would have a pixel dimension of 792 px × 1224 px.
     - Print resolution: Full size at 300 ppi. This is much larger and would yield an image that is 3300 px × 5100 px.
     - Upscaling is undesirable. The programs will create pixels when up sampling, but the results are almost always useless (apart from artificial intelligence technology).
2. Photo editing software comes in many flavors. As of this writing, the most popular choices are
   - Lightroom (paid),
   - Photoshop (paid), and
   - GIMP (free).
3. The goals of photo editing for artwork are a *push–pull* problem:
   - Minimize distortions
   - Maximize crop choices
   - Maximize clarity
   - Minimize color aberrations
   - Maximize contrast
   - Balance darks and lights
   - Maximize resolution

Remember: Garbage in, garbage out. When in doubt, take another and better photograph. Don't waste time *in the box*.

Exercise 2: 100 Lines

Introduction

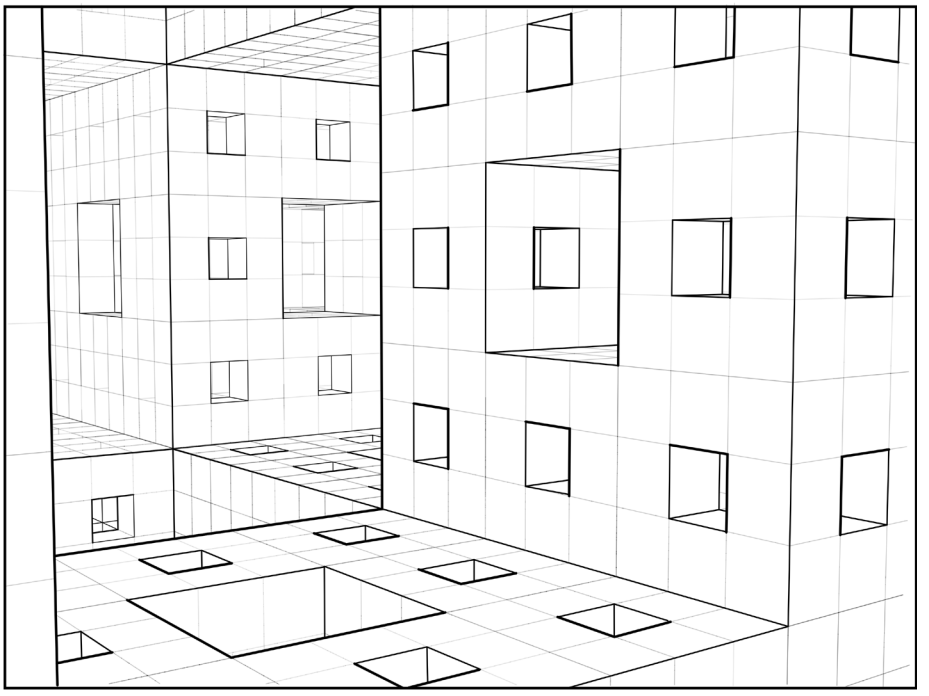

FIGURE 2.3 Exercise 2: 100 Lines Illustrating Depth Using Only Straight Vector Lines

Use 100 straight lines to create a sense of depth on a two-dimensional image plane (i.e., page). Begin by drawing a 1/2-inch (12 mm) border around the page and fill the frame with your composition. Use a vector drawing program (e.g., Inkscape or Adobe Illustrator) to make the drawing, using only straight vector linework. Set up the artboard to an 11″ × 17″ (e.g., ANSI B, ledger or tabloid) or 297 × 420 mm (ISO 216, A3) sheet size. Familiarize yourself with the program and experiment with line type and thickness. All linework is to be achromatic (no color.) Print (export) the final on page to an Acrobat PDF file.

Learning

This assignment module contributes to the following design learning outcomes, which finish the sentence "As a successful student in this course, I am now able …"

- … to control line weight and consistency (e.g., width, continuity, and control) using a vector line art computer program.
- … to abstract a simple line exercise that evokes three-dimensional depth on an image plane.

Scenario

Vector-based drawings have several advantages over raster, as discussed in the section below, Vector and Raster Graphics. You will want to have the ability to use both types of drawing in your illustrations. Often the best way to learn a new software program is to try to solve a specific and simple problem. This approach is both more enjoyable and more challenging than reading the manual. The programs are so comprehensive in scope that it can be overwhelming to learn everything, and it is unnecessary to know everything.

As an example, in Inkscape you will want to first learn to navigate around the workspace and orient yourself to recognizable measurement units. Zoom in and out and pan and notice the top and side rule bars. Notice that there are multiple ways to do the same thing: menu drop down bars, icons, and shortcut keyboard commands. Confused yet? Good. Making mistakes and repeating them is definitely underrated as a learning tool.

Now you will want to draw something. Let's try a rectangle. Can you find how to query information about the rectangle? Parameters may include line width, color, fill color, or pattern, etc. Each is easily changed once you find the dialog box. Dialog boxes are powerful and can serve as a quick way to simulate and experiment with different effects. Everything is parameterized and seemingly accessible through a dialog box.

Okay, you are on your way. Have fun. Get frustrated. Ask each other questions. Ask your professor a question. Do an internet search. Who needs to read a manual? It is there if you need it. Your questions are getting smarter. You are more efficient. You've got this!

Materials

- Inkscape or Adobe Illustrator

Steps

Procedure for the open source application Inkscape version 1.0

1. In your sketchbook with a pencil, develop your idea of a composition of lines that describe spatial depth. Refer to the principles referenced below (e.g., overlapping shapes, diminution, convergence, etc.).
2. Open Inkscape and navigate to "File → Document Properties." Change the preferred units (i.e., inches) and change paper size to "tabloid" and orientation to "landscape."
3. Create the border with the "rectangle" tool. Open "Object → Fill and Stroke" and select no fill and a stroke width of 0.9 mm.
4. Create your lines composition with the "Bezier" tool. Use layers to maintain structure and order.
5. Use three line widths to support your composition (e.g., 0.25 mm, 0.5 mm, and 0.7 mm).
6. Save file as either Inkscape or Plain SVG as you work.
7. When complete, "File → Export PNG File" and name the file and location. Make sure to additionally select the **Export** button.

Tips

- Inkscape is an open source vector graphics editor with capabilities similar to Adobe Illustrator. https://inkscape.org
- In his book *Architectural Drawing*, Rendow Yee covers several perspective cues we can use to create spatial depth on the paper (Yee, 2007, 228–29).
  - Diminution
  - Overlapping Shapes
  - Convergence
  - Foreshortening
- Many processes in digital drawing are iterative. Since you repeat the same commands often, it is useful to learn keyboard shortcuts.

Criteria

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Craft	Illustrator demonstrates exemplary attention to work product and excellence.	Illustrator demonstrates good attention and care toward work product.	Illustrator completes work, but the product seems rushed to completion.	Illustrator demonstrates attention toward work product, but work quality is poor.
Rendering	Illustrator uses line to hold the viewer's attention. Image is controlled and evokes both power and subtlety. Image is descriptive and/or symbolic and supports compositional goals.	Illustrator's linework demonstrates several professional attributes. Rendering style does not distract the viewer and generally supports compositional objectives.	Illustrator's use of line is somewhat effective. Rendering style is consistent and competent. There are some non-contributing attributes.	Illustrator attempts to use line descriptively. Rendering is inconsistent and lacks attention to craft.
Professionalism	Student completes the work on time. Work demonstrates exemplary attention to learning objectives.	Student completes the work on time and demonstrates a good work ethic.	Student generally completes the work at a minimum level of expectation.	Student is missing parts of the work and makes a plan for completion of the remaining assignment.

Related Assignment

- Exercise 1. Breathing Lines

Vector and Raster Graphics

For most of us, the first drawing program on the computer we encounter is a raster painting application, such as Adobe Photoshop or GIMP. Vector-based drawing apps are often

considered more advanced and drawing vector art a skill learned later in our development. This course takes a different approach. We start with a vector line art program, (e.g., Inkscape or Adobe Illustrator) because it serves many immediate needs in the studio.

Raster images are binary files on our computer with suffixes like tif, jpg, png, etc. They are sometimes known by the descriptive term bitmaps. It is analogous to think of a bitmap image as a map that bridges the divide between the bits of a computer (i.e., the smallest increment of data holding a value of "0" or "1") and a rectangular grid of pixels mapped over the extent of the scene you want to capture. Each pixel's color is specified by a number of bits. We project these image maps at different resolutions, usually by downscaling a digitally stored master captured by either the sensor of a camera or defined at the beginning of the process of creating a pixel painting in a program. We subsequently down sample for projecting on a screen (i.e., 72 ppi) or printing to paper (i.e., 300 dpi.)

The CCD sensor of the Nikon D850 full frame DSLR camera is 45.4 megapixels (MP), and this measures 8256 pixels × 5504 pixels (px) with a 3:2 crop ratio. If you want to project this image onto a 1920 × 1080 computer screen, then it is most efficient to down sample the image (~20% of original capture) in order to not overstrain the computer. If you want to print this on a high-resolution poster to hang on your wall, you could down sample the original image to, let's say, 24″ × 18″ (610 mm × 457 mm) at a resolution of 300 dpi (~12 ppm) with a raster image dimension of 7200 px × 5400 px.

Vector images are a fundamentally different file type. Instead of a binary file like raster images, vector art is commonly saved in a text file. Two common suffixes for vector files are svg and pdf. The text files are human readable, like a set of instructions, a process, and a script of geometric movements on a cartesian coordinate system. These scripts describe straight and curved paths and include attributes. From our perspective, the greatest advantages of vector line art are twofold: precision input and infinite scalability independent of resolution. Depending on your need, the final step in projecting or printing a vector image is to convert to a raster format. This conversion is usually optimized automatically by the output device for the best resolution. The following is an example excerpt of an svg file drawn in **Inkscape**, a 10 mm square with a 0.25 mm black stroke and no fill:

```
 <rect style="fill:none;stroke:#000000;stroke-width:0.0980247;
stroke-miterlimit:4;stroke-dasharray:none;stroke-opacity:1"
 id="rect833"
 width="9.9019756"
 height="9.9019756"
 x="0.049012303"
 y="0.049012303" />
```

Since the raster image is dimensionally defined by the width and height of the image in pixels, the number of bits per pixel only comes into play when considering the output (e.g., projection and printing) requirements. The vector image treats everything as objects, and

we will first use the program as a way to gather composite photographs (i.e., raster images) of our hand-drawn artwork onto one poster. There are several filters available for making simple edits to our photographs. Finally, there is an easy cropping tool available.

Graphic Design Principles for Architectural Illustration

Over the course of these studies, you will learn graphic design principles for architectural illustration. We have to start with something simpler for now, so let's discuss the elements of this idea. It is certainly an oversimplification to say that the fundamental design impulse is the juxtaposition of tension and release. This work will often use analogy to talk about complex subjects in an effort to provide an entry point for your understanding. Music is a universal analogy.

In Western music it is common to talk about *cadence*. This word can mean the beat or time or rhythm, variously. It has another more interesting and specific meaning: the harmonic relationship and movement between the dominant chord and the tonic chord. Since this is not a music theory book, let us say only that the dominant chord can feel unsteady and in need of resolution (i.e., tension,) and it *moves* toward a resolution and the stability of the harmony that feels like *home*. Think about all the songs you know and how unique each one is. Now consider that, in the Western canon, music is dominated by twelve unique notes of which the most common groupings or scales mostly use seven individual notes at a time, not counting repeating notes an octave above or below the base seven notes. Finally, consider that the essential harmonic movement is from the dominant chord to the tonic chord. We can make one generalization from this analogy: Tension and release creates aesthetic excitement from the simplest of rules.

Here are some simple rules we can set up as graphic design tension and release movements, or to borrow a phrase, *cadences*. Let's first name the seven *notes* of our scale or elements of design as reinterpreted from the 1941 book, *The Art of Color and Design* (Graves, 1941, xv–xvi).

- Line
- Direction
- Shape
- Proportion
- Texture
- Value
- Color

The essential movements from tension and release that we can make in infinite combinatory possibilities include at least these structural relationships in order from low to high contrast:

- **Repetition** of like elements separated by space
- **Harmony** or similarity of some elements and their properties
- **Gradation** and transition toward contrast and tension

- **Contrast** and discord, especially a lack of similarity
- **Unity**, the balancing principle that exemplifies an aesthetic gestalt of tension and release, an organized system that is experienced as more than the sum of its parts

Taking Control of Your Digital Files

We will be making extensive use of digital files in this course. Before the desktop computer, architectural and engineering firms had elaborate data management systems. A favorite choice for the project architect or project manager was a three-ring binder that lay on top of the desk at the side and at hand. Each member of the team knew they could come over and consult the project file that was tabbed with different sections:

- General conditions, project number, schedule and budget
- Contacts list, faxes and letters from clients, builders, administrators, consultants, and vendors
- Site conditions, field sketches and photographs
- As-built drawings folded in a special way to fit the binder
- Cut sheets of materials, furniture, and fixtures, etc.

As the binders were filled, another was started and made available to the team. At no time was the binder to leave the project manager's area! Some managers preferred file cabinets with manilla folders instead of a binder. Also at the manager's desk was the latest full-sized document set, inclusive of blueline prints and the construction specifications. Again, not a good idea to take them back to your desk. The project manager's primary role was to be the custodian of the project file, the librarian.

In the digital age, many of these ideas remain, while others have changed drastically. The categories are no longer tabbed inserts in the binder; rather, they are folders on a disk drive with shared network access. Version control of this virtual project file is challenging and critical to the team. The most important thing is not which system the project manager uses, but it is most important that the manager communicates to the team how and where files will be stored and accessed and, above all, backed up at least each and every night.

What is your system? This is not optional! You must develop a system that works for you and be consistent in how you use it. Here is an example that you can build upon for our work:

1. Sketchbook (your project file)
   - Sketch assignments
   - Course notes
   - Project schedule, handwritten with annotations
   - Printed examples glued onto blank pages with annotations
2. Top Level Folder on your computer's hard drive: **Architectural Skills**
   - Subfolder: *Documents* for finished and scanned work
   - Subfolder: *Images* for photographs and collected reference work
   - Subfolder: *Movies* reference videos and demonstrations

3. USB drive duplicated and synchronized to your computer hard drive structure
4. Cloud drive automatically backing up your computer hard drive folder
5. Naming system for files (be descriptive)
   - YYMMDD_projectNameAuthor.ext is a good model
   - 230901_exerciseTwoInglert.svg is a name that implies the following:
     - Due on 1 September 2023
     - Project: Exercise 2
     - Author: Inglert
     - Type: Scalable Vector Graphics

One final word: A working file, an archive and a backup are three separate entities that are related to each other and are in sum the bare minimum model from which to build your own system. It is highly probable that one of three things will happen during your studies: (a) a hard drive will fail, (b) an external cloud server will go offline, or (c) a USB stick will be lost. The probability that all three will happen simultaneously is extremely low. Protect your work!

Exercise 3: Contour Drawing of Still Life from Direct Observation

Introduction

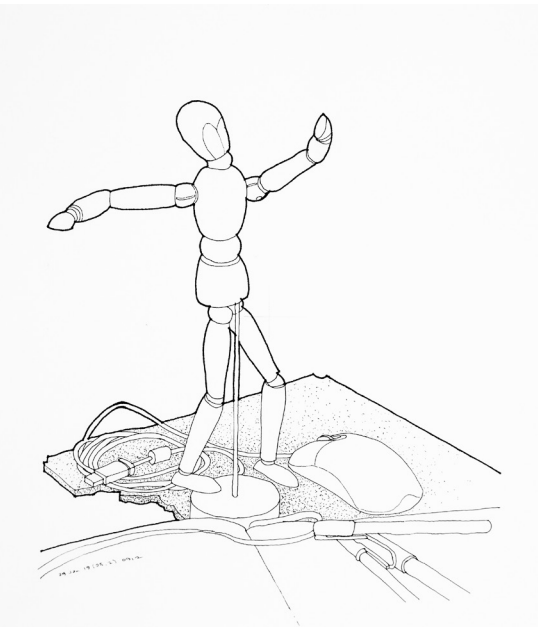

FIGURE 2.4 Exercise 3: Contour Drawing of Still Life from Direct Observation

A contour drawing is an outline that describes the mass and shape of objects. In our usage, the primary outline is called the silhouette, and it circumscribes the outermost shape of the

composite of objects. In Sketch A. 50 Contour Drawings of Hands and Feet, we started with five blind contour drawings where we focused only on the object and never looked at the drawing. Modified contour drawings are freehand drawings that split time between looking at the object and looking at the drawing.

> Drawing is the key to effective seeing, and seeing is the key to effective drawing. (Laseau, 2004, 10)

> There is only one way to learn to draw and that is a perfectly natural way. It has nothing to do with artifice or technique. It has nothing to do with aesthetics or conception. It has only to do with the act of correct observation and by that I mean a physical contact with all sorts of objects through all the senses. … Learning to draw is really a matter of learning to see—to see correctly—and that means a good deal more than merely looking with the eye. The sort of seeing I mean is an observation that utilizes as many of the five senses as can reach through the eye at one time. (Nicolaides, 1969, xiii, 5)

> You have to measure, first of all, with your eyes; and by studying the model judge the comparative measurements of its several masses. Then measure mechanically. When measuring mechanically, hold your charcoal or pencil between the thumb and fingers and use the first finger and the tip of your charcoal to mark the extremities of the measurement you are taking. (Bridgman, 2017, 12)

In this drawing select a personal object of a relatively small scale (bag, shoe, etc.) and draw a modified contour drawing of the object on a 9" × 12" sheet of quality drawing paper. Do not shade or render. Focus on observation, clean, crisp lines, and composition of the drawing on the page.

FIGURE 2.5 Still Life with Scarf. Sketch in Ink and Colored Pencil

Learning

This assignment module contributes to the following design learning outcomes, which finish the sentence "As a successful student in this course, I am now able …"

- … to directly observe shape and forms and measure and translate the spatial scene accurately from an implied image plane to a proportionally scaled drawn surface.
- … to control line weight and consistency (e.g., width, continuity, and control).

Scenario

As we learned in Exercise 1: Breathing Lines, a common anxiety many of us share is an inaccurate belief about our ability to draw. We learned that it was really a problem of how we *see*. When we concentrate on drawing what we observe rather than what we think something should look like, we are better able to draw accurately.

In Exercise 2: 100 Lines, we learned that it was possible to convey spatial depth with depth cues. These ideas can be strengthened through a system of line weight or thickness. If you have duplication studied mechanical drafting, then you are aware of the line weight system for making a drawing look more professional. When we study architectural floor plans and building sections, we will learn a similar line weight system. Unless you are drafting such an architectural drawing, let's propose to follow a simple heuristic for line weight with three rules and one special condition:

- Lines that define the boundary between space and object are heavy/thick (0.7 mm.).
- Lines that mark the boundary between two planes are medium (0.5 mm).
- Lines that are either textural or define two materials that are flush are thin (0.25 mm).
- **Special condition**: If it looks good, consider making the silhouette discussed above the thickest line of all (i.e., 0.9 mm).

Materials

- Pencil or felt-tip pen (0.25 mm, 0.50 mm, 0.70 mm, or 0.9 mm)
- 11″ × 14″ (279 × 356 mm) sheet
- drafting tape

Steps

1. Since you are going to be looking very closely at your still life, find objects that interest you personally. Assemble your composition with overlapping shapes and take time to create a narrative between the objects. Creating a story can mean setting up several episodes of tension and release. Hard objects and soft. Textural and smooth. Geometric shapes and natural.
2. Set up your drawing in a place both where it can stay for the duration of this long drawing and you have a good view of the still life. Since this is a contour drawing, even lighting is best. No shade and shadow shall be rendered.
3. Begin by closing one eye to remove stereoscopic vision. Hold your pencil or pen at arm's length, first vertical and then horizontal, and locate the centroid of your composition.

Since your paper is a rectangle, use your long metal ruler to lightly draw two diagonals to geometrically locate the center of your paper. Finish this step by drawing in freehand and very lightly a vertical line that passes through this center and a light horizontal through the same center. These are measuring lines for the following steps. Each one is a datum of reference.

4. Continue by concentrating on the circumscribing simple shape. Challenge yourself to draw a descriptive polygon of the fewest essential sides and focus on getting the proportion right. This is the most important step because all measurements are derived from relationships to this shape and the center lines.
5. Take your time and use light lines to define the sub shapes of each object, remembering to check your measurements against your centerlines and your circumscribing polygon. If you are comfortable with what you have transferred to the page through hard work and close observation, you are ready to render.
6. Render linework, which in a contour line drawing is surprisingly the easiest part because we have defined a heuristic above and a language of line type: heavy, medium, and light. Enjoy the process and aim for consistency.
7. Finally define and scribe the silhouette line. Silhouette is the most important reading of shape and form from the perspective of the viewer. This thickest of lines should be bold and confident in its rendering. It can also appear as a continuous line around the still life.

Tips

- The described method borrows much from a technique called *Sight Sizing*. It differs in one important respect, although this assignment could be done as a true sight-sizing exercise. Our modified version is more accurately thought of as a relative or comparative sizing method.
- Resist the urge to use technology as a guide for this project. Photography or drawing from image resources may seem like a good shortcut. Would it not be easier just to make a tracing? Remember that the goal here is to learn how to see, and little is learned by tracing or using an image reference.

Criteria

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Craft	Illustrator demonstrates exemplary attention to work product and excellence.	Illustrator demonstrates good attention and care toward work product.	Illustrator completes work, but the product seems rushed to completion.	Illustrator demonstrates attention toward work product, but work quality is poor.

(*Continued*)

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Rendering	Illustrator uses line to hold the viewer's attention. Image is controlled and evokes both power and subtlety. Image is descriptive and/or symbolic and supports compositional goals.	Illustrator's linework demonstrates several professional attributes. Rendering style does not distract the viewer and generally supports compositional objectives.	Illustrator's use of line is somewhat effective. Rendering style is consistent and competent. There are some non-contributing attributes.	Illustrator attempts to use line descriptively. Rendering is inconsistent and lacks attention to craft.
Professionalism	Student completes the work on time. Work demonstrates exemplary attention to learning objectives.	Student completes the work on time and demonstrates a good work ethic.	Student generally completes the work at a minimum level of expectation.	Student is missing parts of the work and makes a plan for completion of the remaining assignment.

Related Assignments

- Exercise 2. 100 Lines
- Sketch A. 50 Contour Drawings of Hands and Feet

Contour Drawing Defines Form

The silhouette of a form is the dominant reading on first encountering a new object. The inner contours of the object reveal the three-dimensional qualities of positive and negative space and allow us to make sense of the object in space. Contour drawings of form are some of the first and arguably the most important architectural drawings students learn. Following a systematic, hands-on and learnable technique, analytical drawing is an iterative heuristic enabling students to discover and learn about essential form.

> Geometry is a formative idea in architecture … [, and] is the single most common determinant or characteristic in buildings. [The primary purpose of contour drawing] is to develop visual acuity and sensitivity to qualities of surface and form … [and is] best done with … a single incisive line. This fosters a feeling of precision that corresponds to the acuity of vision which contour drawing promotes. Shape is the characteristic outline or surface configuration … that we organize and identify what we see. … A shape can never exist alone. It can only be seen in relation to other shapes or the space surrounding it. (Ching, 1998, 17–8, 23)
>
> … [A]rchitecture is engaged with fundamental existential questions. All experience implies the acts of recollecting, remembering and comparing. An embodied

> memory has an essential role as the basis of remembering a space or a place … Architecture is the art of reconciliation between ourselves and the world, and this mediation takes place through the senses. (Pallasmaa, 2005, 72)

Defining Lines: Thick = Spatial, Medium = Planar, Thin = Flush

A building photograph includes visual noise, which obscures a critical appreciation of architectural form. As we view architecture in context or in a photograph it can be difficult to clarify the shapes of the planes, openings, and the overall silhouette (Inglert, 2014, 319). An analytical drawing method can reveal the most essential formal qualities of architecture. This method filters out the confusing details of texture, tone, and color and brings to the forefront the formal elements of silhouette and shapes.

Form is the primary tool of the architect. Ching presented the elements of form as point, line, plane, and volume (Ching, 1979, 18). A strong property of both plane and form is shape, a plane's primary identifying characteristic. Continuing, Ching wrote, "[f]orm is the primary identifying characteristic of a volume." The silhouette of a form may imply solid mass or void space. The silhouette, or edge contour of a volume, "… is the primary means by which we recognize and identify the form … " of architecture. However, this most elemental appreciation of architecture may be too elusive for students when viewed from the busy street or secondhand from a photograph.

Students new to architecture tend to overemphasize the importance of architectural style and oversimplify the role of the architect and the relevance of foundational design principles. An effective *analytique* drawing grounds a student in a critical view toward the built environment. This kind of formal contour drawing is an important element of training future architects. This familiar hand-drawn analytical drawing process, rooted in a Modernist, contour technique, emphasizes a grammar of line weight, which reliably represents three-dimensional space and the geometry of form. An example of the clarifying effect of varying line weight alone illustrates the utility of the method.

There are, of course, other analytical methods for revealing formal attributes, like tone value studies. These will be covered in other chapters. There are also reasons to combine the two basic *analytique* types, contour and tone value, into one drawing.

> If a sketch consists of nothing more than the outlines of buildings … it will communicate a certain amount of information regarding shape, structure, and perhaps even depth … the sketch will be limited in its ability to convey form and depth of space. (Brehm, 2012, 77)

The ease of taking photographs from our phone cameras can be a tempting shortcut for documenting our built environment. Photographs are an important record and are encouraged as part of this process. In understanding design principles, it can be difficult to clarify the shapes of the planes, openings, and the overall silhouette from the *noise* that is captured

in a photograph. A clear method and syntax of analytical drawing helps a student discover the architectural signals from the contextual noise of the image.

Direct Observation vs. Image Resource

As with many of the didactic *arguments* made in this textbook, we'll start with a rhetorical device known as a *false dichotomy*. It is not false in the sense that it is uncommon to hear or that it is provably incorrect. On the contrary, just like in the previous section with our discussion of line weight being *better* in hand drawings than on the computer, this prejudice is often heard in the office or the art studio and coming from the lectures of professors. It goes something like this: "drawing from direct observation is superior to using an image resource." What makes this a false dichotomy is the inference that one must choose only one of these options. Why should we have to choose? Is there a hybrid approach that takes advantage of both processes? In what circumstances would we want to use each? Let's explore these questions.

It is an exciting experience to be an architectural designer and illustrator today. Not only do we have at hand the traditional ways of drawing, but we can also avail ourselves of great digital technologies. One of the most understated, ubiquitous, and maybe overlooked tools is the *computer* and high-end camera in your pocket. The advent of high-resolution photography on a phone has improved the observational and documentary processes of the architect in a profound way. As with many tools, it can also be said that we can come to rely too much on it.

Learning to draw from direct observation is one of the most important skills to develop as an artist. The challenge of translating three-dimensional space onto a two-dimensional surface is perhaps one of the most important innovations of the Renaissance artists. Yet, the development of mathematical perspective should be considered in the same light as the photograph today. Perspective systems are tools to aid the draftsperson. The object of the exercise is still to translate the environment to the page. When followed too obediently, many perspective systems can seem as awkwardly unreal as making a tracing from a photograph.

The classic model for teaching direct observation in the atelier is sight-sizing. The artist would set up a drawing board directly in line with the model subject, stand back, visually and mentally make measurement, and then translate them to the drawing board. It is painstaking work and a very rewarding challenge. Of course, this would be inconvenient with landscapes and buildings! A variation of this method is known as relative sizing. Using a process of working from major shapes in the scenes to smaller shapes, the artist compares objects' relative sizes, estimates these relationships onto an imaginary image plane between the scene and the artist, and sometimes employs helpful tools to guide this work, such as using a pen as a measuring device, squinting the eyes to simplify shapes, and closing one eye to minimize the distortions of binocular vision (i.e., parallax). The downside of either of these methods, of course, is that each is difficult to master and takes much deliberate practice. In a practiced hand though, there is great vision and power in images made from direct observation.

A tempting antidote to this difficult prescription is to use photography. Advantages of photography include helping the artist to translate a three-dimensional scene onto an image

plane, the representational accuracy of the proportional relationships, and the ability to crop the image at any time during the exercise, to name only a few.

Where does this leave us in the decision between direct observation versus image resources? The purist may insist on challenging the architectural vision using only the well-earned skills of sketching *en plein air*. The pragmatist may come to rely on the photograph image reference as an expedient and effective means to an end.

The middle way takes advantage of both processes. In Exercise 3, you learned of a method for combining direct observation and photographic resources. In the first step you find a dynamic viewpoint and context that concentrates on a primary facade (i.e., two-thirds) of the composition and that also includes a secondary facade. We call this an oblique view. Sketch the silhouette, the major shapes, and the minor shapes using the direct observation techniques discussed. Once you have a grasp on this composition, take a photograph using the largest lens option.

In the second step, either on-site or back in the studio, make proportional corrections and revisions while adding any contributing details that you see in the photograph (i.e., image resource). Revision and redrawing are the most important investments you can make in your development. During this step, you may find it helpful to overlay a piece of tracing paper on your drawing to clarify your work.

In the final step, you can render in line weight as discussed in the previous section. It can be useful to keep these three steps distinct because it focuses our efforts and makes the whole exercise less overwhelming.

Sketch A: 50 Contour Drawings of Hands and Feet

Introduction

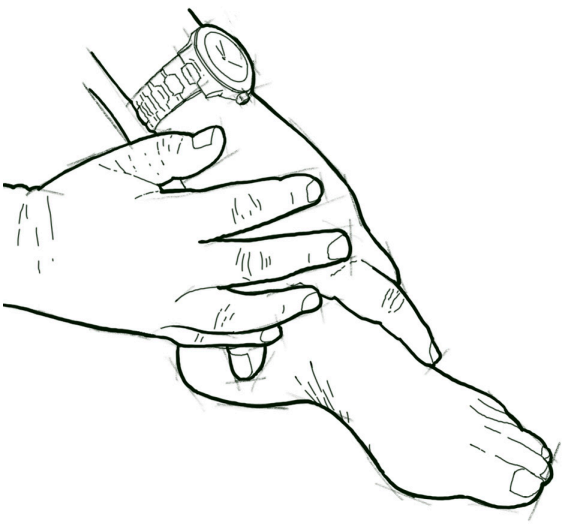

FIGURE 2.6 50 Contour Drawings of Hands and Feet

Draw 50 contour drawings of hands and feet. Each should be done from a different viewpoint and with different hands/feet. The first five sketches will be blind contour drawings of hands as a warm-up for the 45 modified contour drawings. Each drawing should take approximately 3 minutes (i.e., 2.5 hours for 50 drawings).

> In the hand are four bones, continuous with those of the fingers, called metacarpals (meta, beyond, carpus, wrist). They are covered by tendons on the back and on the front by tendons, the muscles of the thumb and little finger, and skin pads. (Bridgman, 2017, 209)

> Repetition serves as a handprint of human intent. A phrase that might have sounded arbitrary the first time might come to sound purposefully shaped and communicative the second. (Margulis, 2014)

The main purpose of this assignment is to gain facility with direct observation through deliberate practice. That said, as an experiment you may emulate no more than five "drawings" from a master artist in source material. It can also be useful to learn to draw from others' drawings. May I suggest the image tab from a Google search such as "drawings anatomy hands"?

Learning

This assignment module contributes to the following design learning outcomes, which finish the sentence "As a successful student in this course, I am now able …"

- … to directly observe shape and forms and measure and translate the spatial scene accurately from an implied image plane to a proportionally scaled drawn surface.

Scenario

Gaining confidence in drawing from observation has more to do with learning to see effectively than it does with the mechanics of drawing well. It may be confusing for a new student to parse that line of text because the connection between seeing and drawing is underappreciated. You proved in Exercise 1: Breathing Lines, that you can easily master the mechanics of drawing lines after a relatively short amount of practice.

Drawing from memory can be a great creative activity for a practiced artist. For someone who is new to this, drawing from memory can be the greatest hindrance to development. The reason for this involves a *perception prejudice*. It is easier for the brain to prejudge what a hand is *supposed* to look like than it is to actually perceive it *correctly* enough to draw well. Close your eyes and imagine a square. Open your eyes and draw that square. No problem, right? Close your eyes again and imagine an eye in someone's face. Open your eyes again and draw the eye. Does it look real? Not sure? Let's try again. Close your eyes and imagine a town square teeming with people on market day with tables set up with fruits and vegetables. Draw what you see. Stressed yet?

A learned signifier for a square shape presents us with very few differences between an actual shape that we perceive and the drawing we made. A square is a generalization. A human eye contains relatively fewer attributes than a crowded town square. Our generalization about an eye may be good enough most days to make our drawing believable. On the other hand, a crowded town square is not easily generalized with our library of signifiers in our head. It therefore seems much more difficult to draw.

If an artist draws directly from observation, then the square shape, the human eye, and the town square are really the same problem. Of course, the difference in complexity means that the town square drawing may take longer to complete. Technically it is no more difficult! You probably don't believe me yet. That's okay.

> … drawing is always the same task: to see clearly what is before your eyes. Sighting is an apt renamed skill. You take a sight; you see the thing-as-it-is … (Edwards, 1979, 130)

This assignment reminds us of playing piano scales. If you had lessons when you were young, then you remember that after several repetitions, your hands knew where to move. The sounds you made became more confident. While not a beautiful sonata or Broadway show tune, your scales resembled music. You may have understood how you could *scale up* this activity to making real music.

Let's learn how to see better. It is not an easy process to master and has taken this author a lifetime of practice to develop confidence. Let's remember that our goal is not mastery; rather, we intend to build confidence and professionalism in our skills.

Materials

- Pencil
- 9″ × 12″ (229 mm × 304 mm) sketchbook

Steps

1. Warm up: For your first five drawings, use the blind contour method. Look only at the hand or foot you are drawing. Slowly circumscribe your subject first in your mind's eye and then on the paper. Never look at your paper to check your progress. This will instill a deep focus for observation, and maybe a little embarrassment! That is okay—keep going!
2. The next 45 drawings use a modified contour drawing method. Look at your object for about 90% of your time, and check your progress by looking at your sketchbook for only 10% of your drawing time. Each drawing should be a quick sketch and take between 3 to 5 minutes to complete.
3. Keep moving your hands and feet into new poses: back of hand, fist, palm, holding an object, top of foot, and if flexible enough, bottom of foot. Use a mirror.
4. Are you right-handed or left-handed? Draw one of your dominant hands with your nondominant hand. Is it shaky? Does it look better than your blind contour?

5. Compose two or three hands to each sketchbook page. Allow them to overlap. Draw larger than you would initially think.
6. When your sketchbook pages are completed, photograph each page and import them into an Inkscape file with "Document Properties" set to an 11″ × 17″ (279 mm × 432 mm) page. Compose and scale all your drawings to fit together on this one page.
7. Export the drawing as a PNG file at 72 ppi for submission.

Tips

- The described method borrows much from a technique called sight-sizing. It differs in one important respect, although this assignment could be done as a true sight-sizing exercise. Our modified version is more accurately thought of as a relative sizing method.
- Resist the urge to use technology as a guide for this project. Photography or drawing from image resources may seem like a good shortcut. Would it not be easier just to make a tracing? Remember that the goal here is to learn how to see, and little is learned by tracing or using an image reference.

Criteria

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Craft	Illustrator demonstrates exemplary attention to work product and excellence.	Illustrator demonstrates good attention and care toward work product.	Illustrator completes work, but the product seems rushed to completion.	Illustrator demonstrates attention toward work product, but work quality is poor.
Rendering	Illustrator uses line to hold the viewer's attention. Image is controlled and evokes both power and subtlety. Image is descriptive and/or symbolic and supports compositional goals.	Illustrator's linework demonstrates several professional attributes. Rendering style does not distract the viewer and generally supports compositional objectives.	Illustrator's use of line is somewhat effective. Rendering style is consistent and competent. There are some non-contributing attributes.	Illustrator attempts to use line descriptively. Rendering is inconsistent and lacks attention to craft.
Professionalism	Student completes the work on time. Work demonstrates exemplary attention to learning objectives.	Student completes the work on time and demonstrates a good work ethic.	Student generally completes the work at a minimum level of expectation.	Student is missing parts of the work and makes a plan for completion of the remaining assignment.

Related Assignments

- Exercise 1. Breathing Lines
- Exercise 3. Contour Drawing of Still Life from Direct Observation

Make a Composite Drawing for Your Portfolio

One fundamental skill that architectural students must learn is how to combine multiple drawings, images, etc., into visual sets that are composed graphically onto a single larger board. A common phrase to hear from both architects and students is "I'm working on a presentation board." This can be contrasted to the business student or educator who gives a slide presentation. Complex and creative concepts deserve a dialogue that goes well beyond an exposition. Architectural presentations more often use a different approach than slides.

There are several ways to communicate ideas. Nonfiction books often proceed serially from a constructed argument formatted as claim statements backed by facts. We can simplify this as thinking of it progressing along a path from analysis (deconstruction) to synthesis (reconstruction). Along this track, we hope to transfer ourselves to a place of new understanding. Your lab report in a science class can be a structured type of this argumentation method. A hypothesis (claim) is tested and reported (data) and combined with logic and observations (methodology) to make a conclusion about the validity of the hypothesis. This kind of accumulated knowledge is easier to deliver in a linear (serial) process. As the complexity and interconnectedness of ideas increases, it becomes increasingly difficult to reduce the ideas that we want to communicate into discrete and testable concepts. It is important to be able to see and appreciate the entire presentation at a glance, to zoom in on particular details, and to revisit complex ideas at the request of the client.

In order to take advantage of our capacity to recognize patterns from within complex systems, we need a way to see everything at once and the smallest of details almost simultaneously. We say *almost* because it is unlikely that the human brain can multitask effectively like a parallel processing computer; rather, we can at best hope to do multiple things poorly at the same time. Business presentations often rely on a narration given in front of a linear sequence of images sometimes known as slides. This is also a common approach in education and a favorite of many professors. The predominant software innovation for making this presentation is PowerPoint.

Several options are available to the architectural designer for compositing visual sets together into a larger presentation board. The most obvious method is to map the information directly to a board and draw the information directly. With the advent of several software solutions, most of us take advantage of the layering and transform tools in the computer. It is important to remain agnostic in this textbook when explaining what we might think of as recipes for processes. Therefore, Sketch A: 50 Contour Drawings of Hands and Feet, uses open-source and free software known as Inkscape. Another good open-source choice is GIMP.

Steps to Make a Composite Drawing for Your Portfolio

1. Download Inkscape from https://inkscape.org/.
2. Collect image assets into a folder on your computer (i.e., ./project/images).
3. Open new document in Inkscape and save with new name in project folder (i.e., newBoard.svg).
4. File → Document Properties Change display units and page size and orientation and close the dialogue box.
5. Open Layers and create a hierarchy of layers. Some suggestions are drawings, photos, text, etc. Remember to change to the correct layer before importing assets.
6. File → Import and hold the Ctrl button and select an arrow to scale the image uniformly.
7. Wash, rinse, repeat … and save often!

References

Brehm, M. (2012). *Sketching on location*. Kendall Hunt Publishers, Inc.

Bridgman, G. (2017). *Bridgman's complete guide to drawing from life*. Sterling.

Brodie, J. (2004). *Drawings of Jim Dine*. Steidl Publishers.

Ching, F. (1979). *Architecture: Form, space & order*: Van Nostrand Reinhold.

Ching, F. & Juroszek, S. (1998). *Design drawing*. Van Nostrand Reinhold.

Crawford, M. (2009). *Shop class as soulcraft*. Penguin Press.

Edwards, B. (1979). *Drawing on the right side of the brain*. J.P. Tarcher, Inc.

Franzen, John. (2015). *Each line one breath*. 2015. https://www.johnfranzen.com/each-line-one-breath.

Graves, M. (1941). *The art of color and design*. McGraw Hill, Inc.

Haskins, C. (1989). Kant and the autonomy of art. *The Journal of Aesthetics and Art Criticism* 47(1), 43–54. http://www.jstor.org/stable/431992

Inglert, E. (2014). *Drawing formal massing studies in "archiMedia" in AFConline*. Design Communication Association.

Koberg, D. & Bagnall, J. (1981). *The revised all new universal traveler*. (2nd ed). William Kaufmann, Inc.

Laseau, P. (2004). *Freehand sketching: An introduction*. Norton.

Margulis, E. (2014). One more time. Aeon Media Group, Ltd. https://aeon.co/essays/why-repetition-can-turn-almost-anything-into-music

National Park Service. (2008). HABS Guide to Field Documentation, NPS. https://www.nps.gov/hdp/standards/habsfieldguide.html

Nicolaides, A. (1969). *The natural way to draw*. Houghton Mifflin Co.

Pallasmaa, J. (2005). *The eyes of the skin. Architecture and the senses.* John Wiley & Sons Ltd.

Tufte, E. (1983). *The visual display of quantitative information*. Graphics Press.

Yee, R. (2007). *Architectural drawing. A visual compendium of types and methods* (3rd ed.). John Wiley & Sons, Inc.

COPYRIGHTED MATERIAL — DO NOT DUPLICATE, DISTRIBUTE, OR POST

Documentation and Drafting

Taking the Measure of Our World

Many find it useful to draw as a means to understanding. The act of recording something to paper is a great way to remember an experience. Drawing can also uncover hidden relationships and concepts. If you look up the word *measure* and trace it to its Latin and Greek origins, you will find that measure is related to the word *meter*. Both words imply an idea of a system of understanding through standardized intervals and bounds. There is comfort in the control that comes from circumscribing an object and from relating that object's size and proportion to other objects in a way that we can communicate with others.

This chapter covers several systems for taking the measure of our world. You will come to understand multi-view drawings, parallel line drawings, and the systems of measure that describe in technical detail complex ideas. From design to construction, the hallmark of the built environment professional, whether an architect, engineer, or constructor is the skill that we bring to imagining and translating ideas to paper in a precise language of measured drawing. Let's begin with something abstract that gets at this idea of circumscribing an object. In several exercises and sketches in this book, you will read about the *Cuboid Generalization Analogy*. It is implied below in the isometric grids of Sketch B. Field Sketch of a Complex Chair. Let's construct a more explicit definition of this phrase.

First Principles of Static Objects

1. A point is infinitely small and has one attribute, a location in an (x, y, z) three-axis Cartesian coordinate system. For each triple, let's apply a shorthand of (x, y, z) = [A] that describes a point coordinate.
2. A line extends a point in one of the three axes. If it is a segment, then it can be defined by a tuple of point coordinates [A, B].
3. If that line [A, B] is extruded perpendicular to itself, such that it is a planar segment, then we can locate it in space with a shorthand of [(A, B)(C, D)]. For each one of the three coordinate directions, let's apply three planar assignments of [XY] or [XZ] or [YZ].

4. A cuboid extrudes a plane perpendicular to its face, and if it is similarly bounded in space, then we can locate it in space with a triple: [(XY),(XZ),(YZ)].

Generalizations

1. A generalization abstracts and models a more complex system, reduces attributes, and distills objects to essential elements.
2. If we circumscribe an object, it is meant that we draw a figure around the object and touch it at several points and never cut into that object.
3. Four figures (e.g., shapes and volumes) are most often used to circumscribe another object: circle and rectangle in two-dimensions, and the sphere and cube in three-dimensions.
4. Since the Cartesian coordinate system is represented as a cubic grid, a cube is a useful generalization of a complex volumetric form.
5. Since a cube is strictly uniform in its dimensions, then a cuboid may be a more refined generalization for circumscribing complex nonuniform volumetric forms.

Cuboid Generalization Analogy

When first encountering a complex volumetric form, it is useful to circumscribe it in a primary box, known as a cuboid, which has three pairs of perpendicular planar faces that can be easily measured. Subsequent iterative analysis may suggest grouping the complex volumetric sub-elements into subsets of cuboid boxes and proceeding toward greater levels of resolution. Since most students easily grasp techniques for drawing realistic looking three-dimensional boxes, then this structural generalization has great utility in the architectural studio.

Can you apply two iterations of this Cuboid Generalization Analogy to your complex chair? If you were effective during your field measurements in Sketch B. Field Sketch of a Complex Chair, then that is the method you followed. It should be easier to project the three views you constructed in the isometric to each of the three planes: Top view is [XY], front view is [XZ] and the side view is [YZ]. In fact, it may be easiest to begin the final drawing by first placing the three rectangle projection boxes on the page in a light construction line. See the step-by-step directions below for more detail.

The Language of Line Type for Construction

We learned in Chapter 2 that rendering line weight in our contour drawings makes them readable. That system proposed that spatial edges should be thick. Planar edge conditions should be medium line weight. Flush edges and defining detail should be thin. There is a slightly different line weight system for parallel projection drawings that we sometimes call construction drawings. These include drawings you may know as plans, elevations, sections, axonometrics, etc. More technically minded students may find these rules comforting because of the defined quality. Indeed, we will be using specific preferred widths that may vary only slightly in different professional offices. The principle remains the same as the contour line drawing line weight system, to allow greater legibility and understanding.

Lines that are cut through by the sectioning plane are drawn with a thick line. If you are drafting by hand, then the most consistent way to achieve a thick line width of 0.7 mm is with a mechanical pencil, technical pen or similar "graded" thickness instrument. Clutch pencils may be used and require much practice to achieve a consistently thick line width. As with all line widths discussed here, in a digital environment it is important to define the line thickness as a parameter in order for the printer to produce consistent results. These are sometimes known as *styles* in the digital environment. Profiled elements in plans and elevations, except for the outermost profile and silhouette (0.7 mm), should be drawn with a 0.5 mm medium width. This is also a good line width for notes and text that is otherwise not a caption or title. The text height for notes, typically 3/32″ (2.4 mm) to 1/8″ (3.2 mm) high, looks balanced with the 0.5 mm medium width. Thin lines are used for dimension strings, notes leaders, and defining shape elements and objects in the view that may be less emphasized. Examples of these elements include furniture, entourage, material detail, and door swings, to name a few. Thin lines are drawn from 0.25 mm to 0.35 mm thickness.

It can be a struggle to learn a new office's drawing standards. It is difficult to find the specifics of line weight within other textbooks. However, in doing professional work on three continents, this author has found a surprising level of consistency with these standards.

Sketch B: Field Sketch of a Complex Chair

Introduction

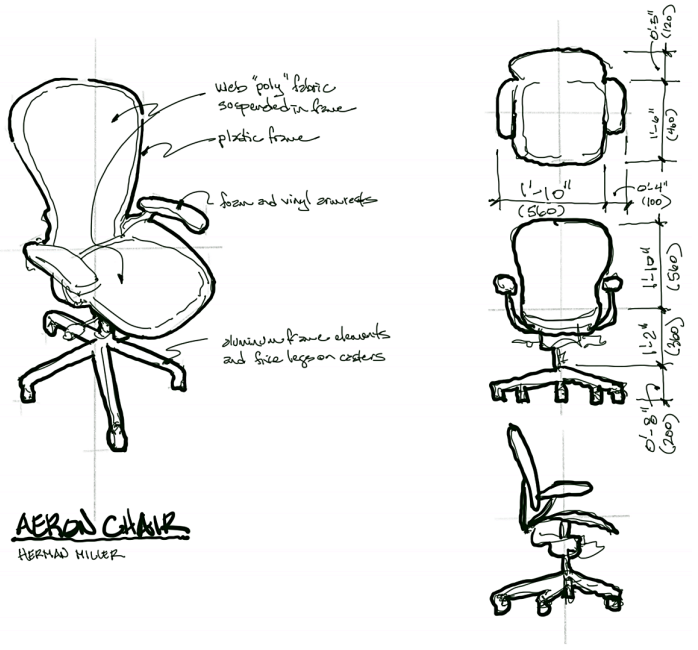

FIGURE 3.1 Field Sketch of a Complex Chair

Select a chair to document in a drafted plan, front elevation, and side elevation. Begin by measuring the chair and recording the dimensions in your sketchbook. Make quick sketches and detail views to record important information. Use these "working drawings" to develop the final drafted views.

Learning

This assignment module contributes to the following design learning outcomes, which finish the sentence "As a successful student in this course, I am now able …"

- … to analyze the built environment and apply measured drawing skills that include plans and elevations, illustrating line quality, drawing notation, and dimensioning.

Scenario

Going out to the field and measuring existing conditions is one of the most common activities in a professional design office. The first step in most projects is to photograph, measure, and make drawings with notes. These field notes are a valuable resource back in the office when we begin to make the technical drawings.

Translation through drawing of three-dimensional spatial conditions to two-dimensional projections—including plans, sections, and elevations—is a good skill to develop because most technical drawings that designers produce for construction are orthographic.

As a professional architect who teaches architecture and engineering students, I am often asked by people outside of the profession why we still learn to draw by hand. In an age of computer-aided drawing, why would a student want to know how to draw by hand when the computer is so excellent? There are many answers to this question, one of which is the fact that the field sketch of existing conditions is the most efficient, effective, and inexpensive method for verifying and beginning a construction project. These field sketches and early photographs are so important to the project that they are kept in the official job file, not to be discarded. They are an important component of the construction documents and are legal documents in practice. We should learn together how to gather good documentation and make effective sketches.

In this assignment, we'll work on a single object: a complex chair. In several assignments coming up, we'll apply these skills to room plans, elevations, and sections in preparation for our first construction document drawing.

Materials

- Phone camera or digital camera
- Pencil
- Tape measure
- Sketchbook
- 1:96 Isometric grid paper
- 1:48 Grid paper

Steps

1. Select a complex chair. A good source for your selection is an office chair with rolling casters. This offers the challenge of nonuniform shapes and complex mechanisms, which will make your drawing a more rewarding challenge than, for instance, a three-legged stool.
2. With a tape measure, identify the overall height, width, and chair dimensions. Construct a three-dimensional box of these lengths using the provided isometric grid. Drawing this grid freehand and with the isometric grid promotes sketching precision without the need for drafting tools.
3. Photograph your chair from approximately the same oblique view that you drew the isometric container box. It is useful to also photograph a top view and front and side views because you will use these views in the related assignment, Exercise 4. Hand Drafting an Orthographic Multi-View Projection of Complex Chair.
4. Transfer the silhouette (outline) of the projected view for each of three drawings: top view, front elevation, and side elevation. Concentrate on the proportions of the silhouette. Sketch these on each of the visible faces of the isometric box. Recall that these are orthographic drawings and that no perspective distortion should be evident.
5. Redraw the three views on the 1:48 grid paper. The experience should be one of flattening the three-dimensional chair as a projection first on the box, and then enlarging that map at twice the scale. Make several notes as to materials and relevant descriptive ideas about the chair.
6. Taking our analysis from the general to the specific, use the tape measure and take important inner dimensions and note important relationships. We are learning to see the chair objectively. Include dimensional information about the inner elements and details. When we do our final drawing project for the chair in Exercise 4, we will again redraw the three views and enlarge them to 1:12 scale.
7. Collect all sketches and photographs together. Digitize all of the imagery you have made and analyses that you documented and compose them together onto one board. The final submission should be saved as a raster image with pixel dimensions 1224 px by 792 px.

Tips

- Recall that these are orthographic drawings and that no perspective distortion should be evident.
- It is useful to bring a large clipboard to the field as a mobile and hard surface for drawing.
- Photograph everything about the chair. You will be glad to have the information when back in the studio.

Criteria

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Craft	Illustrator demonstrates exemplary attention to work product and excellence.	Illustrator demonstrates good attention and care toward work product.	Illustrator completes work, but the product seems rushed to completion.	Illustrator demonstrates attention toward work product, but work quality is poor.
Rendering	Illustrator uses line to hold the viewer's attention. Image is controlled and evokes both power and subtlety. Image is descriptive and/or symbolic and supports compositional goals.	Illustrator's linework demonstrates several professional attributes. Rendering style does not distract the viewer and generally supports compositional objectives.	Illustrator's use of line is somewhat effective. Rendering style is consistent and competent. There are some non-contributing attributes.	Illustrator attempts to use line descriptively. Rendering is inconsistent and lacks attention to craft.
Technical	Illustrator observes and analyzes object data and translates it to a meaningful graphic representation. Professional conventions are followed, inclusive of line weight, orthographic and dimensional information.	Illustrator observes and analyzes object data and translates it to a meaningful graphic representation. Most professional conventions are followed, and some information is missing.	Illustrator is challenged to observe and analyze object data correctly. Few professional conventions are followed, and some information is missing.	Illustrator attempts to observe and analyze object data and representation is inconsistent. Professional drawing conventions are not followed.
Professionalism	Student completes the work on time. Work demonstrates exemplary attention to learning objectives.	Student completes the work on time and demonstrates a good work ethic.	Student generally completes the work at a minimum level of expectation.	Student is missing parts of the work and makes a plan for completion of the remaining assignment.

Related Assignments

- Exercise 4. Hand Drafting an Orthographic Multi-View Projection of Complex Chair
- Sketch C. Field Sketches of Floor Plans of Five Large Rooms
- Sketch D. Field Sketches of Two Exterior Elevations of Large Buildings
- Sketch E. Field Sketches of Two Interior Elevations of Large Rooms
- Sketch F. Field Sketches of Five Partial Interior Sections of Large Room
- Exercise 7. Interior Construction Drawing. Floor Plan and Interior Elevations

Geometric Transformation One: Parallel Projection

A projection system allows for the important transformation of the real physical world into the designer's world of documentation and imagination in environments of paper and screen. Designers and constructors primarily communicate in geometric transformations called parallel projection and perspective projection.

By this point, it may sound obvious that the activity of drawing is the recording of a projection of the physical three-dimensional world onto a two-dimensional plane. As we move through a spatial environment, our eyes take a seemingly infinite number of snapshot projections capturing light reflections onto a sensitive layer of cells called the retina. In turn, these are converted to neural signals. Our eyes capture our environment, not literally like a net; rather, we can think of this capture as a transformation from the physical state of *objectness* to a geometric projection, and ultimately to an idea.

Since a camera is a useful analogue for our eyes, let's use the analogy to understand what is meant by geometric projection. When we take a photograph with a camera, light passes through the lens and ultimately onto a sensor "plane." Before the advent of digital image sensors, this projection was made directly onto light sensitive film. As we will see with a geometric projection in a later section called perspective projection, the image sensor of the camera is literally a scaled mapping of points of light reflecting onto an array of electrical receptors. Depending on the distortions introduced by the camera lens, the results are a very convincing and proportionate reproduction of what our eyes perceive as reality.

Thus far our camera analogy does a good job of approximating a perspective projection. We will explore this analogy further in the next chapter. Let's turn our attention to what is meant by parallel projection. A parallel projection is distinct from perspective projection in that we can conceptualize in the mind's eye an ideal model of our object. This model can be scaled and sliced through shared transformation systems that have developed over the history of design and construction.

The geometric transformation known as parallel projection encompasses two seemingly different ideas: orthographic projection and paraline projection. They are combined here because parallel lines in the actual object are drawn (i.e., drafted) with parallel lines on the image. Perspective projections as we will discover are distinguished by representing parallel lines as converging lines to a vanishing point on the image.

Ching describes three pictorial systems: orthographic, oblique, and perspective (Ching & Juroszek, 1998, 114). Orthographic drawings are called multi-view (e.g., plans, sections, and elevations), and paraline are both axonometric and oblique projections. If a perspective projection is a remapping of the three-dimensional world to a two-dimensional image, then it is essentially a representation of how we naturally see the image. Parallel projections by contrast are a construct of the imagination.

A system of rules is followed for each paraline drawing. Floor plans are constructed with the illusion that a sliced plane is made to a building at or around 3' 4" (1 meter) above the finish floor, such that we can view inside the building and make scaled measurements of shapes

relative to the actual building and its components. This view is good for building elements that can be described in the "x–y coordinate system." Vertical section drawings have imaginary planes that cut through the interior of the building at the discretion of the drafts person and show variously the "x–z" and the "y–z" coordinate systems. Elevations move the cutting plane outside of the building, in order to show the faces of the building. Axonometric and oblique projections construct an "x–y–z" grid system that assures each of the three coordinate planes has a parallel linear relationship on the image plane consistent with parallel lines in the actual object.

Some clients and nonprofessional observers of paraline projections drawings have difficulty understanding these drawings. The distortions caused by the rigor of drawing all parallel lines does not match up with the converging lines we interpret on our retina. Paraline projections are very useful to the designer and to the constructor. The ability to make direct interpretations of measurements on a scaled drawing allows the designer to communicate the design intent to the constructor with great fidelity.

Exercise 4: Hand Drafting an Orthographic Multi-View Projection of Complex Chair

Introduction

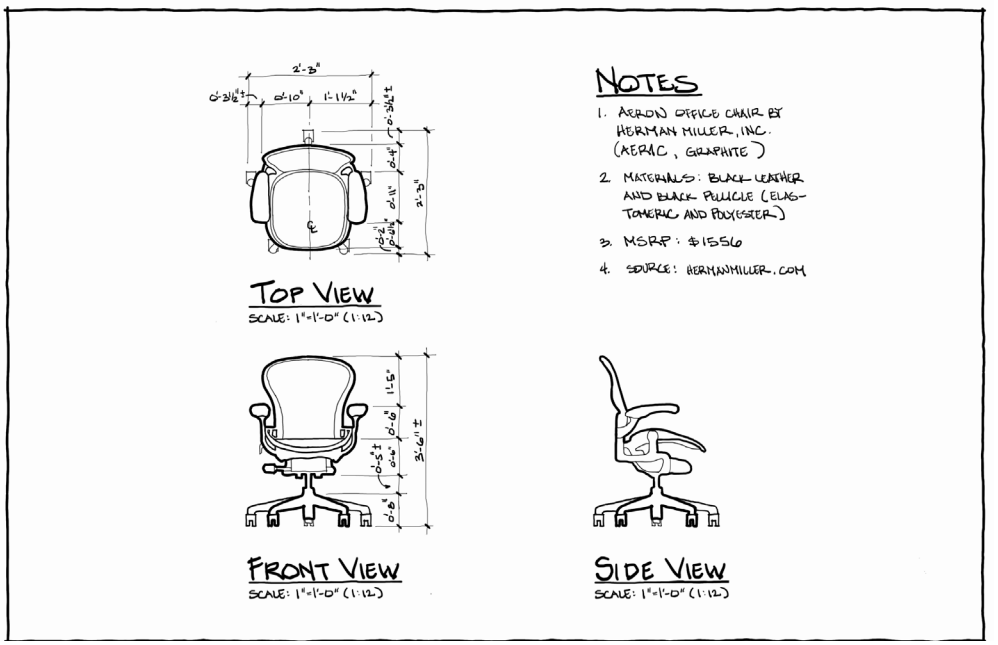

FIGURE 3.2 Exercise Four: Hand Drafting an Orthographic Multi-view Projection of a Complex Chair

In Sketch B. Field Sketch of a Complex Chair, you selected a chair to document in several field sketches that included a plan, front elevation, and side elevation. From the recorded dimensions in your sketchbook, develop the final three technical views. Draw a plan, front elevation, and side elevation of the chair at 1" = 1'-0" (1:12) on a 12" × 18" sheet. Compose the three views so that they have a clear relationship to each other on the page. Focus on quality of linework and composition of the page. Use line weight to communicate a hierarchy of outline, edge, and detail of the object. Do not shade or render.

Learning

This assignment module contributes to the following design learning outcomes, which finish the sentence "As a successful student in this course, I am now able …"

- … to analyze the built environment and apply measured drawing skills that include plans and elevations, illustrating line quality, drawing notation, and dimensioning.

Scenario

Since most technical drawings that designers produce for construction are orthographic, then a good skill to develop is translation through drawing of three-dimensional spatial conditions to two-dimensional projections, such as plans, sections, and elevations.

> In orthographic projection the picture plane intercepts parallel projection rays from the frontal plane of the object. The projection rays are always perpendicular to the picture plane … Multiview projection is most often used in product design, in which accurate measurement and exact image representation are required … In architecture … [a] top view is the same as a plan, and section and elevation are equivalent to a side view. (Wang, 1979, 8–9)

> The main advantage of this type of drawing, and the reason why it is used in building construction, is that building elements are seen in true size (to scale), shape, and orientation when viewed from a perpendicular aspect. (Ching & Adams, 1991, 2.2)

In this assignment, we'll work on a single object: a complex chair. In several upcoming assignments, we'll apply these skills to room plans, elevations, and sections in preparation for our first construction document drawing.

Materials

- Mechanical Pencils (0.25 mm), (0.5 mm) and (0.7 mm)
- Architect's scale
- 12" × 18" sheet
- 1:12 Grid Paper
- Field Sketches

Steps

1. Translate the 1:48 grid drawings from Sketch B. Field Sketch of a Chair to 1:12 size.
2. Draw a small 2" × 3" (50 mm × 75 mm) thumbnail of the compositional design of the page. Organize the top view and the front view in one column. Provide three equal gutter rows between the two views. Likewise, organize the front view and the side view in an aligned row with each other. Again, provide three equal gutter columns between the two views. Remember to leave room for dimensioning (see next step) and captions for each drawing.
3. In a light construction line, draw the bounding boxes for each of the three views as described above in scenario. Leave 3/8" (10 mm) space between the bounding box and first dimension line. Skip another 3/8" and draw a second dimension line. There will be two levels of dimensions for our drawing. Skip another 3/8" space to find the top guideline of the caption title. The title text is 3/16" (5 mm) in height. Below that the scale text is 3/32" (3 mm) height.
4. Proceed to develop the details of each view from the field notes and measurements. Since we are using a freehand drafting style with a grid as guidance, we must take special care to draw with our light construction lines to be as precise with our linework as possible.
5. The curved angles of the chair may present challenges. Take it slowly and deliberately. When you have an accurate outline of the proportions and substructures of the chair, proceed to render the linework.
6. Profiles are a thicker line (0.7 mm), important planar lines are medium thickness (0.5 mm), and textures are a finer thickness (0.25 mm). Dimension lines are 0.25 mm. Dimension hatch marks are thick (0.7 mm). All text can be made with the medium 0.5 mm thick pencil.
7. Photograph or scan the full sheet when completed. The final submission should be saved as a raster image with pixel dimensions 1296 px by 864 px.

Criteria

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Craft	Illustrator demonstrates exemplary attention to work product and excellence.	Illustrator demonstrates good attention and care toward work product.	Illustrator completes work, but the product seems rushed to completion.	Illustrator demonstrates attention toward work product, but work quality is poor.
Rendering	Illustrator uses line to hold the viewer's attention. Image is controlled and evokes both power and subtlety. Image is descriptive and/or symbolic and supports compositional goals.	Illustrator's linework demonstrates several professional attributes. Rendering style does not distract the viewer and generally supports compositional objectives.	Illustrator's use of line is somewhat effective. Rendering style is consistent and competent. There are some non-contributing attributes.	Illustrator attempts to use line descriptively. Rendering is inconsistent and lacks attention to craft.
Technical	Illustrator observes and analyzes object data and translates it to a meaningful graphic representation. Professional conventions are followed, inclusive of line weight, orthographic and dimensional information.	Illustrator observes and analyzes object data and translates it to a meaningful graphic representation. Most professional conventions are followed, and some information is missing.	Illustrator is challenged to observe and analyze object data correctly. Few professional conventions are followed, and some information is missing.	Illustrator attempts to observe and analyze object data and representation is inconsistent. Professional drawing conventions are not followed.
Professionalism	Student completes the work on time. Work demonstrates exemplary attention to learning objectives.	Student completes the work on time and demonstrates a good work ethic.	Student generally completes the work at a minimum level of expectation.	Student is missing parts of the work and makes a plan for completion of the remaining assignment.

Related Assignments

- Sketch B. Field Sketch of a Complex Chair
- Sketch C. Field Sketches of Floor Plans of Five Large Rooms
- Sketch D. Field Sketches of Two Exterior Elevations of Large Buildings
- Sketch E. Field Sketches of Two Interior Elevations of Large Rooms
- Sketch F. Field Sketches of Five Partial Interior Sections of Large Rooms
- Exercise 7. Interior Construction Drawing. Floor Plan and Interior Elevations

Exercise 5: Axonometric Projection Contour Model of a Small Guesthouse

Introduction

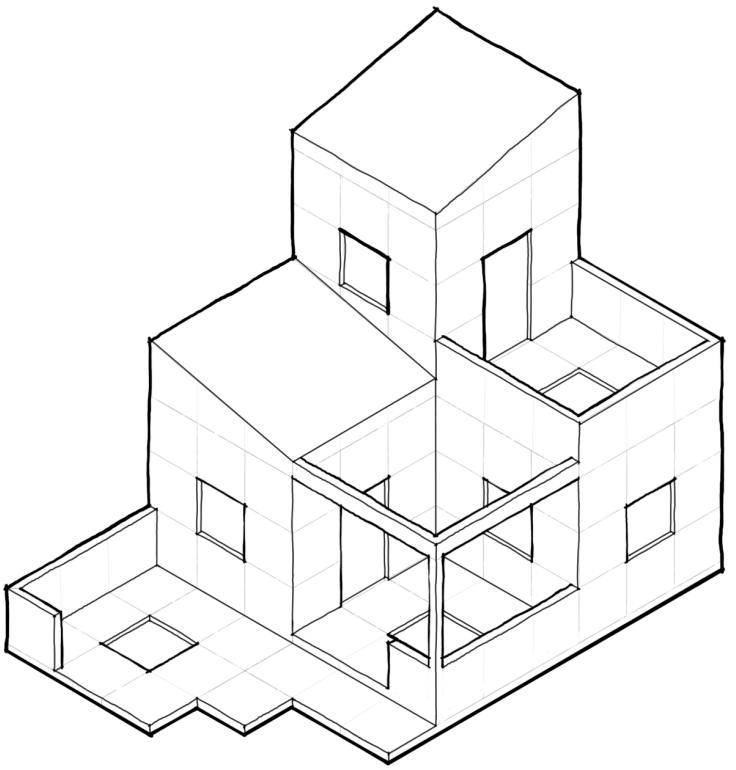

FIGURE 3.3 Exercise 5: Axonometric Projection Contour Model of a Small Guesthouse

An "axonometric" is an orthographic paraline drawing. "Axons" are used to describe three-dimensional characteristics of an object or spatial relationship. Parallel lines don't converge to a vanishing point as in a perspective drawing; rather, each line is drawn parallel. These drawings are useful during the early visualization process of design and are easily constructed with our studio drafting kit and a provided isometric grid. Lines that are parallel in space are drawn parallel in the illustration. You can measure dimensions for all axial lines—those parallel to any of the three principal axes. In order to draw non-axial lines, first locate endpoints using axial measurements, then connect the points together—remember, non-axial lines are not measurable.

Learning

This assignment module contributes to the following design learning outcomes, which finish the sentence "As a successful student in this course, I am now able …"

- … to analyze the built environment and apply measured drawing skills that include plans and elevations, illustrating line quality, drawing notation, and dimensioning.

Scenario

For many students who struggle to effectively represent their architectural design ideas in three-dimensional perspective drawings, it is tempting to instead build a physical model or learn an electronic modeling computer program. In this course we will learn all three of these skills. Each has its place. A perspective drawing is the most efficient and effective design tool due to the relative speed for drawing and also for its ready acceptance by our clients. It more closely resembles what we see with our eyes and in photographs. It also requires the greatest amount of skill and sustained practice from a student in order for the drawing to be an effective representation of a design idea. Perspective drawing is intimidating for the new architecture student.

Physical models are well loved by students and our future clients alike. Building a physical model rewards our patience and close scrutiny of the design, due to it being the slowest and most resource intensive of all the representation skills. Electronic modeling is both the current state-of-the-art and the most common activity of a designer in the studio. Students spend many late hours building beautiful models to study in multiple views and to render in light-ray tracing programs. These electronic models are satisfying, rewarding, but also slow to produce.

As a student and before a time of computer modeling, I was introduced early to an easy-to-produce and highly prized drawing in the academic studio: the axonometric projection. These three-dimensional representations did not exactly look like a perspective and yet were as easy to reproduce as straight-line plans, elevations, and sections that we were already doing. It was empowering!

> Paraline axonometrics … exhibit projectors that are perpendicular to the picture plane and parallel to each other … vertical front edge and nonconverging side planes. (Yee, 2012, 175)

> Other schematic drawing types include the "paraline" pictorial drawings: axonometric (isometric, dimetric, trimetric) and various versions of oblique. Of these, the isometric is probably the most popular design and presentation device—especially for small objects such as products and for schematized views of larger projects. (Oles, 1979, 15)

As mentioned above, axonometric drawings are highly regarded in an academic setting such as the architectural studio. Relationships between architectural elements can be measured directly, unlike a perspective drawing due to convergence and distortion. In particular, the isometric exhibits a 1:1:1 measured relationship between the three axes (x, y, and z).

Another valued attribute of axonometrics is the schematic and three-dimensional diagram quality. These types of drawings are about big ideas, and axonometrics can variously clarify problematic formal and organizational issues and amplify the essential qualities of your projects. As we will see in a later exercise, these drawings can be made as exploded axonometrics and further describe the schematic qualities of our designs. These are truly working drawings.

The 1:96 Isometric Grid Paper provided as a guide in this exercise will allow you to draw directly in an iterative way and follow the forms around until you have an accurate representation of your project. Like a puzzle, it is a relaxing journey with a very satisfying finish. Take your time, check yourself with an architect's scale often, and work the problem until you have a correct axonometric projection. Once you are satisfied, place the image underneath and centered in the left half of the page and render the linework with line weight.

Materials

- Mechanical Pencils (0.25 mm), (0.5 mm) and (0.7 mm)
- Architect's scale
- 12" × 18" sheet
- 1:96 Isometric Grid Paper
- Design Sketch

Steps

1. Begin by creating a 1-inch border around your drawing sheet. Divide the sheet into two halves. Begin drawing 4.1 in the left half. Construct the view from the provided sketch and using the isometric grid you downloaded for this assignment.
2. With the provided measurements draw the complex form. Use a hierarchy of line weights to distinguish spatial, planar and surface lines. Keep the drawing space empty in the right half. This area will be used in the next exercise.
3. All lines that are axial (x, y, or z) may be directly measured either by counting grid squares or by using your architect's scale. Non-axial lines shall be inferred from endpoint relationships with other axial elements. The two roofs are good examples of this principle, because each is made up of constructed non-axial lines.
4. Once the sketch is completed on the grid paper, you can slide the sketch underneath your final tracing paper. This is the rendering stage when you concentrate on line weight: spatial lines are thick (0.7 mm) planar lines are medium (0.5 mm) and flush texture lines are thin (0.25 mm).
5. Photograph or scan the full sheet when completed. The final submission should be saved as a raster image with pixel dimensions 1296 px by 864 px.

Criteria

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Craft	Illustrator demonstrates exemplary attention to work product and excellence.	Illustrator demonstrates good attention and care toward work product.	Illustrator completes work, but the product seems rushed to completion.	Illustrator demonstrates attention toward work product, but work quality is poor.
Rendering	Illustrator uses line to hold the viewer's attention. Image is controlled and evokes both power and subtlety. Image is descriptive and/or symbolic and supports compositional goals.	Illustrator's linework demonstrates several professional attributes. Rendering style does not distract the viewer and generally supports compositional objectives.	Illustrator's use of line is somewhat effective. Rendering style is consistent and competent. There are some non-contributing attributes.	Illustrator attempts to use line descriptively. Rendering is inconsistent and lacks attention to craft.
Technical	Illustrator observes and analyzes object data and translates it to a meaningful graphic representation. Professional conventions are followed, inclusive of line weight, orthographic and dimensional information.	Illustrator observes and analyzes object data and translates it to a meaningful graphic representation. Most professional conventions are followed, and some information is missing.	Illustrator is challenged to observe and analyze object data correctly. Few professional conventions are followed, and some information is missing.	Illustrator attempts to observe and analyze object data and representation is inconsistent. Professional drawing conventions are not followed.
Professionalism	Student completes the work on time. Work demonstrates exemplary attention to learning objectives.	Student completes the work on time and demonstrates a good work ethic.	Student generally completes the work at a minimum level of expectation.	Student is missing parts of the work and makes a plan for completion of the remaining assignment.

Related Assignments

- Sketch B. Field Sketch of a Complex Chair
- Sketch C. Field Sketches of Floor Plans of Five Large Rooms
- Sketch D. Field Sketches of Two Exterior Elevations of Large Buildings
- Sketch E. Field Sketches of Two Interior Elevations of Large Rooms
- Sketch F. Field Sketches of Five Partial Interior Sections of Large Rooms
- Exercise 7. Interior Construction Drawing. Floor Plan and Interior Elevations

References

Ching, F., & Adams, C. (1991). *Building construction illustrated: Second edition*. Van Nostrand Reinhold.

Ching, F., & Juroszek, S. (1998). *Design drawing*. John Wiley & Sons, Inc.

Oles, P. S. (1979). *Architectural illustration. The value delineation process*. Van Nostrand Reinhold.

Wang, T. (1979). *Plan and section drawing*. Van Nostrand Reinhold.

Yee, R. (2012). *Architectural drawing. A visual compendium of types and methods* (4th ed.). John Wiley & Sons, Inc.

Jeu de Formes Assemblées dans la Lumière (Play of Forms in Light)

Monochromatic Tone Value Delineation

Grisaille is a painting technique that uses only one color, usually gray, in a range of shades or values. It often serves as an underpainting stage when using opaque paints. The most common way to describe paint is by color. How do we reconcile these two seemingly contradictory descriptions? Is it value or color? Yes!

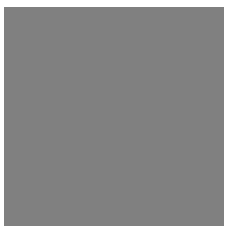

FIGURE 4.1 Medium Gray Reference Box

Figure 4.1 was drawn for illustration purposes here using a scalable vector program called Inkscape. Let's imagine a drawing of a 1-inch square (25 mm). It has no outline color, and the fill is selected as 50% gray. Let's dig a little deeper into our simple square. Since Inkscape is a vector drawing program, the code for the file is text readable. It shows the following attribute: `fill:#808080;stroke:none;stroke-width:0.`

For reference, fill is the color inside the square, stroke is the line bounding the square, and stroke-width is the thickness of that line. What is #808080? It turns out that this is a very specific color readable on web pages. It is known as a *color hex value* and does not have much value for our understanding. Let's dig a little deeper and translate this description into terms more familiar to us. What are other ways of describing color?

In kindergarten, you no doubt learned of the primary colors—red, blue, and yellow. Later, perhaps in high school physics, you learned that the primary colors in light are red, blue, and green. In kindergarten we mixed tempera paints of blue and red together to get purple—two primary colors make a secondary color. Theoretically, if we mix the three primary colors in equal measure, we should get a neutral gray like the square above in the figure. In real life it is much closer to brown. Incidentally, when mixing red light together with blue light, you will get a very different color—magenta. Magenta is not purple!

Since we are working in both the world of physical pigments and digital light, we are going to need a more complex definition of color. This will eventually lead us back to the idea of our 50% gray square in the figure. Hex color #808080 can also be defined in at least four different ways: RGB, HSL, HSV, and CYMK. Here is a table of these values for 50% gray.

RGB	128.0	128.0	128.0	
HSL	0.0	0.0	0.5	
HSV	0.0	0.0	50.0	
CMYK	0.0	0.0	0.0	0.5

RGB stands for red, green, and blue. These are known as channels. Each channel has a range from 0 to 255. By inference, we can say that light in the amounts of half the range 128 of three channels when mixed is 50% gray. If a web page presented the square in the figure above on a computer monitor, we could infer that it would consist of an area of 72 ppi or pixels per inch. A pixel with a value of 128 would be halfway between no light and all light. Could we use the metaphor of a rheostat or dimmer on a light switch? A rheostat controls the amount of current by varying the resistance. The more current that passes, the brighter the light. Leaving the metaphor behind, we can say that while a computer bit has only two states, 0 or 1 (off or on), our pixel above has 256 discrete states. This is a pretty good abstraction of continuous color shifts. Indeed, you may have seen that your computer monitor is capable of 16 million colors! Let's do the math: the cube of 256 is 16.78 million.

HSL stands for hue, saturation, and lightness. HSV represents hue, saturation, and value. CMYK represent the printing primary colors of cyan, magenta, yellow, and black. Since most of our work will be done digitally, we will focus on the RGB system. The important takeaway from this deep dive is that mixing colors differs between pigments and light. Another idea that arises from this discussion is the importance of value. We can say that value is a product of mixing colors together. With the computer, this means relative gray values in each of three channels. For a confirmation of this, check out the three channels of the color image from a colorful rendering in figure 4.2. The red channel is a monochromatic image. The blue channel is similar but highlights different parts of the image. The green channel is again slightly different.

FIGURE 4.2 Three Monochromatic Channels Make RGB Color Image

Monochromatic values are a fundamental way of discerning pattern differences. Perhaps second only to the silhouette or outline of an object, values help us understand how real-world objects reflect light. Values yield so much information to the viewer. Since it is easy to map values that we perceive onto the flat surface of paper or a viewing screen, the illustrator can use a value scale to aid in this coding system. Whereas a computer uses 256 scale values across several channels, it is often adequate for us to think in only seven values from black to white. This approximation can be mapped in at least two different systems, a linear scale and what we'll call here a Lambert scale. You are recommended to make both scales as rendering practice ahead of completing Exercise 6. Perspective Projection and Tone Value Render of a Small Guesthouse.

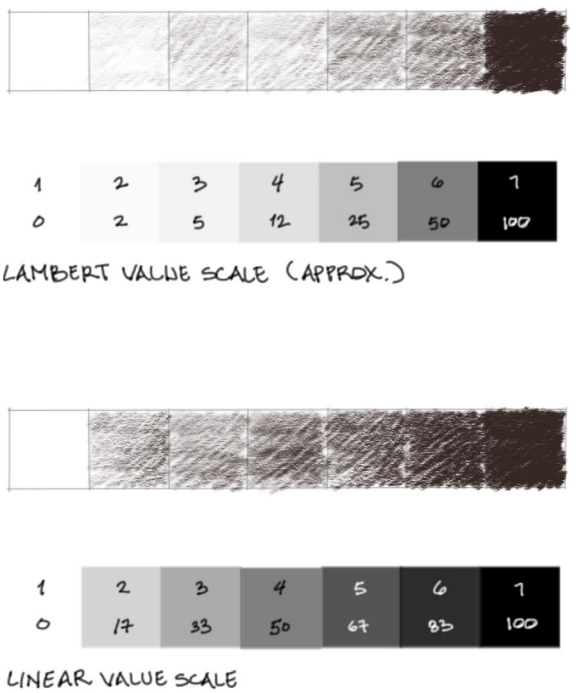

FIGURE 4.3 Two Grayscale Value Reference Images

Photographic Arts as Rendering Paradigm

The development of photography was historically perceived by some as a threat to painting and even to fine art itself. Today, artists paint and draw now more than ever. Photography has instead become a fine art itself. Just as electronic modeling and computer rendering is seen by some as supplanting our need to learn how to draw by hand, architectural illustration is similar to the arc of photography. It is argued here that photography has improved our capacity to see and record. It is prudent for the architectural student to develop skills in all aspects of contemporary practice. That practice can best be described as a hybrid of several systems.

A paradigm can also be thought of as a model and system. The components of any system are at least some discrete phenomena we'll call objects and the interrelationships between these objects. For now, let's keep it simple. The objects of a rendering are the represented scene, transformations from three-dimensional space to two-dimensional representations, relationships of major and minor representations of objects as shapes on the page, and relationships of light reflecting on the objects and material colors and textures. What is photography to the architect and illustrator? What does a photographic rendering paradigm look like? The answer to these questions will be shown as a good rule of thumb or heuristic for our contemporary practices in drawing that can translate across analog and digital domains.

We are transported back several decades. An architect and photographer using a single lens reflex (SLR) camera in 1988 visits a project site on a street corner of a small town. A three-story historical bank will be renovated into restaurant. In addition to taking photographs to document the existing conditions, the architect carries a sketchbook, felt-tip pens, and a tape measure. In the camera bag are three *prime* lenses: a 28 mm f/1.8, a 50 mm f/1.4, and a 105 mm f/2.8. Each roll of film is ISO 64 Kodachrome color positive (slide) 35 mm film with 36 slides to be developed by a lab in about one week.

The 28 mm lens is effective when taking photographs across the street. It captures the entire building, although a small barrel distortion slightly curves the edges of the frame and makes the parallel vertical lines converge to a vanishing point in the sky. This can either be a useful dynamic view to consider for a rendering later, or conversely it can be distracting. The illustrator won't know which until the design idea is considered. The overcast sky makes the light levels a slight challenge, but this lens is *bright*. Stopping down to f/4 in these conditions is no problem. Later, when taking photographs inside, the architect will likely need to use the f/1.8 aperture, and this will introduce a very shallow depth of field. Again, this *limitation* can be an attribute or a detraction, depending on how the effect is used creatively.

The 50 mm lens most closely resembles the natural field of view that we see when walking around. This will be great for taking exterior shots as *eye-level* perspective vignettes. These vignettes are so effective at giving the viewer an experiential quality, so important for making the project come alive. Again, the even brighter f/1.4 lens will be helpful for the interior vignettes. All other things being equal, the wider the angle of the lens, the more light comes through it and is mirrored onto the film plane. The 28 mm allows more light than the 50 mm lens, and the architect is glad for the extra two-third stops available on this 50 mm lens. It could mean the difference between getting a low light shot at 1/30s, which is too hard to hold steady, and 1/60s. Since the architect forgot the tripod today and must hold the camera, that brighter 50 mm will come in handy!

The 105 mm will allow the architect to take detailed shots of the historical cornice. It will help to catalogue the areas where repairs will be required. No need for a ladder on this trip—these shots can be taken from the street. It may be useful for the presentation board to convert some of these images into renderings that demonstrate why the client should keep the existing cornice for the new design. By the end of the site visit, the architect has exposed

four rolls of film to be dropped off for developing and picked up later that week, hopefully before the weekend so that the renderings can be prepared before the client meeting at the beginning of the next week.

Returning to the present, you might ask why go into so much detail about the history of the 1988 architect and a film camera? The digital camera mostly has the same physical limitations that are a function of the glass in the lenses. Further, while these lenses have been miniaturized to be placed in your phone, the principles remain the same. And, it turns out, that electronic modeling environments such as SketchUp, Blender, and REVIT use the same terminology borrowed from photography in setting up the rendered perspective views. While Kodachrome is almost impossible to find, 35 mm negative film stock and those who can develop it still exist. Used analog cameras are still available on used markets, and lenses are adaptable for both analog and digital cameras. Does this seem like a good investment or hobby? You could do worse! It just may help your *eye* for making your renderings.

Color Models

In the previous section, we discussed at length monochromatic rendering domains. As you may infer from above, any discussion of grayscale leads to a discussion of color models too. The physics of four color models were explored briefly for background. In this section, let's apply this background to architectural illustration.

Tint, Tone, and Shade

When you add white to a pure color, the result is a **tint** of the original color. It can appear lighter in tone value. Try not to confuse this in the digital environment with *opacity*. The confusion arises because in a multilayered image with an underlayer of white, this can have a similar effect to adding white with pigments. Yes, it is possible to achieve the same effect this way. It may be better to be more deliberate in your *color design* by using opacity to blend layers and by adding white color to some other color to achieve an opaque tint.

Tone in the context of architectural illustration is the relative lightness or darkness of the pure color. The printing for this book is monochromatic, and this can make any discussion of color a challenge. When discussing tone, however, Figure 4.2 is ideal for showing the effect. Three pure colors are preproduced in 1-inch (25 mm) boxes and placed side by side. Red when desaturated to monochrome appears as a little less than 50% gray, or we might say *medium gray* tone. Green when desaturated is a little more than 10% gray, a *light gray* tone. Blue when desaturated is about 70% gray, a *medium-dark gray* tone. Each color has a *natural* or inherent tone in this context. Since we saw above how important tone value is to the underlying reading of any illustration, by implication we can say that color affects the tone value mapping.

Shade is the inverse to tint, and black is added to a pure color. Just as with the discussion above about tint, it is possible to achieve a similar effect in a digital multilayer environment by changing what is called the layer blending mode. As you will learn, in *normal* blending

mode, an opaque layer will completely cover the layer below. If you change this to *multiply* mode as an example, it will at once make the layer seem transparent and darken some shapes in your scene. Multiply mode is one of our best tools in digital illustration. It is important to consider this darkening attribute.

As a final consideration, mixing two or more pure colors will affect the relative tone value mapping as well. The color changes and so too does the percentage of perceptible tone value. As an example, try this *formula* in a digital program called GIMP: mix the pure color red on a top layer set to *LCh* blending mode and a second layer below of pure blue color also with the LCh blending mode and at the bottom of the layer stack. The LCh blending mode stands for lightness, chroma, and hue. This demonstrates both the power of blending modes in a digital program and the not-so-straightforward way colors blend in digital images. Remember that a red tone was about 50% gray and a blue tone was 70% gray. Simple logic might imply that when mixing the two color tones, a grayscale value somewhere between 50% and 70% might result. When red is on top, this dark red color has a grayscale value of about 65%. Now swap the order of the layers and place the blue layer on top. This new medium violet color has a grayscale value of around 50%! How did that happen? Layer order matters. Blending mode matters. All parameters are interactive and not as predictable as we might hope.

Remember that tone value is the most important visual cue after strong shapes and the silhouette. This implies that when working digitally, it may be a good idea to periodically create a test layer that combines your layer structure onto one layer that you can desaturate. If it still reads effectively in monochrome, then you are on track.

Hue, Saturation, and Lightness

Let's seek just a little more precision in our language. Tone in different contexts can mean both a pure color and a color with a gray added to it. This ambiguity can be confusing sometimes. Perhaps a better word is *hue*. Hue is the underlying base color. Looking at the table for 50% gray above, notice that the value for hue is 0.0. Gray has no hue. On the other hand, pure red has a value for hue of 0.0 also! In this context, hue is measured in degrees of a color wheel circle. Red is at 0 degrees. Pure green has a hue value of 120 degrees. Pure blue has a hue of 240 degrees. Remember from geometry class that in this context Red could have a value of 0 and 360 degrees because this circle is continuous. This implies that as we approach 360 degrees from below and clockwise or from above and counterclockwise, the hue is approaching the color red.

Saturation in this domain refers to the intensity of a color relative to pure gray (i.e., 50% gray) in some contexts and white in other contexts. Again, we can use GIMP as our color laboratory and test our understanding. Start with a pure red by dialing in the RGB sliders with the following values: Red 255, Green 0, and Blue 0. Select the tab for HSV and grab the "S" slider. It reads 100 and is pegged to the right side of the scale. While dragging the slider to the left, watch how the color changes and how the values of all the parameters change. What is the color when dragged all the way to the left at value 0? It is pure white!

While we are still in GIMP, let's check out what happens when we shift the *value* scale. Here you can intuit what is meant by *value*. It is what we think of as tone value for our rendering.

In the absence of saturation, we are working solely with value, no matter what our starting hue was. Continue to shift the sliders at will, and you will gain a greater understanding of the system and the interactions between the three parameters of hue, saturation, and value.

Geometric Transformation Two: Perspective Projection

In Chapter 3 we learned about geometric transformation one: **parallel projection**. In order to draw the upcoming Exercise 6. Perspective Projection and Tone Value Render of a Small Guesthouse, we will need to learn more about perspective projection. Two systems will be presented here—one is analog, the other is digital. You will learn later in this book that these two methods can be combined for the sake of efficiency. Before we do that, let's discuss the foundational principles that underly perspective projection.

It is unlikely that you will ever learn the mathematical formula that underpins perspective projection. For our purposes it is enough to know there are four inputs. The first input is the three-dimensional (3D) coordinate position of a point that is projected onto a flat planar surface. A second input is the 3D position of a camera. The third input is the orientation or viewing angle of the camera. Finally, there is the 3D location of the flat planar surface relative to the camera. Confused yet? We have learned before that a complex system can be drawn and diagrammed to provide clarity.

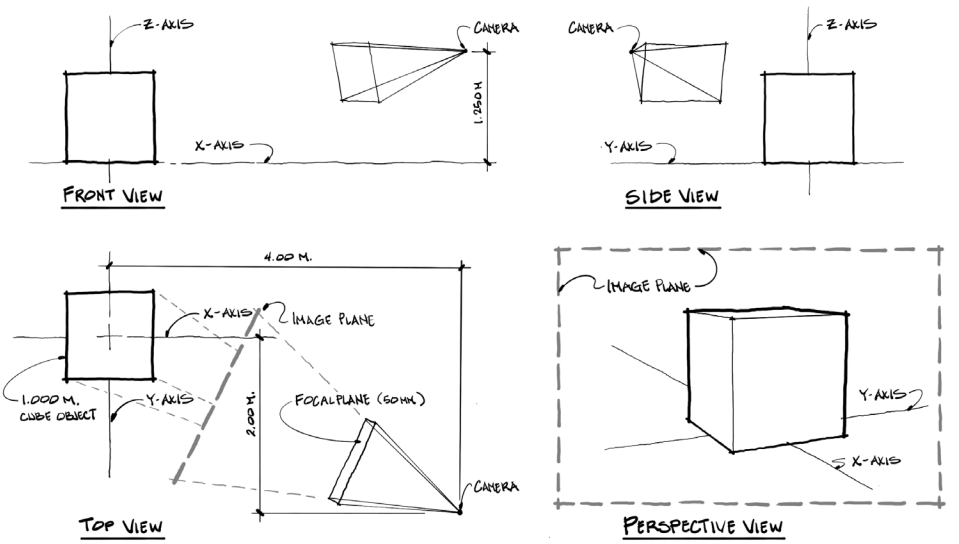

FIGURE 4.4 Orthographic Diagram of Setup for Four Perspective Inputs

Thumbnail Perspective Method

You may be surprised to discover that you have a lot of experience working this complex system out in a more direct method in your head. You probably are already pretty good at thinking and ultimately drawing in three-dimensional perspective. What follows is an adaptation of William Kirby Lockard's Direct Perspective Method.

> The method put forward here is intended as a lightning-fast freehand study method. Rigid drawings are used only to show the method clearly. If you get into ticking off and ruling lines you would be better actually to project the perspective. It will be more accurate and take only a little longer.
>
> Students often take this simple method as a great new all-purpose perspective method, and use it to attempt the construction of city-scapes, or complex interiors. This is like attempting to play Beethoven's Ninth on the harmonica. It is meant to be a simple, relatively accurate, study tool, not a precise technique. (Lockard, 1977, 16)

The Thumbnail Perspective Method involves at least three drawings. The method is self-correcting and depends on iterative redrawn perspective images. Each drawing is progressively larger and builds on a concept of mapping an architectural space onto an imaginary framework. This is the kind of book where it is okay to skip around. Please, refer to Volume 2, Chapter 1 and *Sketch K. Formal Precedent Study. Thumbnail Sketch to Contour Drawing*. It is important before proceeding to the electronic modeling method to read through Sketch K so that you understand the analog process.

The imaginary framework is simply stated: You are viewing another person or persons in front of you who is/are standing in front of and next to the leading edge (i.e., measuring line) of a cubic volume that measures 10 feet (3 meters) square on all three axes. You are viewing the cube at an oblique angle, such that one face is more predominant than the other. This is known as a two-point eye-level perspective.

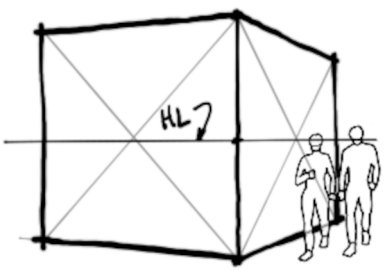

FIGURE 4.5 Thumbnail Perspective Method Setup: Drawing One of Three

On a small piece of paper or in the center of your sketchbook, draw a 2-inch (50 mm) square to mark the bounds of this small thumbnail sketch drawing. Somewhere near one-third from the bottom edge and near one-third of either the right or left side draw a silhouette of a small human figure, perhaps only ¼" (6 mm) high. Draw a horizontal line through the eyes of your scaled figures and across the page at zero degrees, and label this the horizon line. Assume this is five feet (1.5 m) above the ground. Double this height using your pencil or pen as a measuring device, and it yields the height of your cube at the measuring line. The predominant face of the cube will have a top line and bottom line with shallow angles that converge probably off the page. The subdominant face has top and bottom lines with slightly steeper angles that converge. In the dominant face, estimate that back edge line that *looks* like it would complete a square. Repeat this process for the subdominant face and understand that the subdominant back edge will be closer to the measuring line than the back edge of the predominant face due to different rates of convergence. To eliminate confusion, let's diagram this together in our sketchbooks.

Let's call this first drawing a thumbnail. When completed, the cubic volume will be lightly drawn. As a reference measuring tool, an estimate of the scene of interest should be drawn to a resolution that clearly identifies the overall silhouette and additionally the major inner shapes of the architectural subject. Do not be too concerned if the proportions of shapes do not match perfectly what you see. We will build confidence and correction in the second drawing of the trio. The last step of the first thumbnail drawing is to identify the preferred compositional framing, presuming that you do not settle on the beginning square. With a red pen or pencil, lightly divide this compositional frame rectangle into three horizontal rows and three vertical columns. Like a muralist, we will use this nine-rectangle grid framework to transfer our shapes to the larger doubled size of 4" × 4" (50 mm × 50 mm).

In the second drawing we will redraw with any needed corrections and seek to resolve the proportioning of the major shapes, add the interior minor shapes, and work on a tone-value shading of the scene in light. It is your choice to whether to repeat the cubic framework. I would continue to place human-scaled figures or silhouettes in this second drawing. The light and shadow study we do here will be intuitive. We will pick a direction of the light source, the sun, and identify planes that face toward the light (highlights), away from the light (shades), or have a shadow cast onto them. This is still a relatively small drawing and won't allow much detail or texture.

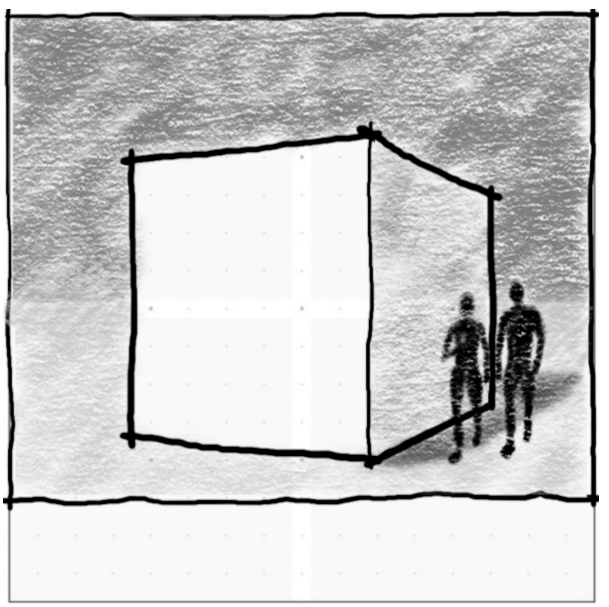

FIGURE 4.6 Thumbnail Perspective Method Setup: Drawing Two of Three

The third drawing is in principle very similar to the second. Once again, we will redraw at a larger size, this time at roughly a 6" × 6" (75 mm × 75 mm) bounding area. In the preceding drawings we settled on a composition, so this bounding area will match the larger of

the two rectangle dimensions. The final drawing should be considered a rendering. While it is desirable to have very light lines to lay out the silhouette, major and minor proportional shapes, our rendering will make these lines disappear as we solely render the tone-value shapes. Select either the linear or Lambert tone value scale that we discussed. Map no more than seven different tone values from black for cast shadows through middle grays for planes in varying orientations away from the light source and to a highlight of white. Concentrate on your best rendering technique that minimizes texture in favor of flat soft washes of colored pencil.

The preceding three steps are specific to the tone value rendering method. It is no doubt easy to see how this three-step process would work for all perspective drawings, including a contour line rendering. The only step that varies for this method is the third rendering step, which is dependent on your desired result. A color wash as the final rendering also can apply this direct perspective method.

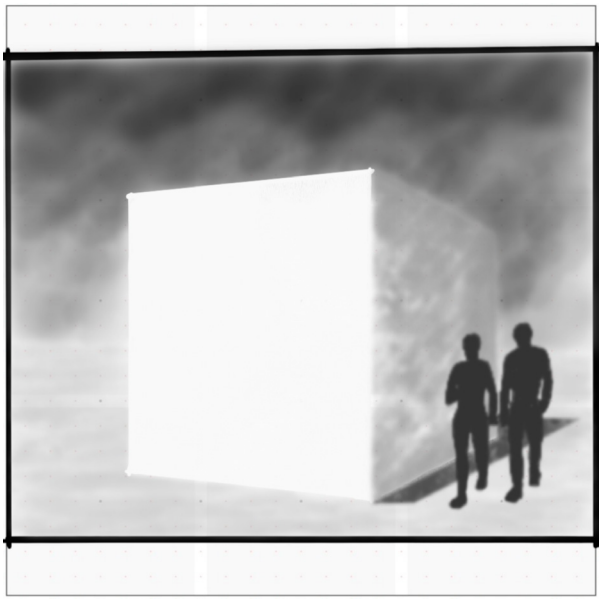

FIGURE 4.7 Thumbnail Perspective Method Setup: Drawing Three of Three

Electronic Modeling Method

One of the best tools for three-dimensional visualization is an electronic digital model. Some of these models can be created very intuitively and quickly. Others require painstaking and arduously long hours at the computer. The requirements for selecting one over the other are often a function of both the stage of the architectural design and client requirements for a presentation of the design. It is important for guarding your precious time that you do not fall in the trap of building a detailed computer model too soon. A much better use of your time on the computer is to build the very basics of a three-dimensional framework that allows you to

do some previsioning and manipulation of the model to generate your preferred view. After this very quick modeling session, it can be beneficial to print on paper the framework to a reasonable size and use an overlay technique of tracing paper refinements like the thumbnail perspective method. While it can be immensely enjoyable to create new virtual worlds like those in a Minecraft (2021) game, you are well advised to avoid the indulgence of modeling too much detail and instead progress quickly to the rendering and visioning stages of architectural design.

Working as "flat" as possible for as long as possible is among the best advice about electronic modeling. What does this mean? Often the designer proceeds from a two-dimensional multiview orthographic drawing, such as a plan, section, or elevation. Working flat is the process of drawing rectangles, lines, and shapes without a "z" dimension. This process is useful because most electronic modeling programs are *sticky* and ambiguous in the representation of depth. That means geometries are welded together at vertices. When you try to move a line segment to a new position, it can have many unintended stretching consequences. Additionally, when we view space from a non-orthographic *perspective*, our relationship to the depth that we see may be intuitively obvious to us, and the computer does not share our intuition. The software developers have embedded inferences about intersecting geometries that can sometimes be helpful. On the other hand, it can be exceptionally frustrating when the computer gets it *wrong*! Therefore, work for as long as possible while managing only two dimensions. When it is time to push and pull your geometries into the z-axis, it will be an exceptionally satisfying experience. But wait—there's another thing to do first.

Since geometries tend to be joined at vertices resulting in unintended stretching, each program you will encounter has some method of grouping elements together into systems. You are well advised to be profligate in using these groups. This is powerful modeling, and the pros make excellent use of this kind of *templating* of components. The following table is a guide to some common terminology for you to research and learn the basics of making groups or components:

Program Name	Element Name
AutoCad	Block
REVIT	Family
SketchUp	Group, Component
Blender	Group, Collection
Maya	Group

With the electronic modeling method it is much easier to create any view that you desire, and this can have unintended consequences. Extreme perspective distortion can be exciting, and when it is not a deliberate choice of the designer, it can also distract from your focus on the design. A reminder from an earlier discussion about photography: Our most frequent

view of an object is from a standing eye-level perspective, usually about five feet (1.5 meters) above the ground and with a 50 mm lens. This view will challenge you because it often does not allow you to include *everything* that you have modeled. Maintaining this view is a good discipline, and if you want to show more distortion, have a good reason for that view and be deliberate in your purpose (e.g., contrast, tension, dynamics, juxtaposition, etc.).

Additionally, use the computer as a tool. Model only the bare basics of what you need for the purpose. As an example, in the next assignment you will be asked to model a guesthouse electronically. Our main purpose here is to use the computer as a tool to define and *design* the sun and shade patterns. You only need the basic cubic volumes. No materials are needed. No textures are needed. This is often referred to as a clay model rendering, which owes its namesake to the physical modeling material clay. Two main advantages come from this decision to be minimalistic in your approach: It takes far less time for you to model, and it takes far fewer resources for the computer to render the desired image. Always remember that the goal is a tone value rendering. The software can make this task both harder and easier. The choice is yours!

Exercise 6: Perspective Projection and Tone Value Render of a Small Guesthouse

Introduction

A "perspective" is a non-orthographic three-dimensional drawing, and the view often resembles what we observe and can photograph. The perspective view we are going to draw uses an electronic model method, which can be contrasted to a mathematical analog method we will learn later. In a perspective, parallel lines converge to vanishing points. These drawings are useful throughout all phases of the visualization process of design and are easily constructed using varying methods.

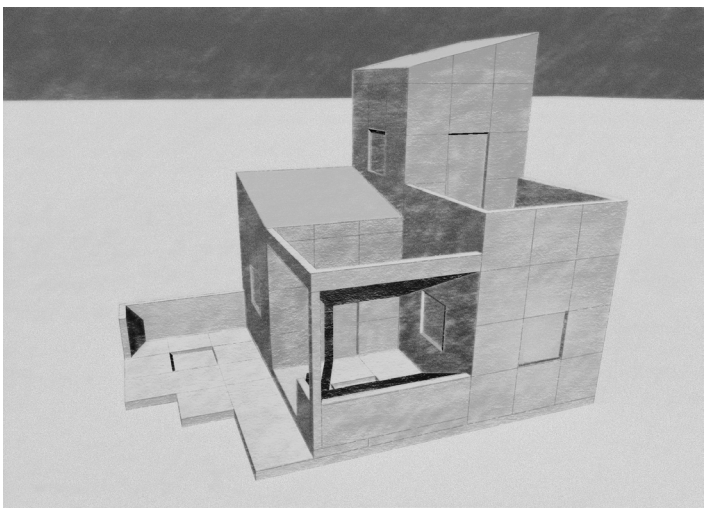

FIGURE 4.8 Exercise 6: Perspective Projection and Tone Value Render of a Small Guesthouse

Learning

This assignment module contributes to the following design learning outcomes, which finish the sentence "As a successful student in this course, I am now able …"

- … to analyze a field sketch of a built environment condition and synthesize that information by modeling the conditions in a three-dimensional visioning program.
- … to transform parameters within an electronic computer model and simulate the influence of highlight, shade, and shadow.
- … to visualize the built environment in a tone value rendering using dry media techniques.

As mentioned in Exercise 5 (Axonometric Projection Contour Model of a Small Guesthouse), electronic modeling is an attractive and fun drawing to make. It may take a significant amount of time to model every screw. Thankfully, we only need to model the major forms of our guesthouse.

> Modeling with exact dimensions … is the best method. … You need to determine the level of detail that should be included in your models. … Excessive detail is usually unnecessary, and it will slow you down. (Brightman, 2013, 332–33)

Tone-value rendering maps show highlights, shades, and shadows. Since tone value is an important visual cue that allows us to understand the representation of a three-dimensional object on a two-dimensional surface, it is valuable to describe the form of an object. The relationships between light and dark are well understood by the viewer because one encounters the interplay of light and dark shapes on objects due to the influence of a light source, such as the sun. This illusion works well unless the tone values are ambiguously mapped and show too little clear distinctions between the implied planes. Therefore, when translating from observed three-dimensional phenomena onto a two-dimensional surface, artists and illustrators can confidently convey the shared experience we have moving around in space and interacting with visual objects.

> The value key or tonality … is the first impression received and immediately engenders an emotional reaction irrespective of the subject matter or composition. It must be remembered that we react to light in a very primitive manner … the intensity of light reflected to the eye determines the primary emotional response. White, gray, or black surfaces reflect varying amounts of light, each creating a distinctly different mood in the observer. (Graves, 1941, 129)

Materials

- Colored pencil (i.e., black.)
- Trimble SketchUp
- 12" × 18" (305 mm × 457 mm) sheet

Steps

1. Begin by creating a simple model in SketchUp.
2. Construct the model from the sketch provided and position the final point of view looking at the same corner as the sketch.
3. Set up the shadow positions within the model to provide the most aesthetically pleasing interplay of sun–shade–shadow composition.
4. After completing the model, print to letter-sized paper at a size roughly equivalent to your other drawing.
5. Lay the 12" × 18" (305 mm × 457 mm) vellum sheet over the printed model and render with a black colored pencil, using a tone–value method (i.e., no linework allowed!).

Criteria

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Craft	Illustrator demonstrates exemplary attention to work product and excellence.	Illustrator demonstrates good attention and care toward work product.	Illustrator completes work, but the product seems rushed to completion.	Illustrator demonstrates attention toward work product, but work quality is poor.
Rendering	Illustrator uses tone value to represent the interplay of light on volumetric forms. Image is controlled and evokes both power and subtlety. Image is descriptive and/or symbolic and supports compositional goals.	Illustrator's tone value work demonstrates several professional attributes. Rendering style does not distract the viewer and generally supports compositional objectives.	Illustrator's use of tone value is somewhat effective. Rendering style is consistent and competent. There are some non-contributing attributes.	Illustrator attempts to use tone value descriptively. Rendering is inconsistent and lacks attention to craft.
Technical	Modeler observes and analyzes object data and translates it to a meaningful electronic model representation. Professional conventions are followed, inclusive of view selection, accurate translation of field notes and light source selection.	Modeler observes and analyzes object data and translates it to a meaningful electronic model. Most professional conventions are followed, and some information is missing.	Modeler is challenged to observe and analyze field sketch correctly in the electronic model. Few professional conventions are followed, and some information is missing.	Modeler attempts to observe and analyze field sketch and representation is inconsistent. Professional drawing conventions are not followed.

Professionalism	Student completes the work on time. Work demonstrates exemplary attention to learning objectives.	Student completes the work on time and demonstrates a good work ethic.	Student generally completes the work at a minimum level of expectation.	Student is missing parts of the work and makes a plan for completion of the remaining assignment.

Related Assignments

- Sketch D. Field Sketches of Two Exterior Elevations of Large Buildings
- Exercise 5. Axonometric Projection Contour Model of a Small Guesthouse
- Exercise 7. Interior Construction Drawing. Floor Plan and Interior Elevations

References

Brightman, M. (2013). *The SketchUp workflow for architecture*. John Wiley & Sons, Inc.

Graves, M. (1941). *The art of color and design* (1st ed.). McGraw-Hill Book Company, Inc.

Lockard, W. K. (1977). *Drawing as a means to architecture*. Pepper Publishing.

Minecraft Official Site. (2021). Minecraft.net. https://www.minecraft.net/en-us.

COPYRIGHTED MATERIAL — DO NOT DUPLICATE, DISTRIBUTE, OR POST

Construction Documentation

Field Sketches, Site Photography, and the Project File

Field sketches are drawn to document the existing conditions of a building site. During the same site visit, architecture and engineering professionals may take photographs. Along with the signed contract for professional services, these sketches and photographs often make up the beginning elements of the project file. Historically, the project file was often either a manilla folder with a two-hole punched metal clasp binder and/or a three-ring binder. In the professional office, this project file was usually maintained by the project architect, engineer, or manager. If you were a professional working on the job, you would walk to the manager's desk with your own notepad and questions to consult the project file. The file very rarely was taken from the manager's desk! With the development of the computer, the project file is more likely to be a directory folder in a shared network drive. The project architect still acts as the archivist.

> Facts are important only if they are appropriate. Facts are used to describe the existing conditions of the site, including the physical, legal, climatic, and aesthetic aspects. These facts about the site should be documented graphically to be really effective. (Pena & Parshall, 2012, 50)

Since the project file in whatever form is the most important living document, we can infer that the contents of the file have legal consequence in the case of disputes that may arise. Field sketches may look informal and sometimes messy, but you should not underestimate their importance.

> Keep all important project records. Written documentation will serve as proof of your firm's position in the event of any disputes. Written means printed, in the form of notes, letters, photographs, photocopies, faxes, printed e-mail, or printouts of computer files that are stamped with a date. (Moreno, 2001, 389)

The field sketch serves several needs for the project because the sketch documents the existing conditions, forms a basis for subsequent construction drawings, and is a record of

the dimensional and geometric properties that disappear once the actual construction begins. The same can be said about the photographic record. Dimensioned and annotated drawings in combination with the photographs represent a far better record than faulty memories or mental images. When you are practicing your field sketches, focus on both efficiency and making a comprehensive documentation of existing conditions. Your time will be limited on-site by the economic constraints of the project budget, yet the value of your efforts will be equally appreciated back in the office. As you begin to translate your notes, sketches, and photographs into working documents, each piece of observed data will allow you and your colleagues a sense of confidence in the complex decision you must make. Unless your field sketches are lost or are incomplete as a record, your understanding of the existing building and site conditions will follow from a strong foundation of professionalism. Architects, engineers, construction managers, and the clients these professions serve all depend on making quick sketches that include dimensions, annotations, and accurate graphic relationships. These sketches are supported with a photographic record and sometimes also an audio recording or video made directly while on-site capturing initial thoughts and impressions. In this way, we can say that good architecture begins with empirical research that is catalogued and integrated into the development of the design. Each project is unique. Architecture reflects this deliberate focus on the site and built context as fundamental drivers of design ideas.

Sketch C: Field Sketches of Floor Plans of Five Large Rooms

Introduction

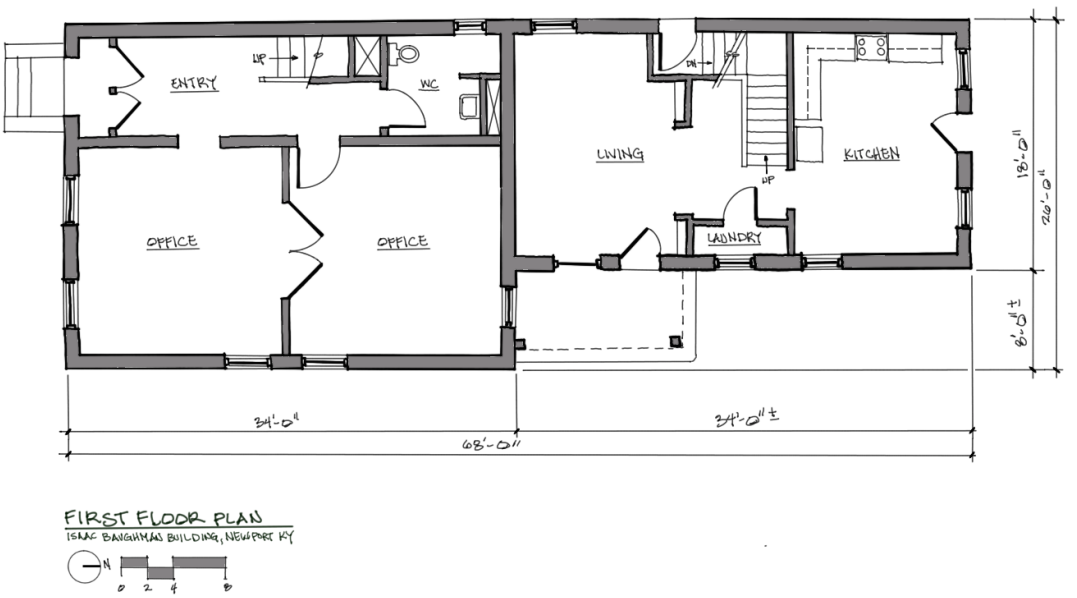

FIGURE 5.1 Field Sketches of Floor Plans of Five Large Rooms

Sketch the floor plan of five living spaces. Draw freehand, but make sure the plan is proportionally correct. Include walls, openings, doors, windows, and furniture. Include notes about the space, materials, measurements, or other observations as you see fit. Use one page per drawing. Each drawing should take approximately 10 minutes.

> The plan is a horizontal section and should be cut through the building at a height which goes through all wall openings, such as doors and windows. Show lines which occur above this section plane as dashed or dotted lines. (Kirby Lockard, 1977, 18)

Learning

This assignment module contributes to the following design learning outcomes, which finish the sentence "As a successful student in this course, I am now able …"

- … to analyze the built environment and apply measured drawing skills that include plans and elevations, illustrating line quality, drawing notation, and dimensioning.

Scenario

Going to the field and measuring existing conditions is one of the most common activities in a professional design office. The first step in most projects is to photograph, measure, and make drawings with notes. These field notes are a valuable resource back in the office when we begin to make technical drawings.

Materials

- Phone camera or digital camera
- Pencil
- Tape measure
- Sketchbook
- 1:96 Grid paper

Steps

1. Select a large complex room with doors and windows and furniture. A good source for your selection is a lecture hall, library reading room, high-rise lobby, etc. This offers the challenge of a midsize room that is not too large to be a burden and that is more of a challenge than a residence.
2. With a tape measure, identify the overall height, width, and openings with dimensions. Construct a floor plan freehand, and pay particular attention to the overall proportions of the room (e.g., 1:1, 1:2, 1:4, 2:3, 3:4, etc.). Drawing this image freehand and with the grid promotes sketching precision without the need for drafting tools.
3. Photograph your room from various views. These images will be useful to you after you have returned to the studio and wish to add notes and an estimate of furniture locations, etc.

4. Taking our analysis from the general to the specific, use the tape measure and take important inner dimensions and note important relationships. Include dimensional information about the inner elements and details.
5. Select four more rooms of similar description. Repeat this process for a total of five floor plan field sketches.

Tips

- Taking a large clipboard to the field is useful in providing a mobile hard surface for drawing.
- Photograph everything about the room. You will be glad to have the information when back in the studio.

Criteria

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Craft	Illustrator demonstrates exemplary attention to work product and excellence.	Illustrator demonstrates good attention and care toward work product.	Illustrator completes work, but the product seems rushed to completion.	Illustrator demonstrates attention toward work product, but work quality is poor.
Rendering	Illustrator uses line to hold the viewer's attention. Image is controlled and evokes both power and subtlety. Image is descriptive and/or symbolic and supports compositional goals.	Illustrator's linework demonstrates several professional attributes. Rendering style does not distract the viewer and generally supports compositional objectives.	Illustrator's use of line is somewhat effective. Rendering style is consistent and competent. There are some non-contributing attributes.	Illustrator attempts to use line descriptively. Rendering is inconsistent and lacks attention to craft.
Technical	Illustrator observes and analyzes object data and translates it to a meaningful graphic representation. Professional conventions are followed, inclusive of line weight, orthographic and dimensional information.	Illustrator observes and analyzes object data and translates it to a meaningful graphic representation. Most professional conventions are followed, and some information is missing.	Illustrator is challenged to observe and analyze object data correctly. Few professional conventions are followed, and some information is missing.	Illustrator attempts to observe and analyze object data and representation is inconsistent. Professional drawing conventions are not followed.

(*Continued*)

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Professionalism	Student completes the work on time. Work demonstrates exemplary attention to learning objectives.	Student completes the work on time and demonstrates a good work ethic.	Student generally completes the work at a minimum level of expectation.	Student is missing parts of the work and makes a plan for completion of the remaining assignment.

Related Assignments

- Exercise 4. Hand Drafting an Orthographic Multi-View Projection of Complex Chair
- Sketch D. Field Sketches of Two Exterior Elevations of Large Buildings
- Sketch E. Field Sketches of Two Interior Elevations of Large Rooms
- Sketch F. Field Sketches of Five Partial Interior Sections of Large Rooms
- Exercise 7. Interior Construction Drawing. Floor Plan and Interior Elevations

Sketch D: Field Sketches of Two Exterior Elevations of Large Buildings

Introduction

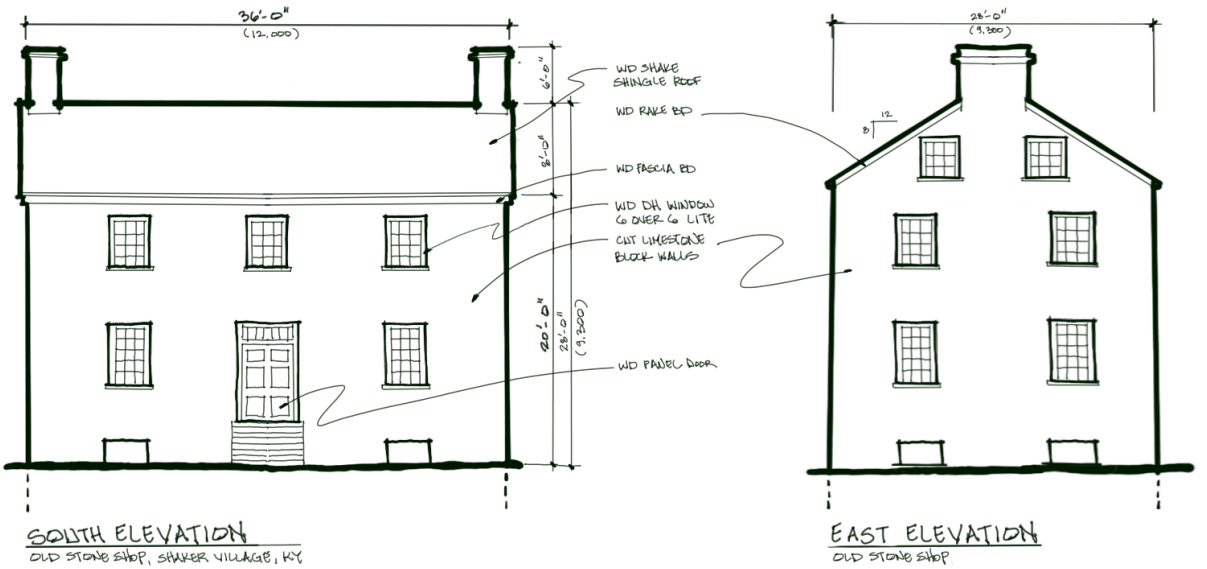

FIGURE 5.2 Field Sketches of Two Exterior Elevations of Large Buildings

Sketch two exterior building elevations of a medium to large building. Draw freehand, do not draft. Make sure the drawing is proportionally correct by comparing dimensions (height and width), but there's no need to measure the space or building. Use your best judgment. Include details of openings, windows, and doors as appropriate to the scale of the drawing. Check with your textbook for elevation drawing conventions. Add notes and observations to each drawing. Use one page per drawing. Each drawing should take approximately 10 minutes.

> A principal view of an object projected orthographically on a vertical picture plane … may be a front, side, or rear view. … In architectural graphics, we label elevation views in relation to the compass directions or to a specific feature of a site. (Ching & Juroszek, 1998, 125)

Learning

This assignment module contributes to the following design learning outcomes, which finish the sentence "As a successful student in this course, I am now able …"

- … to analyze the built environment and apply measured drawing skills that include plans and elevations, illustrating line quality, drawing notation, and dimensioning.

Scenario

This assignment is a continuation of Sketch C. Field Sketches of Floor Plans of Five Large Rooms. Please review the scenario section for that assignment for more information.

Materials

- Phone camera or digital camera
- Pencil
- Tape measure
- Sketchbook
- 1:96 Grid paper

Steps

1. Select two exterior elevations of a large and complex building. Again, a good source for your selection is a lecture hall, library reading room, high-rise lobby, etc. This offers the challenge of a midsize room that is not too large to be a burden and that is more of a challenge than a residence.
2. With a tape measure, identify the overall height, width, and openings with dimensions. Construct exterior elevations freehand, and pay particular attention to the overall proportions of the room (e.g., 1:1, 1:2, 1:4, 2:3, 3:4, etc.). Drawing this image freehand and with the grid promotes sketching precision without the need for drafting tools.

3. Photograph your room and building from various views. These images will be useful to you after you have returned to the studio and wish to add notes and an estimate of furniture locations, etc.
4. Taking our analysis from the general to the specific, use the tape measure and take important inner dimensions and note important relationships. Include dimensional information about the inner elements and details.

Tips

- Taking a large clipboard to the field is useful in providing a mobile hard surface for drawing.
- Photograph everything about the room and building. You will be glad to have the information when back in the studio.

Criteria

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Craft	Illustrator demonstrates exemplary attention to work product and excellence.	Illustrator demonstrates good attention and care toward work product.	Illustrator completes work, but the product seems rushed to completion.	Illustrator demonstrates attention toward work product, but work quality is poor.
Rendering	Illustrator uses line to hold the viewer's attention. Image is controlled and evokes both power and subtlety. Image is descriptive and/or symbolic and supports compositional goals.	Illustrator's linework demonstrates several professional attributes. Rendering style does not distract the viewer and generally supports compositional objectives.	Illustrator's use of line is somewhat effective. Rendering style is consistent and competent. There are some non-contributing attributes.	Illustrator attempts to use line descriptively. Rendering is inconsistent and lacks attention to craft.
Technical	Illustrator observes and analyzes object data and translates it to a meaningful graphic representation. Professional conventions are followed, inclusive of line weight, orthographic and dimensional information.	Illustrator observes and analyzes object data and translates it to a meaningful graphic representation. Most professional conventions are followed, and some information is missing.	Illustrator is challenged to observe and analyze object data correctly. Few professional conventions are followed, and some information is missing.	Illustrator attempts to observe and analyze object data and representation is inconsistent. Professional drawing conventions are not followed.
Professionalism	Student completes the work on time. Work demonstrates exemplary attention to learning objectives.	Student completes the work on time and demonstrates a good work ethic.	Student generally completes the work at a minimum level of expectation.	Student is missing parts of the work and makes a plan for completion of the remaining assignment.

Related Assignments

- Exercise 4. Hand Drafting an Orthographic Multi-View Projection of Complex Chair
- Sketch C. Field Sketches of Floor Plans of Five Large Rooms
- Sketch E. Field Sketches of Two Interior Elevations of Large Rooms
- Sketch F. Field Sketches of Five Partial Interior Sections of Large Rooms
- Exercise 7. Interior Construction Drawing. Floor Plan and Interior Elevations

Sketch E: Field Sketches of Two Interior Elevations of Large Rooms

Introduction

FIGURE 5.3 Field Sketches of Two Interior Elevations of Large Rooms

Sketch two interior room elevations of a medium to large building. Draw freehand, do not draft. Make sure the drawing is proportionally correct by comparing dimensions (height and width), but there's no need to measure the space or building. Use your best judgment. Include details of openings, windows, and doors as appropriate to the scale of the drawing. Check with your textbook for elevation drawing conventions. Add notes and observations to each drawing. Use one page per drawing. Each drawing should take approximately 10 minutes.

Learning

This assignment module contributes to the following design learning outcomes, which finish the sentence "As a successful student in this course, I am now able …"

- … to analyze the built environment and apply measured drawing skills that include plans and elevations, illustrating line quality, drawing notation, and dimensioning.

Scenario

This assignment is a continuation of Sketches C. Field Sketches of Floor Plans of Five Large Rooms and D. Field Sketches of Two Exterior Elevations of Large Buildings. Please review the scenario sections for those assignments for more information.

Materials

- Phone camera or digital camera
- Pencil
- Tape measure
- Sketchbook
- 1:96 Grid paper

Steps

1. Select two interior walls in a large and complex room with doors and windows and furniture. A good source for your selection is a lecture hall, library reading room, high-rise lobby, etc. This offers the challenge of a midsize room that is not too large to be a burden and that is more of a challenge than a residence.
2. With a tape measure, identify the overall height, width, and openings with dimensions. Construct interior and exterior elevations freehand, and pay particular attention to the overall proportions of the room (e.g., 1:1, 1:2, 1:4, 2:3, 3:4, etc.). Drawing this image freehand and with the grid promotes sketching precision without the need for drafting tools.
3. Photograph your room and building from various views. These images will be useful to you after you have returned to the studio and wish to add notes and an estimate of furniture locations, etc.
4. Taking our analysis from the general to the specific, use the tape measure and take important inner dimensions and note important relationships. Include dimensional information about the inner elements and details.

Tips

- Taking a large clipboard to the field is useful in providing a mobile hard surface for drawing.
- Photograph everything about the room and building. You will be glad to have the information when back in the studio.

Criteria

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Craft	Illustrator demonstrates exemplary attention to work product and excellence.	Illustrator demonstrates good attention and care toward work product.	Illustrator completes work, but the product seems rushed to completion.	Illustrator demonstrates attention toward work product, but work quality is poor.
Rendering	Illustrator uses line to hold the viewer's attention. Image is controlled and evokes both power and subtlety. Image is descriptive and/or symbolic and supports compositional goals.	Illustrator's linework demonstrates several professional attributes. Rendering style does not distract the viewer and generally supports compositional objectives.	Illustrator's use of line is somewhat effective. Rendering style is consistent and competent. There are some non-contributing attributes.	Illustrator attempts to use line descriptively. Rendering is inconsistent and lacks attention to craft.
Technical	Illustrator observes and analyzes object data and translates it to a meaningful graphic representation. Professional conventions are followed, inclusive of line weight, orthographic and dimensional information.	Illustrator observes and analyzes object data and translates it to a meaningful graphic representation. Most professional conventions are followed, and some information is missing.	Illustrator is challenged to observe and analyze object data correctly. Few professional conventions are followed, and some information is missing.	Illustrator attempts to observe and analyze object data and representation is inconsistent. Professional drawing conventions are not followed.
Professionalism	Student completes the work on time. Work demonstrates exemplary attention to learning objectives.	Student completes the work on time and demonstrates a good work ethic.	Student generally completes the work at a minimum level of expectation.	Student is missing parts of the work and makes a plan for completion of the remaining assignment.

Related Assignments

- Exercise 4. Hand Drafting an Orthographic Multi-View Projection of Complex Chair
- Sketch C. Field Sketches of Floor Plans of Five Large Rooms
- Sketch D. Field Sketches of Two Exterior Elevations of Large Buildings
- Sketch F. Field Sketches of Five Partial Interior Sections of Large Rooms
- Exercise 7. Interior Construction Drawing. Floor Plan and Interior Elevations

Sketch F: Field Sketches of Five Partial Interior Sections of Large Rooms

Introduction

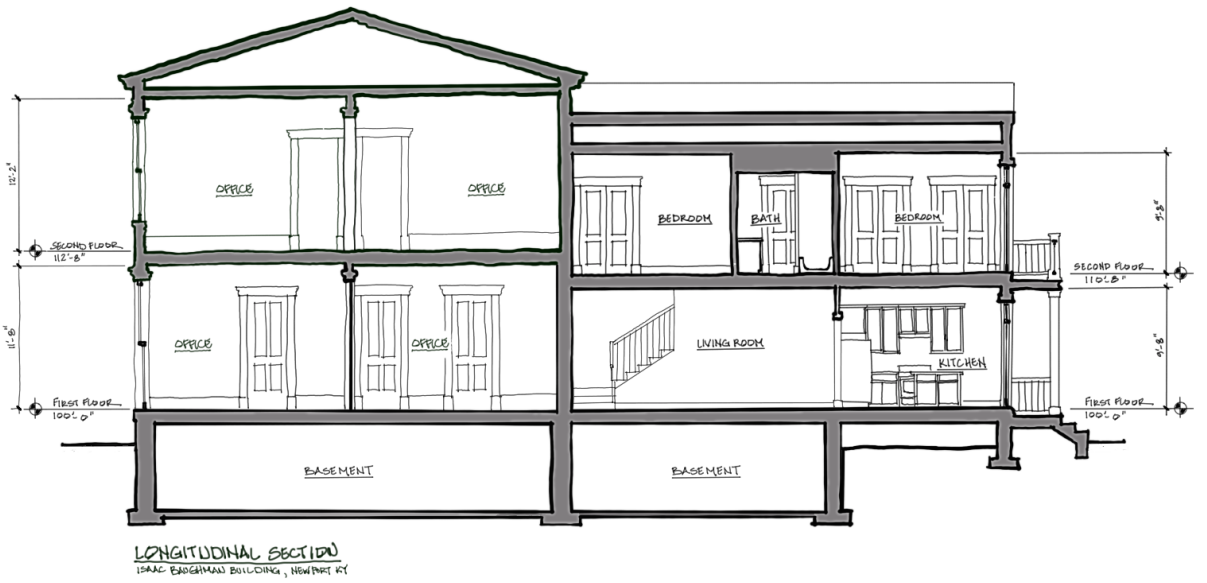

FIGURE 5.4 Field Sketches of Five Partial Interior Sections of Large Rooms

Sketch five sections of buildings and/or spaces of a large building. Sketch loosely using your choice of media. Focus on proportion and accuracy, using your best judgment to estimate size and scale of spaces. Include details of openings, windows, and doors as appropriate to the scale of the drawing. Check with your textbook for elevation drawing conventions. Add notes and observations to each drawing. In a future project Exercise 8. Rendered Section. Hybrid Drawing, we will develop one of these sections into a larger rendered sectional drawing. Use one page per drawing. Each drawing should take approximately 10 minutes.

Learning

This assignment module contributes to the following design learning outcomes, which finish the sentence "As a successful student in this course, I am now able …"

- … to analyze the built environment and apply measured drawing skills that include plans and elevations, illustrating line quality, drawing notation, and dimensioning.

Scenario

This assignment is a continuation of Sketches C. Field Sketches of Floor Plans of Five Large Rooms, D. Field Sketches of Two Exterior Elevations of Large Buildings, and E. Field Sketches of Two Interior Elevations of Large Rooms. Please review the scenario sections for those assignments for more information.

Materials

- Phone camera or digital camera
- Pencil
- Tape measure
- Sketchbook
- 1:96 Grid paper

Steps

1. Select a five interior walls in a large and complex room with doors and windows and furniture. A good source for your selection is a lecture hall, library reading room, high-rise lobby, etc. This offers the challenge of a midsize room that is not too large to be a burden and that is more of a challenge than a residence.
2. With a tape measure, identify the overall height, width, and openings with dimensions. Construct interior sections freehand, and pay particular attention to the overall proportions of the room (e.g., 1:1, 1:2, 1:4, 2:3, 3:4, etc.). Drawing this image freehand and with the grid promotes sketching precision without the need for drafting tools.
3. Photograph your room and building from various views. These images will be useful to you after you have returned to the studio and wish to add notes and an estimate of furniture locations, etc.
4. Taking our analysis from the general to the specific, use the tape measure and take important inner dimensions and note important relationships. Include dimensional information about the inner elements and details.

Tips

- Taking a large clipboard to the field is useful in providing a mobile hard surface for drawing.
- Photograph everything about the room and building. You will be glad to have the information when back in the studio.

Criteria

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Craft	Illustrator demonstrates exemplary attention to work product and excellence.	Illustrator demonstrates good attention and care toward work product.	Illustrator completes work, but the product seems rushed to completion.	Illustrator demonstrates attention toward work product, but work quality is poor.
Rendering	Illustrator uses line to hold the viewer's attention. Image is controlled and evokes both power and subtlety. Image is descriptive and/or symbolic and supports compositional goals.	Illustrator's linework demonstrates several professional attributes. Rendering style does not distract the viewer and generally supports compositional objectives.	Illustrator's use of line is somewhat effective. Rendering style is consistent and competent. There are some non-contributing attributes.	Illustrator attempts to use line descriptively. Rendering is inconsistent and lacks attention to craft.
Technical	Illustrator observes and analyzes object data and translates it to a meaningful graphic representation. Professional conventions are followed, inclusive of line weight, orthographic and dimensional information.	Illustrator observes and analyzes object data and translates it to a meaningful graphic representation. Most professional conventions are followed, and some information is missing.	Illustrator is challenged to observe and analyze object data correctly. Few professional conventions are followed, and some information is missing.	Illustrator attempts to observe and analyze object data and representation is inconsistent. Professional drawing conventions are not followed.
Professionalism	Student completes the work on time. Work demonstrates exemplary attention to learning objectives.	Student completes the work on time and demonstrates a good work ethic.	Student generally completes the work at a minimum level of expectation.	Student is missing parts of the work and makes a plan for completion of the remaining assignment.

Construction Drawing Page Layout and Document Set Organization

Construction documentation is a standardized drawing practice. The architecture, engineering, and construction professions across the world agree on most drawing conventions. Standardization promotes clear and consistent communication of design intent. Knowledge of these standards allows a student to be a proficient professional on multidisciplinary teams and on a wide range of projects.

Architectural Drawing Conventions

What is a construction drawing? How does it differ from a sketch made by a craftsman in preparation for hand or machine work?

> … the collection of final preconstruction drawings that represent the building as a whole. They are the pictorial record of the official design for the building, and generally include detailed depictions of every element of the finished building … drawings are produced by the design team, and go through several drafts during the design phase before the final draft becomes part of the contract, which is then sent out to be bid on by contractors. The winning contractor is bound by all of the contract documentation, including the construction drawings. (Higgins, 2018)

Architectural drawing conventions are a mostly standardized set of graphic practices that describe complex technical design intentions for construction in place. While constructors are responsible for the means and methods of construction, these design intention documents often imply how materials are assembled and how each is secured in place. Engineers who subcontract to the architect and constructors who read these drawings share a language for interpretation. Here are some useful reference books that cover many of these conventions:

- Architectural Graphic Standards, New York
- Neufert Architects' Data (Bauentwurfslehre) Leipzig, Germany
- The Architect's Handbook of Professional Practice, New York
- Time Saver Standards, New York

Wherever architects are licensed around the world, we generally find that architectural drawing conventions are standardized. The first architectural academy was founded at the Ecole des Beaux Arts in Paris in the 19th century. Four primary models of education developed geographically from this initial academy: France, Britain, Germany, and the United States. This period was also fraught with colonial expansion throughout the world, and cultural institutions were expanded along with political and military hegemony.

It was natural that the rise of colonial expansionism, the world wars that accompanied these ambitions, and the rebuilding efforts, along with a globalization capital and trading model, would all combine to create a set of shared architectural practices and protocols for designing and constructing environments and buildings throughout these empires, even long after Colonialism diminished in influence. The major exception to this remains the Imperial vs. SI units of measurement divide. Measurement as a principle is so fundamental to how architectural standards are constructed that it may seem incredible that other elements of education and practice bear so many similarities. Nonetheless, it would be trivial for a young intern architecture student from Middletown, USA, to leave inches behind and work in millimeters in Melbourne, Australia.

Architects, engineers, and constructors share a common language of construction drawings, and the processes used to develop these drawings and the protocols evident in professional design firms are remarkably similar wherever work is being built. As we will see in subsequent chapters, the important advances made possible by computer-aided drawing, interdisciplinary design, and shared building information modeling assets have only served to increase architectural standards.

Exercise 7: Interior Construction Drawing. Floor Plan and Interior Elevations

Introduction

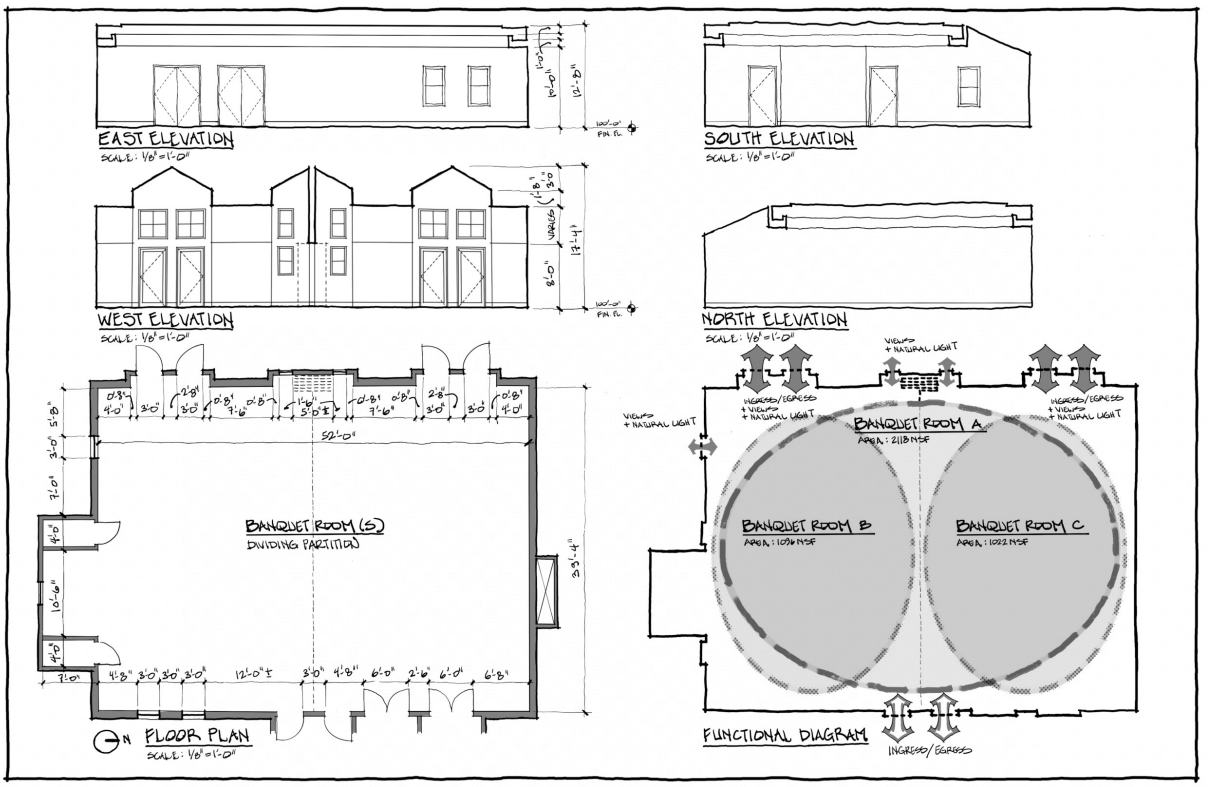

FIGURE 5.5 Exercise Seven: Interior Construction Drawing. Floor Plan and Interior Elevations

Select one of the plans from your five sketchbook plans (i.e., Sketch C. Field Sketches of Floor Plans of Five Large Rooms) to develop into a drafted plan and four interior elevations. Arrange the drawings on the page in a clear order and at an appropriate scale for the space. Include furniture, openings, doors, windows, and other details. Focus on line weights, quality of lines, and composition to communicate the nature of the space.

Also include a plan diagram of the space that clearly shows the different zones of activity or information about the space that is not readily apparent in the drafted plan. A diagram is a graphic representation of information. Each line and symbol should convey information about the space, relationships, and its basic design. The final drawing will have one drafted plan, four drafted interior elevations, and one plan diagram.

Learning

This assignment module contributes to the following design learning outcomes, which finish the sentence "As a successful student in this course, I am now able …"

- … to analyze the built environment and apply measured drawing skills that include plans and elevations, illustrating line quality, drawing notation, and dimensioning.

Scenario

The defining characteristic of any construction drawing is the organized presentation of orthographic multi-view drawings composed together in relationships of alignment, cross-referencing, economy of presentation, and utmost precision. This requires a strong set of standards that you must learn to become a productive professional.

Construction drawings are instruments of service for architects and engineers. These drawings are the primary means of communicating the design intention to the constructors. Drawing conventions are more standardized for construction drawings than other things we draw. There are courses, especially at technical schools, dedicated to reading construction drawings. There are generally accepted principles for preparation and interpretation of construction drawings.

Since architects, engineers, fabricators, and constructors interact on projects with each other, we can infer that there are advantages to having a standardized set of procedures and conventions in the preparation of construction documents. There are small deviations in some drawing conventions between disciplines (e.g., architectural vs. engineering and engineering vs. fabrication), yet these differences are immaterial to accurate comprehension of these technical drawings.

Interdisciplinary teams form to make our complex buildings and structures. Teams are bound by contract law to protect all parties engaged in the messy business of construction. While it is beyond this book's scope to discuss contracts here, an example is helpful to make the connection between rigorous drawing standards and minimizing litigation and disputes on the job. Traditionally there was a contract between the architect and the owner. Separately there was a contract between the constructor and the owner. We will skip talking about subcontracts (e.g., architects and engineers, constructors and fabricators, etc.). Above the term *instruments of service* was used, and construction drawings are sometimes artfully called the contract documents. In fact, the contract between the architect and the owner usually specifies that the contract documents consist of the signed agreement, the construction drawings, and the material specifications. The predominant source of litigation or a breach of contract

between the architect and the owner often points to errors and omissions in the material specifications (written) and the construction drawings (drawings and written information).

Therefore, one strength of a professional no doubt points to characteristics of detailed attention combined with careful processes to check for these errors and omissions. While the principles discussed in this assignment may seem picky, pedantic, or peculiar, there is good precedent for learning the precise art of making excellent construction drawings.

It may surprise you to learn that architectural drawing conventions are remarkably similar throughout the world. The author has taken care to include both imperial units (i.e., feet and inches) alongside SI units (i.e., metric) because you are likely to encounter both in your career. Yet, this may be the greatest distinction you find. In other words, you could plop most architects and engineers down in a seat in a New York, Paris, Tokyo, Mumbai, Melbourne, Cairo, or a Buenos Aires design office, and they could be productive very quickly.

> Subflooring or underlayment for resilient tile, terrazzo, other finish flooring, should be level to within 1/8" over a 10' length. Concrete slab beneath wood finish floor should be level to 1/4" in 10'. (Guidelines Publications, 1975, 27)

Materials

- Pencil
- Architect's scale
- Grid paper and triangles
- Arch B, 12" × 18" (A3, 297 mm × 420 mm) sheet

Steps

1. Plan for a vellum drafting sheet size of Arch C, which is 1" × 18" (A3, 297 mm × 420 mm). The drawing scale is 1/8" = 1' 0" or 1:96 (1:100 in SI units).
2. Acquire a grid underlay guide of four cells per inch. Be aware that some engineering grids use five cells per inch, and this is less helpful. The Imperial system of measurement is based on multiples of four, and the metric system (SI units) is based on multiples of 10. Therefore, if working in SI units, find millimeter grid paper.
3. Draw a 0.9 mm border line located 1 inch (25 mm) from each edge. This yields a drawing area that is 10" × 16" (i.e., for A3 it is 247 mm × 370 mm) available for each of six images. Alignment of these images is important for an organized and professional composition. Observe that most rooms are wider in one direction than the other, and since there is a requirement for two floor plan type drawings, the wider dimension most likely runs along the x-axis. Therefore, most compositions favor a three row and two column organization. Divide the available drawing area such that each cell has a column width of 8" (185 mm) and a row height of 3.33" (99 mm).
4. A good rule of thumb for many of our drawings is to proceed from the general to the specific. The most general geometric description for our plans, elevations, and sections

is a bounding rectangle (i.e., what are the outer limits in terms of width and height of the object we are drawing). Begin by locating each bounding box. Allow space for dimensioning and titles.

5. As you add detail for each drawing, think of this entire process in three steps or phases:

- mapping phase, layout sheet for all drawings and block in individual cell layouts;
- construction phase, build appropriate detail of each drawing; and
- render phase, add linework for clarification as well as dimensions, notes, and captions.

Criteria

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Craft	Illustrator demonstrates exemplary attention to work product and excellence.	Illustrator demonstrates good attention and care toward work product.	Illustrator completes work, but the product seems rushed to completion.	Illustrator demonstrates attention toward work product, but work quality is poor.
Rendering	Illustrator uses line to hold the viewer's attention. Image is controlled and evokes both power and subtlety. Image is descriptive and/or symbolic and supports compositional goals.	Illustrator's linework demonstrates several professional attributes. Rendering style does not distract the viewer and generally supports compositional objectives.	Illustrator's use of line is somewhat effective. Rendering style is consistent and competent. There are some non-contributing attributes.	Illustrator attempts to use line descriptively. Rendering is inconsistent and lacks attention to craft.
Technical	Illustrator observes and analyzes object data and translates it to a meaningful graphic representation. Professional conventions are followed, inclusive of line weight, orthographic and dimensional information.	Illustrator observes and analyzes object data and translates it to a meaningful graphic representation. Most professional conventions are followed, and some information is missing.	Illustrator is challenged to observe and analyze object data correctly. Few professional conventions are followed, and some information is missing.	Illustrator attempts to observe and analyze object data and representation is inconsistent. Professional drawing conventions are not followed.
Professionalism	Student completes the work on time. Work demonstrates exemplary attention to learning objectives.	Student completes the work on time and demonstrates a good work ethic.	Student generally completes the work at a minimum level of expectation.	Student is missing parts of the work and makes a plan for completion of the remaining assignment.

Tips

- Refer to Figure 5.2 Exercise 7. Interior Construction Drawing. Floor Plan and Interior Elevations for a good example of how to organize and coordinate plans and interior elevations.
- Laseau illustrates what he calls *ideagrams* (Laseau, 1989, 164–169).
- Since this assignment is a "sketch" drawing instead of a "drafted" work, you may benefit from using a tracing grid and guide. The scale of each cell grid at 1/8" = 1' 0" would be 2 feet per cell. If using metric units, you may use millimeter grid paper and the 1:100 scale would be 1 meter per cell.
- If using an alternate method of creating a template sheet in a vector drawing program like Inkscape, print the output from the vector program as a PDF. When using Acrobat Reader's "poster" feature, it is critical that you print to a scale of 100% (i.e., *not*, "to fit").

Related Assignments

- Exercise 4. Hand Drafting an Orthographic Multi-View Projection of Complex Chair
- Sketch C. Field Sketches of Floor Plans of Five Large Rooms
- Sketch E. Field Sketches of Two Interior Elevations of Large Rooms

Sections Represent the Complexities of Architecture

A rendered interior section shows several design elements in one image. The exterior construction is implied by the wall thickness. Several construction elements may be inferred due to the way things like soffits, door and window heads, and heating, ventilation, and air conditioning is accommodated and drawn. Materials, textures, and colors are rendered. This is a rich drawing.

> … the term section typically describes a cut through the body of a building, perpendicular to the horizon line. A section drawing is one that shows a vertical cut transecting, typically along a primary axis, an object or building. The section reveals simultaneously its interior and exterior profiles, the interior space, and the material, membrane, or wall that separates interior from exterior, providing a view of the object that is not usually seen. (Lewis et al., 2016, 6)

Hybrid Drawings: On the Desk and Inside the Box

A hybrid is often thought of as an offspring of two parent elements. Just as you are a hybrid of your parents, it would not be correct to say that you express equal characteristics of your mom and dad. You are more than the sum of your parts. We have done drawings by hand, *on the desk*. We have also begun using the computer to draw, *in the box*. There are telltale

characteristics of each. Many have mistakenly considered this an either-or choice. In this course, we will think of this choice as *both-and*.

Two characteristics will be explored in this section: efficiency and quality. It may be helpful to list some commonly held ideas.

- Drawing with a computer is efficient over the long term, especially for technical drawings, complex perspective scenes, and color renderings.
- Drawing by hand is efficient for certain quick drawings, like small sketches and diagrams.
- Computer drawings have qualities such as great precision and high resolution.
- Hand drawings have qualities such as friendliness, craftsmanship, and emotional appeal.
- Both computer and hand drawings can be impressive to clients.

Whenever these dualities are expressed, there is a tendency to argue the merits of one over the other. If you are like the author, then you may say why must I choose between ice cream or apple pie? Let me have apple pie *à la Mode*!

> Visualists have been trying to reproduce the characteristics of hand drawing with computers for many years … hybrid imaging produces a 100 percent computer-generated image that has an inviting quality and casual appearance. Hand drawing may play a minor role during initial visualization stages, but the computer is the primary image generator. (Leggitt, 2010, 210)

Since the qualities that we discussed above are often a matter of personal preference, we would sometimes choose to do a drawing by hand and at other times to do a drawing totally in the computer. The point is that you as the illustrator should have choices that are a function of best fit for the project, rather than a preference for using a particular tool. For instance, if your client specifies a computer rendering in your agreement for services, or a watercolor rendering by hand, then you would want to meet your client's expectations. It can matter sometimes. If you have a choice, then there is much to gain from a hybrid approach.

Since new illustration techniques have developed with the introduction of the computer, it has been an exciting time to make architectural renderings. The relationship between traditional hand drawing techniques has also evolved in a way that synthesizes the two processes into a new hybrid practice for illustration. It is encouraging and empowering to experiment with evolving your drawing processes from the desk, to inside the box, and back and forth.

Introductory Raster Graphics and Digital Painting Techniques

In Chapter 2 we discussed the differences between raster and vector graphics. Here we do a deeper dive into *painting with pixels*. There are some unique techniques involved with digital painting; however most of the techniques are an attempt to emulate analogue processes. As an example, a sophisticated watercolor technique involves the painting of glazes. A glaze of

transparent color is placed on paper and allowed to dry. Successive transparent layers are added, each time allowing the previous color to dry before applying a new glaze. Contrast this to the idea of mixing colors wet-in-wet. One great advantage of digital painting is that this effect can be done without the need to wait for the paper to dry! Depending on what brush parameters and characteristics are chosen, one can paint both glazes and wet-in-wet technique simultaneously.

While one idea is to emulate analogue hand painting, there are many unique things about the digital experience. The two predominant advantages of digital painting are layer structure and advanced masking techniques. Other important tools that you will find in all digital painting programs include layer blend modes, filters, multi-view interfaces, opacity, and some vector line functionality. Check out the steps section below in Exercise 8 for more detail about how to stack effects and leverage layers and layer masks.

Exercise 8: Rendered Section. Hybrid Drawing

Introduction

FIGURE 5.6 Exercise Eight: Rendered Section. Hybrid Drawing

Select one of the sections that you drew in Sketch F. Field Sketches of Five Partial Interior Sections of Large Rooms. The section must show an opening from interior space to exterior space (door, window, balcony, etc.). Manually draft the section on an Arch B, 12" × 18" (A3, 297 mm × 420 mm) sheet. Draft to an appropriate scale for your space. (i.e., An example room 18' wide, or 6 m, and 12' high, or 4 m, would fit well at 1/2" = 1' 0" (1:20 SI units.)

Scan the drawn room section and bring it into a raster graphics editor program. Render the section using the program to illustrate the space. Include both interior and exterior in the rendering and include scale figures. Do not worry about perspective, construction details, or details that do not add to the basic shape and/or character of the space. The section only needs to show the basic profile of the space or room. The intent is to use digital graphics combined with hand drafting to document the character of a space. The final composition can be

assessed upon the quality of the drafted section and the ability to use a raster graphics editing program to illustrate an architectural space. The final drawing should include the following:

- hand drafted section, scanned and imported into Photoshop
- rendered interior
- rendered exterior
- 1 scale figure, minimum

Learning

This assignment module contributes to the following design learning outcomes, which finish the sentence "As a successful student in this course, I am now able …"

- … to analyze the built environment and apply measured drawing skills that include plans and elevations, illustrating line quality, drawing notation, and dimensioning.

Scenario

> At the turn of the twenty-first century a gap widened between "high tech" younger designers and the hands-on "low tech" veteran designers. Designers positioned between the two groups were the first to take notice and began searching for ways to integrate … new methods that merge traditional drawing techniques with high-tech digital tools. (Leggitt, 2010, 8)

Artists and illustrators can leverage the speed of direct-to-paper linework and combine it with the convenience of layering and the powerful editing tools and filters of digital painting programs. The hybrid nature of this drawing is twofold: it is a construction drawing and an illustrative rendering, and it is made using digital and analogue drawing techniques. Whenever you can illustrate multiple design considerations within a single drawing, we may say that it is rich and dense with information. The drawing is suggestive of important interrelationships. The relationships between construction, user experience, utility and aesthetic are made evident in a rendered section drawing because the viewer apprehends these concepts and design elements all at once. Therefore, when planning such a multi-parameter exposition, the designer makes certain implicit claims about important architectural juxtapositions that can be aided by such a collage approach. The digital collage of layers is very efficient and open to several iterations and overlays. Unless the choice of materials, colors, and textures is deliberately and carefully considered, the collage of design elements can seem arbitrary and unbalanced. On the other hand, as the designer gains more confidence in this technique, the rendered interior section drawing can be one of the most influential and descriptive architectural illustrations.

Materials

- Pencil
- Architect's scale

- Grid paper and triangles
- Arch B, 12" × 18" (A3, 297 mm × 420 mm) sheet
- Raster image editor (e.g., GIMP, Photoshop, etc.)

Steps

1. Plan for a vellum drafting sheet size of Arch B, which is 12" × 18" (A3, 297 mm × 420 mm). The drawing scale is perhaps 1/2" = 1' 0" or 1:24 (1:20 in SI units). Draw a larger scaled interior section than in Sketch F. Focus on line weight differentiation such that all construction elements that are sectioned (i.e., cut through) are a thick line (0.7+ mm), and elements that are visible in elevation are a thinner line (0.35 mm.)
2. Place your drawing flat either on the ground, table, or taped to the wall, and illuminate with even and non-shadow producing light. Photograph with the camera on your phone using the largest physical lens and try to avoid using the pinch feature to zoom (i.e., digital zoom).
3. Import into the digital painting program (i.e., GIMP). The image is probably larger than you need. As an example, if the original crop of an iPhone 12 Pro Max would result in a photo with a resolution of 4032 px × 3024 px, and perhaps more than an 8 Mb file, then it would be larger than needed and unnecessarily burden the computer during our digital painting phase. A more useful maximum pixel dimension would be 2700 px with a corresponding file size of less than 4 Mb.
4. Using a layering system, begin to paint the walls. A common strategy with painters is to build from the background toward the foreground elements. Add another layer to add the window elements. You may want to find a photograph of a window element in elevation to sample and manipulate like an electronic dance music DJ samples drum break beats! Have fun and bring in furniture, plants, and other entourage elements to enliven your scene.
5. One requirement of this assignment is to show the outside environment through an opening in the wall. Use a layer mask to open a view to the layer below where the exterior scene you borrowed from a web image resource resides. Try to blur the outside layer below just a little and slightly desaturate the color intensity. This creates a perception of atmospheric perspective. Another layer should include at least one scale reference human silhouette that does not compete or dominate the architectural materials and finish. Adding significant blur (Gaussian or motion blur) or making this silhouette completely gray in color can be effective.

Tips

- Photographing artwork is a challenge. It is far easier to correct for scale and perspective for instance, than it is for uneven light. Seek a high contrast light, a white background, and dark and clear lines. Remember to place a scale reference to use when adjusting in the digital painting program.

- The most useful skill to learn in digital painting is creating a mask. Imagine that you are viewing an interior wall. Draw a smaller rectangle on the wall. In your mind's eye, take some imaginary scissors and cut out the rectangle, so that you can see to the outside. In principle this is a layer mask.
- Layering is the predominant feature of digital painting. Again, it is useful to use an analogy to enable our understanding. Imagine that you draw a sketch of an existing exterior elevation on a piece of tracing paper. Tear off another sheet and tape directly over your sketch. On this top sheet draw a new porch design. Don't like it? Instead of erasing the undesirable porch design, tear off another sheet of tracing paper and redraw an improved design over the top of the sheets below and repeat this process. In the digital world, each new layer is analogous to each sheet of tracing paper, only *much more* powerful!
- Many people love watercolor paintings. A big part of the watercolor aesthetic is the layering of transparent and fluid glazes that allow for a depth of color development over time. You can emulate this technique by reducing the opacity of the layers and experimenting with layer modes such as "multiply" and "overlay." The main point of this exercise is to experiment!

Criteria

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Craft	Illustrator demonstrates exemplary attention to work product and excellence.	Illustrator demonstrates good attention and care toward work product.	Illustrator completes work, but the product seems rushed to completion.	Illustrator demonstrates attention toward work product, but work quality is poor.
Rendering	Illustrator uses tone value to represent the interplay of light on volumetric forms. Image is controlled and evokes both power and subtlety. Image is descriptive and/or symbolic and supports compositional goals.	Illustrator's tone value work demonstrates several professional attributes. Rendering style does not distract the viewer and generally supports compositional objectives.	Illustrator's use of tone value is somewhat effective. Rendering style is consistent and competent. There are some non-contributing attributes.	Illustrator attempts to use tone value descriptively. Rendering is inconsistent and lacks attention to craft.

(*Continued*)

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Technical	Modeler observes and analyzes object data and translates it to a meaningful electronic model representation. Professional conventions are followed, inclusive of view selection, accurate translation of field notes and light source selection.	Modeler observes and analyzes object data and translates it to a meaningful electronic model. Most professional conventions are followed, and some information is missing.	Modeler is challenged to observe and analyze field sketch correctly in the electronic model. Few professional conventions are followed, and some information is missing.	Modeler attempts to observe and analyze field sketch and representation is inconsistent. Professional drawing conventions are not followed.
Professionalism	Student completes the work on time. Work demonstrates exemplary attention to learning objectives.	Student completes the work on time and demonstrates a good work ethic.	Student generally completes the work at a minimum level of expectation.	Student is missing parts of the work and makes a plan for completion of the remaining assignment.

Related Assignments

- Sketch F. Field Sketches of Five Partial Interior Sections of Large Rooms
- Exercise 7. Interior Construction Drawing. Floor Plan and Interior Elevations

References

Ching, F. & Juroszek, S. (1998). *Design drawing.* John Wiley & Sons, Inc.

Guidelines Publications. (1975). *Architectural rules of thumb.*

Higgins, A. (2018). *An introduction to the different types of construction drawings.* AutoDesk Construction Cloud. Resource Center. Accessed 29 August 2021, https://bim360resources.autodesk.com/connect-construct/an-introduction-to-the-different-types-of-construction-drawings

Kirby Lockard, W. (1977). *Drawing as a means to architecture.* Pepper Publishing.

Laseau, P. (1989). *Graphic thinking for architects and designers.* W. W. Norton.

Leggitt, J. (2010). *Drawing shortcuts: Developing quick drawing skills using today's technology* (2nd ed.). John Wiley; Sons, Inc.

Lewis, P., Tsurumaki, M., & Lewis, D. (2016). *Manual of section.* Princeton Architectural Press.

Moreno, E. (2001). *Information management. The architect's handbook of professional practice* (13th ed.). John Wiley & Sons, Inc.

Pena, W. & Parshall, S. (2012). *Problem seeking: An architectural programming primer* (5th ed.). John Wiley & Sons, Inc.

COPYRIGHTED MATERIAL — DO NOT DUPLICATE, DISTRIBUTE, OR POST

Chapter 6

Le Grand Tour and the Influence of Beaux-Arts on Drawing

The Role of the Sketchbook in Architecture

The idea of "Le Grande Tour" features large in the history of architecture education. The idea of *active* travel is a common thread for most architects, not just those who studied in the 19th century Ecole des Beaux-Arts but also to this day. The architecture student exposes the mind to new locations, societal customs, and building traditions. Is it enough to photograph and research on our phones? How does a sketch differ from a photograph as a record of a place? Baskinger and Bardel wrote that a good sketch provides something more than objective data. It provides information (2013).

As a student of architecture and as a contemporary professional it may be easy to forget the power of a sketch. Sketching on location and from direct observation was considered a crucial skill for training architects during the time of educational travel known as Le Grand Tour (17–19th century), and careful attention to this craft served to intensify and extend the act of observing (Brehm 2012, 6).

The architect's sketchbook is important both as a record and as a *sandbox* for exploration, play, and discovery. The architect's travel journal of sketches made from direct observation is one of the most fundamental elements of our education. It enables our reasoning by analogy, and through the use of structural frameworks (i.e., scaffolding), it is a natural way to learn, contextualize, and therefore make sense of our world. Architect's sketches are often presented to make the viewer think. At other times, the only viewers of our sketchbooks are ourselves. When we sketch, we are not necessarily looking for approval (judging); rather, "… a good sketch prompts some kind of response … Drawings are created in service of ideas—crafted to express and embody your ideas in compelling ways" (Baskinger & Bardel 2013, 134).

The sketch journal seems less emphasized in contemporary architecture education. Students ignore serious study and application of the discipline of sketching from direct observation at significant risk to professional development, creative thinking, and personal fulfillment.

> To name a thing allows us a sense of apprehension by drawing distinctions between objects along our journey toward comprehension. We identify and

> objectify, and through such a process we may make sense of our world. For an architect, the sketchbook can mirror this process of sense making in ways not limited by our disparate and specific written or spoken languages. Drawing a scene from direct observation "names" and distinguishes objects, environments and conceptual constructs using a "minds-eye" language that is at once specific to the architect's vision and general and applicable to viewers of the sketchbook no matter what native language. Each vignette affords a rich communication with the architect's external social circle; while, at the same time, a sketch enriches the architect's apprehension of his or her craft and inner psychological circle. (Inglert & Inglert, 2018)

One very specific reason often cited for the virtue of keeping a dedicated sketchbook is as a direct record of the architect's travel observations and experiences, an "encyclopedia De architectura" of a very creative, speculative, and personal discipline. While the complexity and disparate meanings each sketch yields may not carry the precision of a well-crafted word phrase in a moment, an architect's sketchbook can reward the curious, reflective, and speculative mind toward new synthetic visions, outside of the moment when the scene was captured. Since architects envision new environments, the sketchbook can be a valuable tool.

Exercise 9: Monochrome Rendering of Architectural Detail

Introduction

FIGURE 6.1 Exercise Nine: Monochrome Rendering of Architectural Detail

Trompe-l'oeil, or "fool the eye," is an artistic technique of making a highly realistic rendering to convince a viewer of three-dimensional space or texture on a 2D surface. It is often used in built environments to create textures or architectural elements. In drawing, trompe-l'oeil is used to create the illusion of reality or depth within the drawing frame.

Select an architectural detail from Sketch G. Field Sketches of Five Architectural Details. Take good photographs of the material to be used as a guide for the final drawing. Select an appropriate detail and composition for the view. Your detail drawing should contain/be:

- A joint between three or more materials
- Full scale or larger
- Perspective view
- 1" (25 mm) border on drawing sheet

On a sheet of Bristol board, draw your detail at full scale. Render the drawing to show realistic textures, light, and shadow. Make the drawing as convincing as possible. The final drawing will be assessed on accuracy of rendering technique, quality and creativity of composition, and technical ability to render different textures, light, and shadow.

Learning

This assignment module contributes to the following design learning outcomes, which finish the sentence "As a successful student in this course, I am now able …"

- … to analyze a field sketch of a built environment condition and simulate the influence of highlight, shade and shadow and render materials with a photorealistic effect.

Scenario

> As the drawings are enlarged from scale to scale the proportions of smaller parts are studied, and the arrangement and disposition or ornament, until finally the details are considered: the profile of mouldings, the detail of ornament, the arrangement of the drawings on the sheet, and the presentation—the actual drawing and rendering of the problem. (Harbeson, 1927, 24)

Students of architecture have investigated architectural details of well-known buildings since the beginnings of formalized study. At the Ecole des Beaux-Arts, this study was known as an *Analytique*. While these drawings were often orthographic elevations, sections and plans rendered in beautiful watercolor washes, Exercise 9 is a perspective study rendered in monochromatic tone values with a wax-based color pencil.

Whenever we study architecture at different scales, we develop a deeper appreciation for the complexities of our profession and craft. When we draw these complex assemblages of details, we simulate how objects in the real world are connected and how materials interact with one another through the interplay of light, shadow, and edge.

We can confidently predict that the student who methodically investigates an exemplary detail connection by drawing the assembly at a full scale or larger will gain a deep understanding of the system. While this process can seem time consuming, it has a high reward for the investment of effort.

The design of an environment does not progress logically, efficiently, or in a linear path from one idea to a solution. Architectural design is slow, sometimes messy, and rewarded by focus and attention on the details while at the same time, on the big picture. From sketch to rendering and all the implied steps in between, have confidence that the process of drawing will reveal greater understanding. André De Shields gave the following advice:

> In his 2019 Tony acceptance speech, the then 73-year-old inspired viewers with his acceptance speech, where he laid out his cardinal rules for success: "Surround yourself with people whose eyes light up when they see you coming," and, "Slowly is the fastest way to get to where you want to be." (Raphelson, 2021)

Materials

- Pencil
- Bristol board, 11" × 17" (279 mm × 432 mm)

Steps

1. Select an architectural detail from Sketch G. Field Sketches of Five Architectural Details. Compose a perspective view that illustrates a joint between three or more materials.
2. Lay out your sheet so that the detail is represented at full scale or larger. Remember to include a 1" (25 mm) border on drawing sheet.
3. Considerable care should be shown to rendering very smooth gradients of tone value. Rendering material texture is particularly difficult and requires an objective eye. *Modeling* is how we illustrate depth, and this is defined as transitioning from a hard and contrasty edge to a soft and lost edge.
4. The illustration has a goal of photorealism. Look around. The real world does not have *lines*. There are of course edges that our mind may want to turn into lines. Resist the urge to use lines. Focus on the subtle transitions between tone values.
5. Take great care when photographing your final artwork. Proper even lighting is key to maintaining the subtle gradations. Whites should be white. Blacks should be black. Too much contrast in the digital file can ruin the image.

Tips

- You may remember doing a tone value scale that had seven gradations from black to white. Similarly, we can make an edges scale from the sharpest to the softest most imperceptible edge (i.e., *lost edge*). Before starting your rendering, make these two reference scales.

- Architects use line often for symbolic and technical reasons in our illustrations. Painters rarely use line. To achieve a more photographic quality in this exercise, let's think more like painters!
- Take care to protect your drawing from the oils in your hand. If you are right-handed, you may want to plan to render from left to right. If you are left-handed, draw from right to left.

Sketch G: Field Sketches of Five Architectural Details

Introduction

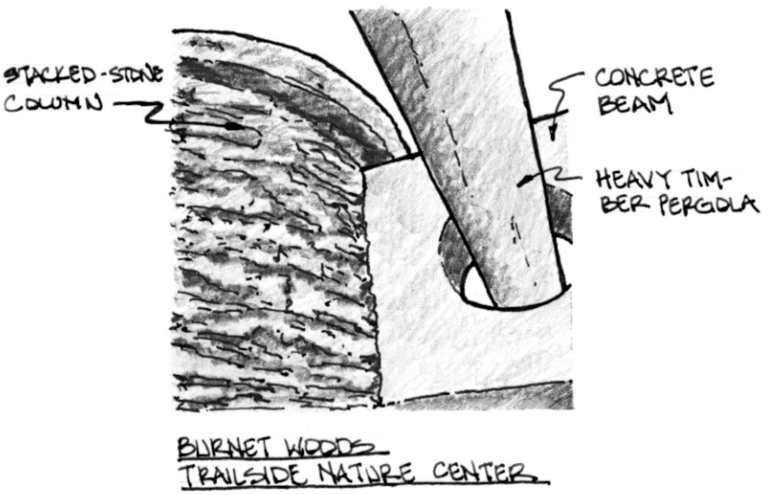

FIGURE 6.2 Field Sketches of Five Architectural Details

> God is in the details. (Van der Rohe, 1959)
> [Carlo] Scarpa's work is typically noted for an obsessive relationship with materials and craft, an extreme attention to detail, and a focus on the fragment. (Neveu, 2010)

The built environment is composed of materials assembled in various patterns and details. An architectural detail is the joint between different materials, the articulation of a surface, or the seam in construction. It is quite often in the details that a designer can express purpose, quality, and attitude of an environment. Sketch five architectural details from observation during your architectural walking tour. Combine styles of drawing to capture the nature of the detail. Each detail should be the joint between three or more materials. You may also wish to photograph the detail or revisit the site to draw the detail with more accuracy. Select details that you find interesting and important because your sketches will become the basis for your work in assignment Exercise 9. Monochrome Rendering of Architectural Detail.

Learning

This assignment module contributes to the following design learning outcomes, which finish the sentence "As a successful student in this course, I am now able …"

- … to analyze the built environment and apply measured drawing skills that include plans and elevations, illustrating line quality, drawing notation, and dimensioning.

Scenario

This assignment is a continuation Sketches C. Field Sketches of Floor Plans of Five Large Rooms, D. Field Sketches of Two Exterior Elevations of Large Buildings, E. Field Sketches of Two Interior Elevations of Large Rooms, and Sketch F. Field Sketches of Five Partial Interior Sections of Large Rooms. Please review the scenario section for those assignments for more information.

Materials

- Phone camera or digital camera
- Pencil
- Sketchbook

Steps

1. Select five exterior or interior details to study through perspective drawing. A good source for your selection is a lecture hall, library reading room, high-rise lobby, etc. This offers the challenge of a midsize building that is not too large to be a burden and that is more of a challenge than a residence.
2. Photograph your room or exterior detail from various views. These images will be useful to you after you have returned to the studio and wish to add notes and an estimate of furniture locations, etc.
3. Taking our analysis from the general to the specific, note important dimensions and relationships. Include dimensional information and annotations about the materials, elements, and details.
4. Experiment with a style that uses both contour lines (analytical) and tone value (experiential). See the example above for clarification.

Tips

- Taking a large clipboard to the field is useful to provide a mobile and hard surface for drawing.
- Photograph everything about the room and your building. You will be glad to have the information when back in the studio.

Related Assignments

- Exercise 4. Hand Drafting an Orthographic Multi-View Projection of Complex Chair
- Sketch C. Field Sketches of Floor Plans of Five Large Rooms
- Sketch D. Field Sketches of Two Exterior Elevations of Large Buildings

- Sketch E. Field Sketches of Two Interior Elevations of Large Rooms
- Exercise 7. Interior Construction Drawing. Floor Plan and Interior Elevations
- Exercise 8. Rendered Section. Hybrid Drawing
- Sketch F. Field Sketches of Five Partial Interior Sections of Large Rooms

Criteria

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Craft	Illustrator demonstrates exemplary attention to work product and excellence.	Illustrator demonstrates good attention and care toward work product.	Illustrator completes work, but the product seems rushed to completion.	Illustrator demonstrates attention toward work product, but work quality is poor.
Rendering	Illustrator uses tone value to represent the interplay of light on volumetric forms. Image is controlled and evokes both power and subtlety. Image is descriptive and/or symbolic and supports compositional goals.	Illustrator's tone value work demonstrates several professional attributes. Rendering style does not distract the viewer and generally supports compositional objectives.	Illustrator's use of tone value is somewhat effective. Rendering style is consistent and competent. There are some non-contributing attributes.	Illustrator attempts to use tone value descriptively. Rendering is inconsistent and lacks attention to craft.
Technical	Modeler observes and analyzes object data and translates it to a meaningful electronic model representation. Professional conventions are followed, inclusive of view selection, accurate translation of field notes and light source selection.	Modeler observes and analyzes object data and translates it to a meaningful electronic model. Most professional conventions are followed, and some information is missing.	Modeler is challenged to observe and analyze field sketch correctly in the electronic model. Few professional conventions are followed, and some information is missing.	Modeler attempts to observe and analyze field sketch and representation is inconsistent. Professional drawing conventions are not followed.
Professionalism	Student completes the work on time. Work demonstrates exemplary attention to learning objectives.	Student completes the work on time and demonstrates a good work ethic.	Student generally completes the work at a minimum level of expectation.	Student is missing parts of the work and makes a plan for completion of the remaining assignment.

(*Continued*)

Related Assignments

- Sketch G. Field Sketches of Five Architectural Details
- Exercise 6. Perspective Projection and Tone Value Render of a Small Guesthouse

Exercise 10: Contour Line Drawing of Eye-level Perspective

Introduction

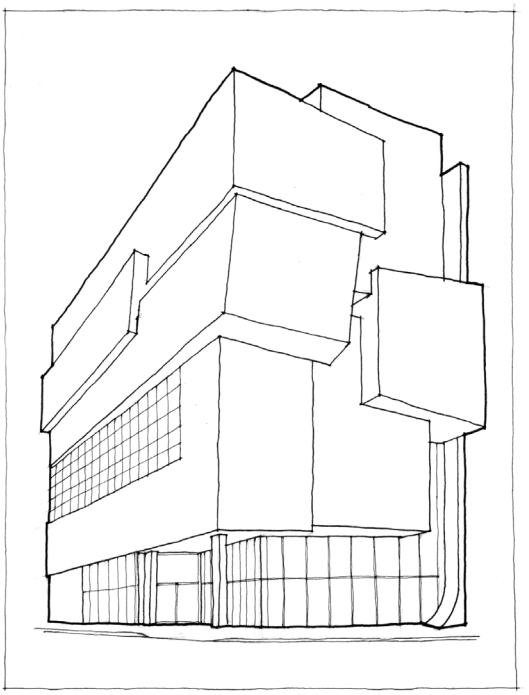

FIGURE 6.3 Exercise Ten: Contour Line Drawing of Eye-level Perspective (Hand Drawing)

Select one of your drawings from Sketch H. Field Sketches of 10 Architectural Perspectives to develop as a finished drawing. Build up information in a layered drawing process. Start with lightly drawn converging lines and lines to indicate horizon line and vanishing point (if they fit on the page). Locate objects and use sighting techniques to compare height, width, and angles. Begin to add weight to the outline of the object as you become more confident in its size and location. Finish the drawing by adding strong, crisp line weights to make the drawn objects read. Using a perspective framework, add line weight, horizon lines, and converging lines.

This drawing is large and should have minimal detail. It is therefore important to concentrate attention on line quality. There must be proper line weight differentiation and hierarchy. The final drawing shall be one 11" × 14" (279 × 356 mm) drawing. The drawing will be assessed on

line quality and perspective and completeness. No tone value delineation should be included for this assignment. Please see tip below about line profiling.

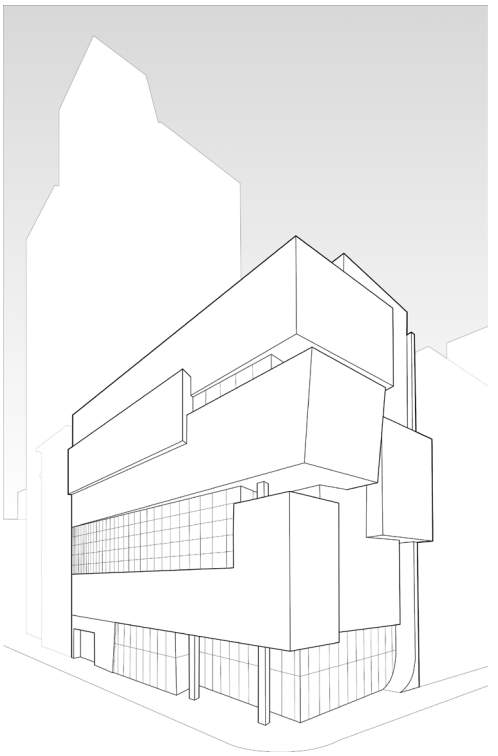

FIGURE 6.4 Exercise Ten: Contour Line Drawing of Eye-level Perspective (Digital Drawing)

Learning

This assignment module contributes to the following design learning outcomes, which finish the sentence "As a successful student in this course, I am now able …"

- … to directly observe shape and forms and measure and translate the spatial scene accurately from an implied image plane to a proportionally scaled drawn surface.
- … to control line weight and consistency (e.g., width, continuity, and control).

Scenario

We discussed in a previous chapter and in Exercise 3. Contour Drawing of Still Life from Direct Observation the various reasons why a contour line drawing is effective at showing formal qualities. Now that we are drawing architecture, it is even more evident. It is an important analytical tool for architecture. Please refer to that prior discussion in Chapter 2. What is interesting and different about Exercise 10 is the contribution that linework differentiation

makes to the *reading* of our drawing. Let's focus in this section on the relationship between the different types of edges we observe in nature (hard to soft to *lost* edges) and how our contour drawings can reflect this phenomenon. By *reading* we are talking about how the *composition* leads the viewer's eyes around the page. In his book *Mastering Composition* Ian Roberts describes a useful system for controlling the reading of paintings (2008, 112). We can adapt some of these ideas.

1. Working either from life or from a photograph, establish the main lines of influence, which Roberts calls *armature*, that lead the viewer to the focus of interest you choose:

    - verticals such as building edges
    - horizontals such as the horizon line
    - curving lines and diagonal lines such as roads, plantings, etc.

2. Analyze the tonal variations in a thumbnail sketch. These establish the main tonal shapes.
3. Create an emphasized edge sketch of lines:

    - High contrast between the tonal variations is darkest.
    - Low contrast and lost edges are the lightest and maybe don't exist as lines at all in the sketch.

4. With this new analysis and understanding, proceed to construct the contour perspective with the confidence of a very good *road map* based on intention and composition.
5. This painting-centric approach *informs* the perspective contour drawing, especially the relative line weights.

Materials

- Pencil
- Bristol board, 11" × 14" (279 × 356 mm)

Steps

1. Select an architectural perspective from Sketch H. Field Sketches of 10 Architectural Perspectives. Compose a perspective oblique view that shows two sides of a building: a major side that is roughly two-thirds wide and a minor side one-third wide.
2. Lay out your sheet so that the perspective view mostly fills the drawing area. Remember to include a 1" (25 mm) border on the drawing sheet.
3. It is intended that this is a freehand perspective. The emphasis on great line quality is functionally about two qualities: line weight that reflects depth of three-dimensional space and consistency. This is a different challenge than before because you are rendering line with a felt-tipped pen instead of a pencil.
4. Another option for this drawing is to use a computer and a vector-based drawing program, such as Inkscape or Adobe Illustrator. In this case the lines are not drawn freehand. They are more precise, which may appeal to some students.

5. It is a significant challenge to confirm that the perspective is *perfect and correct*. The second challenge is a *correct* linework mapping. We have practiced this in several exercises and sketches leading up to this exercise.

Tips

- Several iterations may be necessary to make corrections. The best way to do this by hand is to use tracing paper overlays. Once you are confident in the perspective quality, then you can transfer the linework with a light pencil to the finished paper.
- The most natural approach that gives a livelier drawing quality is to *build* the perspective over several iterations. A tracing of a photograph is an option; however, the results can seem both distorted by the camera lens and somewhat machine-like. The human touch should not be underestimated.

Criteria

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Craft	Illustrator demonstrates exemplary attention to work product and excellence.	Illustrator demonstrates good attention and care toward work product.	Illustrator completes work, but the product seems rushed to completion.	Illustrator demonstrates attention toward work product, but work quality is poor.
Rendering	Illustrator uses line to hold the viewer's attention. Image is controlled and evokes both power and subtlety. Image is descriptive and/or symbolic and supports compositional goals.	Illustrator's linework demonstrates several professional attributes. Rendering style does not distract the viewer and generally supports compositional objectives.	Illustrator's use of line is somewhat effective. Rendering style is consistent and competent. There are some non-contributing attributes.	Illustrator attempts to use line descriptively. Rendering is inconsistent and lacks attention to craft.
Technical	Illustrator observes and analyzes object data and translates it to a meaningful graphic representation. Professional conventions are followed, inclusive of line weight, orthographic and dimensional information.	Illustrator observes and analyzes object data and translates it to a meaningful graphic representation. Most professional conventions are followed, and some information is missing.	Illustrator is challenged to observe and analyze object data correctly. Few professional conventions are followed, and some information is missing.	Illustrator attempts to observe and analyze object data and representation is inconsistent. Professional drawing conventions are not followed.

(*Continued*)

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Professionalism	Student completes the work on time. Work demonstrates exemplary attention to learning objectives.	Student completes the work on time and demonstrates a good work ethic.	Student generally completes the work at a minimum level of expectation.	Student is missing parts of the work and makes a plan for completion of the remaining assignment.

Related Assignments

- Sketch G. Field Sketches of Five Architectural Details
- Exercise 6. Perspective Projection and Tone Value Render of a Small Guesthouse

Sketch H: Field Sketches of 10 Architectural Perspectives

Introduction

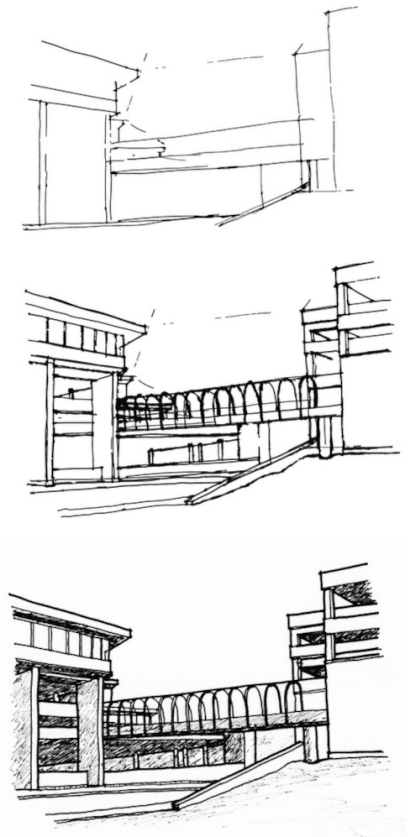

FIGURE 6.5 Field Sketches of Ten Architectural Perspectives

> When a figure floats isolated in a sea of empty space, its presence is emphasized. … The figure stands out clearly as a positive shape against an empty, diffuse, and shapeless background. … Vignette[:] Situating the drawing in a large field emphasizes its individuality. The space between the drawing and the edge of a sheet typically should be similar to or larger than the dimensions of the drawing. (Ching & Juroszek, 1998, 32, 307)

Using a pen, draw 10 freehand perspectives of architecture from observation. Include lines indicating convergence, diminution, overlapping, foreshortening, horizon line, and vanishing points. Work rapidly, loosely, and at a relatively large scale. Each drawing must be done on a separate page and take approximately 10 to 15 minutes.

Learning

This assignment module contributes to the following design learning outcomes, which finish the sentence "As a successful student in this course, I am now able …"

- … to analyze patterns of form and design through observational drawings made *en plein air* and to embed those ideas through a process of re petition, revisioning, and redrawing.

Scenario

> A sketch is the product of a variety of lines assembled to make shapes that resemble realistic forms. Detail is added to these shapes to give them more meaning and identity. A final dimension is achieved by the addition of tones and black to represent differences in light on the various planes and to depict shadows and shades. … One must develop a quick, confident, positive, and accurate stroke of line in order to make convincing shapes, details, and tones. This takes many hours of simple practice. (Oliver, 1979, 15)

In an online social media group called Architectural Sketching, architects have debated what constitutes a *sketch*. In this course of study we do technical drawings, renderings and illustrations, electronic modeling, and sketches. Most architects who were educated before computers have a clear idea of what a sketch is. A collage ethic combined with the ease of electronic modeling and layered image editing programs have all combined to blur the distinctions for new students. The author considers this experimentation a positive development. Nonetheless, there is a great benefit to developing the traditional skill set to make a quick sketch from direct observation, and *en plein air*. This exercise will challenge you to develop these sketching skills.

Materials

- Felt-tip pen or fine point pen
- Sketchbook

Steps

1. On a single page of your sketchbook and working at a relatively small scale (i.e., 5" × 7" or 130 × 180 mm) block out the major shapes and relationships in light construction lines of the architecture as a vignette.
2. After making adjustments and corrections, begin rendering the varying edge types (e.g., sharpest to softest and *lost edges*) with linework.
3. Finish rendering and confirm that you have varied the line thickness (e.g., spatial, planar, and textural edges).

Tips

- It is important to start from the largest shapes before moving to details. The process starts by finding the major vertical and horizontal lines in the scene. Next you can add the diagonal and curvilinear lines using the vertical and horizontal lines as reference.
- Once you are satisfied with the proportions and relationships of the shapes defined by the lines, block in the tone-value relationships using varying densities of pattern blocks. Because we are using a pen, gradients are formed by varying the density of lines.
- Only after you are confident about the shapes, proportions, balance, and linework of the composition should you attempt to render any detail.

Criteria

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Craft	Illustrator demonstrates exemplary attention to work product and excellence.	Illustrator demonstrates good attention and care toward work product.	Illustrator completes work, but the product seems rushed to completion.	Illustrator demonstrates attention toward work product, but work quality is poor.
Rendering	Illustrator uses line to hold the viewer's attention. Image is controlled and evokes both power and subtlety. Image is descriptive and/or symbolic and supports compositional goals.	Illustrator's linework demonstrates several professional attributes. Rendering style does not distract the viewer and generally supports compositional objectives.	Illustrator's use of line is somewhat effective. Rendering style is consistent and competent. There are some non-contributing attributes.	Illustrator attempts to use line descriptively. Rendering is inconsistent and lacks attention to craft.

(*Continued*)

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Technical	Illustrator observes and analyzes object data and translates it to a meaningful graphic representation. Professional conventions are followed, inclusive of line weight, orthographic and dimensional information.	Illustrator observes and analyzes object data and translates it to a meaningful graphic representation. Most professional conventions are followed, and some information is missing.	Illustrator is challenged to observe and analyze object data correctly. Few professional conventions are followed, and some information is missing.	Illustrator attempts to observe and analyze object data and representation is inconsistent. Professional drawing conventions are not followed.
Professionalism	Student completes the work on time. Work demonstrates exemplary attention to learning objectives.	Student completes the work on time and demonstrates a good work ethic.	Student generally completes the work at a minimum level of expectation.	Student is missing parts of the work and makes a plan for completion of the remaining assignment.

Related Assignments

- Exercise 3. Contour Drawing of Still Life from Direct Observation
- Sketch G. Field Sketches of Five Architectural Details
- Exercise 10. Contour Line Drawing of Eye-level Perspective

The Role of the Electronic Portfolio in Architecture

Students of architecture demonstrate professional skills and design projects with a portfolio. In the 1980s, this author had a very large leather folio of original works, organized with the most accomplished work at the front of the collection. Since it was important to show some comprehensive depth, several technical drawings were included with the renderings and illustrations. Not all work was included out of respect to the viewer, because of assumed time limitations. The purpose was to get a job! Students would make phone calls and solicit interviews with professional architects. We hoped that professionals would take some time to look over what we had so carefully catalogued for presentation and discussion. The process today differs primarily in media. Portfolios are still the dominant means to getting a personal interview in a professional office. Students email hundreds more firms than could be contacted by phone calls. Electronic portfolios are published as email attachments or as a link on a website (e.g., social media and publishing platforms such as issuu.com).

> The challenge of proper self-promotion through portfolio design is to be able to objectively assess your strengths and accomplishments. Preparing a portfolio

> requires you to take a step back from your own design work and to make an evaluation as unemotionally as possible. … Planning a portfolio presentation also requires a keen sense of organization and an ability to arrange various written and visual materials into a unified graphic package. … Those who review your portfolio will be looking for a businesslike attitude and a pragmatic "soundness" in your work, as well as creativity and pure grace and beauty. (Linton, 2003, 26)

It is a golden age of architectural portfolios! A critical review of other architecture portfolios can help you *design* your own. We can distinguish the professional portfolio from a learning portfolio.

Intermediate Raster Graphics and Digital Painting Techniques

Before the invention of the raster image program, considerations such as color transparency, material textures, the faithful rendering of human figures, plants, and furniture all combined to make interior perspective renderings seem painterly and from the hand of a skilled artist. So long as we remember these artistic expectations and aspirations, then the empowerment you will no doubt feel of borrowing, sampling, and collaging your interior perspectives together should make this assignment very fun. The traditional aesthetics have not changed much, and therefore when you paint with the raster image program remember to layer your colors in transparent *glazes*, select your material textures carefully along with scaled figures and *entourage* and, above all, be intentional about how and on what you want the viewer to focus attention on your rendering. Unless the interior looks *lived-in*, the value of this rendering will be diminished. There really is no more powerful technique for sharing your architectural ideas than using someone else's eyes and mind that are immersed in the *experience* of your project. Your duty is to welcome people into your imagined space through the portal of your rendering.

> Paint that is transparent allows light to pass through it … through the paint layer, reflects off the white surface underneath, and travels to the eye … like stained-glass windows. They filter out some of the wavelengths of light that pass through them, sending back the wavelengths that yield their characteristic colors. … A glaze is a transparent layer applied to an existing dry passage of paint, usually to intensify, deepen, unify, or otherwise change the color. (Gurney, 2010, 100)

Exercise 11: Rendered Interior Perspective. Hybrid Drawing

Introduction

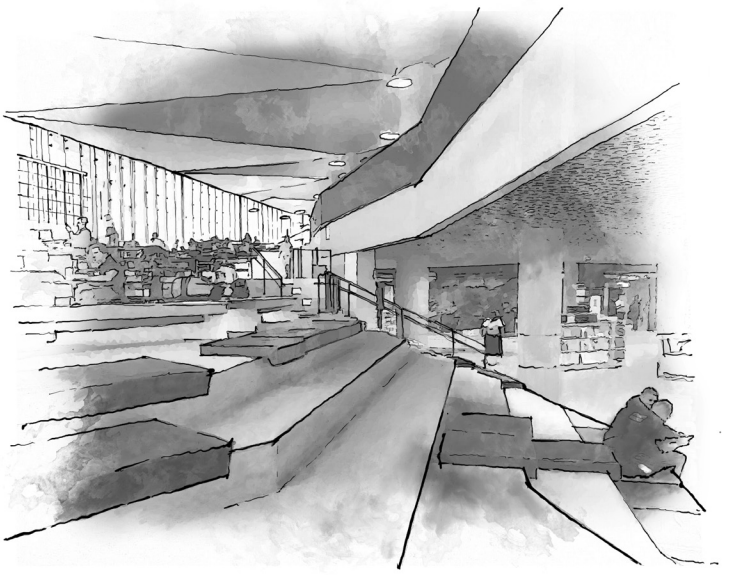

FIGURE 6.6 Exercise Eleven: Rendered Interior Perspective. Hybrid Drawing

Create a rendered perspective view of an interior space that expresses the unique character of a space through scale, materiality, and light. Use freehand perspective drawing techniques combined with raster graphics to complete the drawing. The drawing may be a one-, two-, or three-point perspective. It must be of an interior space.

Learning

This assignment module contributes to the following design learning outcomes, which finish the sentence "As a successful student in this course, I am now able …"

- … to analyze and accurately represent an interior perspective view of an existing space.
- … to render light, color, and materials both by traditional hand-drawn techniques and contemporary raster graphics painting.

Scenario

> Unlike the painter or sculptor who can produce finished, realized works from the very beginning … the designer must be content with drawings and scale models until the happy day when a client is ready to underwrite realization of a design

> project. Drawings and renderings become a kind of intermediary end-product … as the best realization available short of actual construction. (Pile, 1967, 1)

Interior perspectives are a fundamental skill for architectural rendering. Computer modeling has made constructing interior perspectives somewhat easier and has introduced new opportunities for creativity. Computer rendering packages can analyze and simulate interior lighting conditions, which can aid the renderer in producing realistic views. Rendering options now include traditional hand-drawn painting techniques along with raster image editing and painting. Exercise 11 provides some practice in combining the traditional and the digital. The exercise proceeds from a good line drawing of an interior perspective that may not even be evident in the final rendering, depending on your choices. Nonetheless, the fundamentals of perspective and good planning for directing the eye of the viewer to focus attention are important.

Materials

- Drawing paper, either physical or digital
- Pen, pencil, and possibly watercolor paint
- Raster graphics painting program (e.g., GIMP and Photoshop)

Steps

1. Select an interior space. The space can be from an art museum or any interior space with an important and large volume gathering area.
2. Create a full-scale mock-up of the view. Adjust the composition as you see fit.
3. On 11" × 17" (279 mm × 432 mm) paper, draw a freehand perspective using the simple built-up drawing technique to create the perspective. The final drawing should be very accurate in terms of detail, include excellent line quality, and have a clear hierarchy of line weights.
4. Scan and import the hand drawing into photoshop. Render the perspective using your choice of raster image editing tools and/or hand rendered graphics. The drawing must include scale figures, representative materials/surfaces, and a representation of light in the space.
5. Concepts and skills include freehand drawing, perspective, illustrative sketching, line weight, raster graphics, collage, composition, rendering techniques, and two-dimensional documentation of three-dimensional space. The final drawing will be assessed on completeness of the assignment, composition of the drawing, and creativity in expression.

Tips

- It may be creative for you to consider a collage approach that, at first, is rough in quality.
- You may choose to use an underlay technique, drafting tools, or simply continue to draw on top of a lightly drawn armature.

Criteria

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Craft	Illustrator demonstrates exemplary attention to work product and excellence.	Illustrator demonstrates good attention and care toward work product.	Illustrator completes work, but the product seems rushed to completion.	Illustrator demonstrates attention toward work product, but work quality is poor.
Rendering	Illustrator uses tone value to represent the interplay of light on volumetric forms. Image is controlled and evokes both power and subtlety. Image is descriptive and/or symbolic and supports compositional goals.	Illustrator's tone value work demonstrates several professional attributes. Rendering style does not distract the viewer and generally supports compositional objectives.	Illustrator's use of tone value is somewhat effective. Rendering style is consistent and competent. There are some non-contributing attributes.	Illustrator attempts to use tone value descriptively. Rendering is inconsistent and lacks attention to craft.
Technical	Modeler observes and analyzes object data and translates it to a meaningful electronic model representation. Professional conventions are followed, inclusive of view selection, accurate translation of field notes, and light source selection.	Modeler observes and analyzes object data and translates it to a meaningful electronic model. Most professional conventions are followed, and some information is missing.	Modeler is challenged to observe and analyze field sketch correctly in the electronic model. Few professional conventions are followed, and some information is missing.	Modeler attempts to observe and analyze field sketch and representation is inconsistent. Professional drawing conventions are not followed.
Professionalism	Student completes the work on time. Work demonstrates exemplary attention to learning objectives.	Student completes the work on time and demonstrates a good work ethic.	Student generally completes the work at a minimum level of expectation.	Student is missing parts of the work and makes a plan for completion of the remaining assignment.

Related Assignment

- Exercise 8. Rendered Section. Hybrid Drawing

Exercise 12: Preparing the Electronic Portfolio

Introduction

FIGURE 6.7 Exercise Twelve: Preparing the Electronic Portfolio

Create an 8.5" × 11" (A4) portfolio of all your exercises and sketches completed so far. Use one page per project. Below is a section called **Related Assignments**. There are 22 items. Two of these items are in the following chapter and should be included in the electronic portfolio when completed. Scan or photograph your work into digital format, and then compose the

document using a desktop publishing application (e.g., Adobe InDesign, Scribus, etc.). Label each assignment. Create a title page for your document. On the title page, include a response to the following two questions in 200 or less words: What drawing skills have improved during this course of study? Why is (or is not) drawing important to the design process? Finally, export a portable document format (i.e., pdf) at 150 ppi.

Learning

This assignment module contributes to the following design learning outcomes, which finish the sentence "As a successful student in this course, I am now able …"

- … to coordinate and archive drawings and illustrations in a professional portfolio for use in communicating skills progress.
- … to analyze and reflect on the meaning of the learning in this course.

Scenario

Our goal with this exercise is to create an electronic learning portfolio. It is important to be comprehensive with your collection. You are going to be showcasing all your prior work in this course of study. One purpose is to develop experience archiving and cataloguing your personal work. You should continue this discipline throughout your career. A second specific purpose for us is to quickly assess your development in this course of study. When you flip through the pages of your learning portfolio, you will no doubt gain confidence in your ability to develop architectural illustration skills.

Materials

- Scribus or InDesign (i.e., desktop publishing application.)
- Digital photos of all exercises and sketches

Steps

1. Begin by creating a folder (i.e., directory) on your computer. You may want to name it something like *Name_Ex_12_Folio*. Create a subdirectory called *images*.
2. Collect all the digital photographs that you have carefully shot on your phone with excellent lighting conditions.
3. Open the desktop publishing program and create a main template page. On this template you should create at least two entities: an image placeholder and a text box placeholder.
4. Duplicate this template page at least 21 times per the list of "Related Assignments" below. We have not yet done two assignments: Sketch I. Field Sketches of a Monumental Stair System and Exercise 13. Ray-tracing Render of a Stair Model. Leave these two final sheets blank for now.
5. Establish a naming convention for each caption on the page. Get the appropriate image from your images subfolder, change the text to the appropriate caption. Rinse, wash, and repeat! Don't forget to save frequently.

6. Check the tips section below for help with photography and keeping this document to a manageable size. As you can imagine, the quality of your photographs is very important.
7. Export this file in portable document format. It is very important to remember two problems that arise with native file formats (e.g., InDesign.indd and Scribus.sla). First, your viewer is not likely to have these programs, yet everyone has access to Adobe Acrobat Reader. Second, desktop publishing programs often link outside image resources instead of embedding the images in the document. It can be embarrassing if you send a document with broken links—not the professional competency you want to project!

Tips

- When you change the lens opening from one f-stop to the next, you are adjusting the aperture "one stop." The f-stop series has been arranged so that each such change either doubles the intensity of light or cuts it in half. When you go down to the next smaller aperture (from f/4 to f/5.6, for instance), you are "stopping down" one stop and letting in half as much light. (Lovell et al., 1984, 46)
- Our eyes are amazing organs. Their ability to compensate for relative light differences instantaneously can fool us into believing that it may be brighter. An overcast spring day may be around 10,000 lumens, while a small well-lit and seemingly bright studio at night is comparatively dark at around 1000 lumens. This is almost four f-stop settings darker on your camera. The physics of the camera lens are much more rigid than our eyes. You will gain a respect for the light levels achievable inside vs. outside. The best advice you can ever follow is to avoid the "garbage in, garbage out" trap. Dark photos are *noisy*, and if there are shadows evident at all, the photograph is probably unusable. No amount of wizardry in an image editing program can overcome poor photographic light.
- Good photographic light is even, bright, and non-glaring. The easiest way to achieve this is to photograph outside, if possible, on the shady side of a building and away from reflecting elements like windows.
- If weather is inclement or it is dark outside, then the classic setup for lights may be described as follows: Place a large diffusing type of lamp close to your subject and pointing at a 45-degree incidence angle to the subject. Place the same type of light 180 degrees in top view and pointing at a 45-degree incidence angle in altitude from the ground. If these lights can be diffused with a panel without compromising too much brightness, this is ideal.
- Use a tripod and the timer on your camera if possible. This helps to eliminate compromised focus.
- Files intended for digital display only on a screen can effectively be as small as 640 px × 800 px. If you want to print the PDF and still maintain satisfactory quality, then a better size is at least 1300 px × 1700 px. There is no reason to make your files much more than 2600 px × 3400 px in size. By comparison, a 640 × 800 image is probably less than 0.25 Mb, and a 1300 × 1700 image is about 0.60 Mb, while a 2600 × 3400 image is almost 2.25 Mb! Multiply each one of these by 22 images, and you can surely appreciate how unwieldy this PDF could be, even when compressed, to attach in an email to a potential employer.

Criteria

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Craft	Illustrator demonstrates exemplary attention to work product and excellence.	Illustrator demonstrates good attention and care toward work product.	Illustrator completes work, but the product seems rushed to completion.	Illustrator demonstrates attention towards work product, but work quality is poor.
Professionalism	Student completes the work on time. Work demonstrates exemplary attention to learning objectives.	Student completes the work on time and demonstrates a good work ethic.	Student generally completes the work at a minimum level of expectation.	Student is missing parts of the work and makes a plan for completion of the remaining assignment.

Related Assignments

- Exercise 1. Breathing Lines
- Exercise 2. 100 Lines
- Exercise 3. Contour Drawing of Still Life from Direct Observation
- Sketch A. 50 Contour Drawings of Hands and Feet
- Sketch B. Field Sketch of a Complex Chair
- Exercise 4. Hand Drafting an Orthographic Multi-view Projection of Complex Chair
- Exercise 5. Axonometric Projection Contour Model of a Small Guesthouse
- Exercise 6. Perspective Projection and Tone Value Render of a Small Guesthouse
- Sketch C. Field Sketches of Floor Plans of Five Large Rooms
- Sketch D. Field Sketches of Two Exterior Elevations of Large Buildings
- Sketch E. Field Sketches of Two Interior Elevations of Large Rooms
- Sketch F. Field Sketches of Five Partial Interior Sections of Large Rooms
- Exercise 7. Interior Construction Drawing. Floor Plan and Interior Elevations
- Exercise 8. Rendered Section. Hybrid Drawing
- Exercise 9. Monochrome Rendering of Architectural Detail
- Sketch G. Field Sketches of Five Architectural Details
- Exercise 10. Contour Line Drawing of Eye-level Perspective
- Sketch H. Field Sketches of 10 Architectural Perspectives
- Exercise 11. Rendered Interior Perspective. Hybrid Drawing
- Exercise 12. Preparing the Electronic Portfolio
- Sketch I. Field Sketches of a Monumental Stair System
- Exercise 13. Ray-tracing Render of a Stair Model

References

Baskinger, M. & Bardel, W. (2013). *Drawing ideas: A hand-drawn approach for better design.* Watson-Guptill Publications.

Brehm, M. (2012). *Sketching on location.* Kendall Hunt Publishing.

Ching, F. & Juroszek, S. (1998). *Design drawing.* John Wiley & Sons, Inc.

Gurney, J. (2010). *Color and light. A guide for the realist painter*. Andrews McMeel Publishing.

Harbeson, J. (1927). *The study of architectural design*. The Pencil Points Press, Inc.

Inglert, E. & Inglert, L. (2018). One hundred days of similitude. *Representation: Journal of the Design Communication Association*.

Linton, H. (2003). *Portfolio design*. W. W. Norton.

Lovell, F., Zwahlen, R., & Folts, J. (1984). *Handbook of photography*. Breton Publishers.

Oliver, R. (1979). *The sketch*. Van Nostrand Reinhold Co.

Neveu, M. (2010). *Slow Time: Reading the Work of Scarpa.* Presented at the Narrative Space Conference, University of Leicester England. http://digitalcommons.calpoly.edu/cgi/viewcontent.cgi?article=1051&context=arch_fac

Pile, J., Ed. (1967). *Drawings of architectural interiors*. Whitney Library of Design.

Raphelson, S., Ed. (2021). Broadway is back: André de Shields welcomes audiences back to the theater. *NPR*. https://www.wvxu.org/2021-09-08/broadway-is-back-andre-de-shields-welcomes-audiences-back-to-the-theater

Roberts, I. (2008). *Mastering composition*. North Light Books.

Van der Rohe, L. M. (1959, June 2). On restraint in design. *The New York Herald Tribune*.

Electronic Modeling Frameworks and Workflows for Illustration

Simulation, Rapid Prototyping, and Modular Systems Thinking

Introduction

> Today abstraction is no longer that of the map, the double, the mirror, or the concept. Simulation is no longer that of a territory, a referential being, or a substance. It is the generation by models of a real without origin or reality: a hyperreal. … Whereas representation attempts to absorb simulation by interpreting it as a false representation, simulation envelops the whole edifice of representation itself as a simulacrum. (Baudrillard, 2020, 1, 6)

A framework serves as scaffolding for building our understanding. Frameworks are imperfect in comprehensively defining complex subjects, yet can be helpful when we approach a topic for the first time. If we start at our most basic sense of architectural illustration, then we have experience working in analogue and digital frames of reference. Let's go deeper into digital rendering. We have discussed both raster graphics and vector graphics in two-dimensional illustrations. Again, these are useful distinctions for understanding contemporary practice. Three-dimensional digital work also has complex levels we can describe.

The author's first encounter with three-dimensional modeling was with AutoCAD in the late 1980s. Primarily a computer-aided drafting (CAD) program, most professionals used this program in the same way we used the physical drafting board. We drew lines that symbolized construction drawing instructions for builders (e.g., lines, dimensions, symbols, and text.) We set up title blocks and iterated through each drawing by opening files rather than by taping down large drawings from the flat files. The major innovations of CAD for productivity included layering, ease of copying (especially floor plans) for reuse, transferring and sharing digital files, and ultimately the referencing and linking files within files with versioning control. Almost by accident, the author discovered the *z-dimension* in the model view and started experimenting with creating 3D views. It was very difficult!

The 3D journey of most architects started with computer modeling and visualization packages of polygonal mesh models. As in mathematics, a vertex joins to another vertex to another, and a basic triangle is formed with a *face* or mesh. Terms you may learn along the way include *quads*, *n-gons*, and *nurbs*.

Once a model of an object is created, several *transforms* are available. It is good practice to build models in *actual* real-life scale. If you model a stair tread and riser in the computer program, then you should not work at a reduced scale like we might do on the drafting board in hand drawing. Rather, that stair tread would be *built* 11" (280 mm) wide, and the riser would be 7" (178 mm).

When it came time to *print* that image for distribution in a drawing set, then you would use a scale factor to reduce the image on a sheet of paper. For example, a common scale for a section detail for that stair could be 1-1/2" = 1'-0", which is a scale factor of $2/3 \times 12 = 8$, or 1:8 (i.e., the reciprocal of the fractional scale multiplied by 12 inches). In the metric scale, this would probably be rounded to a scale factor of 1:10. A useful analogy for traditional construction drawing types (e.g., plans, elevations, sections, and details) is to consider these 2D representations to be *slices* from the electronic model. A floor plan is sliced at about 3'4" (1m) above the finish floor, so that it takes in the sill of the window. It is thus a horizontal slice through the model. A section is a vertical slice. An elevation is also a vertical slice; however, it is taken outside of the building edge and is a slice through the building site. A detail is a partial slice of the model. Imagine several large slicing planes through the room elements and systems where you are now sitting.

Four Propositions

1. **Simulation**: If architects envision inhabited and experienced environments, then simulations of predictive reality may guide the architect's vision.
2. **Rapid Prototyping**: If a simulation is nested within a virtual environment, then rapid testing by partial fabrication may reveal real-world viability of the simulation.
3. **Modular**: If the basis for design is prototype-based inheritance, then the attributes and functions of the components derive from a general extensible object.
4. **Systems Thinking**: If inhabitation is composed of complex interactive systems, then the architect's design skills may benefit from generalizable and representative modeling.

Simulating Our Design Process

Finally, we come to our use of the electronic model—a three-dimensional rendering of a building condition. In this chapter we will be making detailed measurements of an existing monumental stair. With our field notes, we will *build* a *full-scale* electronic model, apply photographic material and texture assets (raster images) to the model's meshes, place a viewing camera for our *scene*, and locate point lights representing the sun and accent lights. Our model parameters will be familiar to you from the physics of real life (e.g., focal length of camera, watts of light, kelvin color of light, material specularity, emissivity, etc.). We are therefore

going to consider this a physics-based three-dimensional computer rendering. Our quest will be to make the most photorealistic rendering we can. Beware! This may be the most fun you will have had since beginning our work together because the virtual design world is a very compelling experience.

Sketch I: Field Sketches of a Monumental Stair System

Introduction

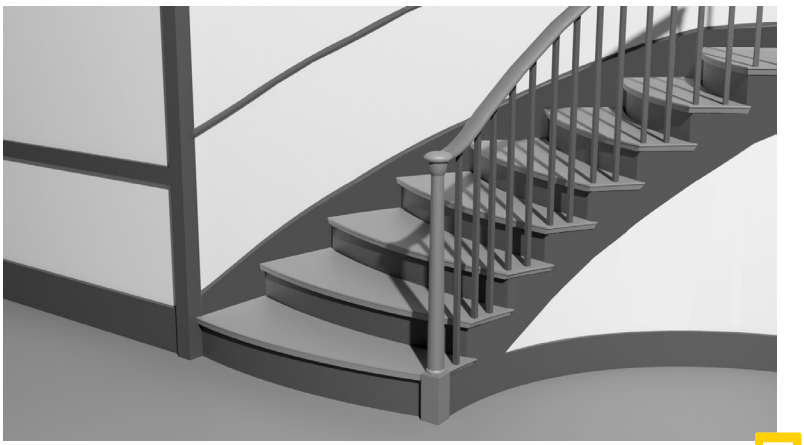

FIGURE 7.1 Field Sketch of a Monumental Stair System

Working in teams of three or four people, accurately measure a monumental stair between at least two levels. The stair may be interior or exterior. How do we define a *monumental stair*? This term appears only once in the Ohio Building Code (OBC, 2017), which is based on the International Building Code of 2015. This reference to a monumental stair regards intermediate handrails (Chapter 1014.9). On the other hand, there is extensive information on all things exit access stairway. These stairs are the more modest and often uninteresting ones found in buildings. By inference, most architects would therefore define monumental stairs as other than exit access stairs. Let's start there.

A monumental stairway is *not*:

> EXIT. That portion of a means of egress system between the exit access and the exit discharge or public way. Exit components include exterior exit doors at the level of exit discharge, interior exit stairways and ramps, exit passageways, exterior exit stairways and ramps and horizontal exits. EXIT ACCESS. That portion of a means of egress system that leads from any occupied portion of a building or structure to an exit. EXIT ACCESS STAIRWAY. A stairway within the exit access portion of the means of egress system. EXTERIOR EXIT STAIRWAY. An exit component that serves to meet one or more means of

> egress design requirements, such as required number of exits or exit access travel distance, and is open to yards, courts, or public ways. STAIR. A change in elevation, consisting of one or more risers. STAIRWAY. One or more flights of stairs, either exterior or interior, with the necessary landings and platforms connecting them, to form a continuous and uninterrupted passage from one level to another. (OBC, 2017, 22–59)

Monumental stairs are special architectural elements that the most utilitarian among us might think of as extra and nonessential. Yet, the most beautiful elements in architecture are often less about raw utilitarian function and more about the experience of a sense of place. There are amazing examples of monumental stairs on which architects have lavished much attention and special focus. You may choose to measure either an interior or exterior monumental stair. Find one that excites your inner imagination, because you are going to be looking very closely at the measurements and details. You will capture just enough data and information so that you can build a detailed electronic model of it isolated out of the context of the building. In the following quote, Thomas Jefferson provides a good specification for a description of a stair:

> The risers are to the treads as 3. to 4. to wit 7 1/2 I. & 10 I. This is the antient proportion, and preferable to the modern of 2. to 1. which is so tedious that every person prefers going 2. steps at a time, tho' that be rather laborious. (Beiswanger, 1998, 45)

Learning

This assignment module contributes to the following design learning outcomes, which finish the sentence "As a successful student in this course, I am now able …"

- … to analyze the built environment and apply measured drawing skills that include stairway systems, illustrating line quality, drawing notation, and dimensioning.

Scenario

Monumental stairway systems are often featured in double-high or greater rooms, such as entry lobbies, atria, etc. The fundamental components of a stair system include stringers, treads, risers, handrails, and landings. Often monumental stairs will feature special materials, textures, and colors. Here are some historical examples of stairs that would be good examples to investigate and study in detail:

1. Bramante staircase in the Vatican City State by Donato Bramante, completed 1505
2. The Laurentian Library staircase in Florence, Italy, by Michelangelo, completed 1559
3. Spanish Steps in Rome by Francesco de Sanctis, completed 1725

4. Spiral staircase in the Trustees Office, Pleasant Hill, Kentucky, by Micajah Burnett, completed 1840
5. Paris Opera House stairs by Charles Garnier, completed 1875
6. Olivetti showroom staircase in Venice by Carlo Scarpa, completed 1958
7. MAXXI, national museum of 21st-century arts, in Rome by Zaha Hadid, completed 2010

Since monumental stairs are distinct from exit access stairways, there is more latitude in monumental stair design. Stairs can be open to large volumes of interior space, there is a wide variety of material selections, and the geometries can often seem exhibitionist and celebratory for the architecture. Stairs can be a focus point and center of interest for the architecture. A fundamental function of the stair may be for vertical transportation, and yet function alone does not explain the exuberance of the spiral staircase in the Trustees Office in the Shaker community designed by the otherwise minimalist and understated architect Micajah Burnett. We can be certain that humans want to promenade and be seen, which was the design impulse and innovation at the Palais Garnier, otherwise known as the Paris Opera House.

With a few notable exceptions, the most interesting stairs are not the functional exit access stairs that quickly allow us to escape dangers within a building to the safety of outside. Monumental stairs are designed more for the pleasure of architecture, for the experience of the promenade, and as a jewel housing many important examples of architecture. Select a stair that you find celebrates the experiences of architecture and measure it. In the next assignment you will build an electronic model of your stair, complete with materials, textures, and lighting.

Materials

- Pencil
- Tape measure
- Sketchbook

Steps

1. Select a stair that you find celebrates the experiences of architecture. Working in teams of three or four, accurately measure a monumental stair between at least two levels.
2. It is useful to include a plan view, a section view, and an eye-level perspective. Record dimensions and notes.
3. Measure and include important details such as handrail dimensions, materials, and lighting of stair space.
4. Try to be efficient with how you document all the information for each stair. Think about the way you arrange this information on the page and try to efficiently capture vital information without repeating your work. For example, if a stair tread is 11 inches and its riser is seven inches, you can assume that the rest of the treads and risers are the same dimension. There is no need to measure each one.

5. Share your work with your teammates. One can measure while the other takes notes and draws; however, each student's sketchbook must contain one complete documentation. These stair documentations will be used to develop a realistic rendering of the stair in a future exercise. The next exercise will be done individually.

Tips

- Remember to make several photographs while on-site.
- A detail drawing can be useful for elements such as stair nosings, connections between stringers and treads, and handrail connections.
- Make good photographs of materials and colors. These raster images can be used to create custom maps and textures for the computer rendering.

Criteria

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Craft	Illustrator demonstrates exemplary attention to work product and excellence.	Illustrator demonstrates good attention and care toward work product.	Illustrator completes work, but the product seems rushed to completion.	Illustrator demonstrates attention toward work product, but work quality is poor.
Rendering	Illustrator uses line to hold the viewer's attention. Image is controlled and evokes both power and subtlety. Image is descriptive and/or symbolic and supports compositional goals.	Illustrator's linework demonstrates several professional attributes. Rendering style does not distract the viewer and generally supports compositional objectives.	Illustrator's use of line is somewhat effective. Rendering style is consistent and competent. There are some non-contributing attributes.	Illustrator attempts to use line descriptively. Rendering is inconsistent and lacks attention to craft.
Technical	Illustrator observes and analyzes object data and translates it to a meaningful graphic representation. Professional conventions are followed, inclusive of line weight, orthographic and dimensional information.	Illustrator observes and analyzes object data and translates it to a meaningful graphic representation. Most professional conventions are followed, and some information is missing.	Illustrator is challenged to observe and analyze object data correctly. Few professional conventions are followed, and some information is missing.	Illustrator attempts to observe and analyze object data and representation is inconsistent. Professional drawing conventions are not followed.

(*Continued*)

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Professionalism	Student completes the work on time. Work demonstrates exemplary attention to learning objectives.	Student completes the work on time and demonstrates a good work ethic.	Student generally completes the work at a minimum level of expectation.	Student is missing parts of the work and makes a plan for completion of the remaining assignment.

Related Assignment

- Exercise 13. Ray-tracing Render of a Stair Model

Exercise 13: Ray-tracing Render of a Stair Model

Introduction

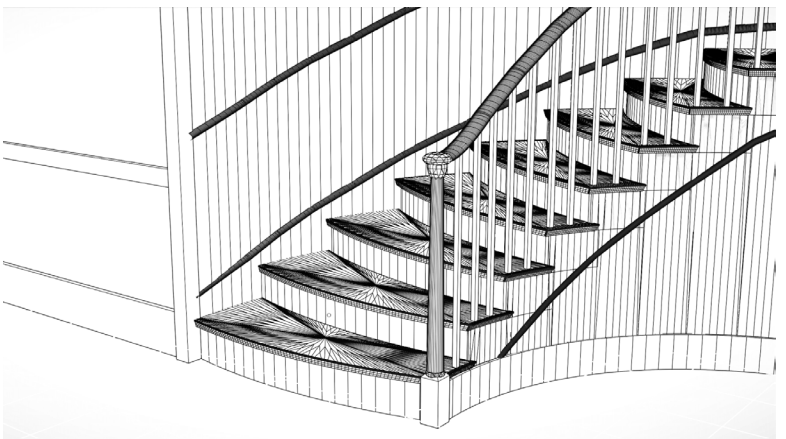

FIGURE 7.2 Exercise Thirteen: ~~Ray-tracing Render of a Stair Model~~

Most three-dimensional electronic modeling software comes with pre-rendering visualization and printing. There are several different ways to think about how your computer outputs three-dimensional visualizations. If you have ever played Minecraft (Mojang Studios, 2021), then you would agree that this is not a photorealistic view of a three-dimensional world! Perhaps you have opened the modeling program known as SketchUp (Trimble, 2021) and had some fun modeling, applying materials and colors, and experimenting with the styles available for how the renderings might look when printed. Again, hopefully you agree that while this can look good for some in-office applications, the printed image does not look photorealistic or professional for clients. This is where computer rendering add-ons come into the picture.

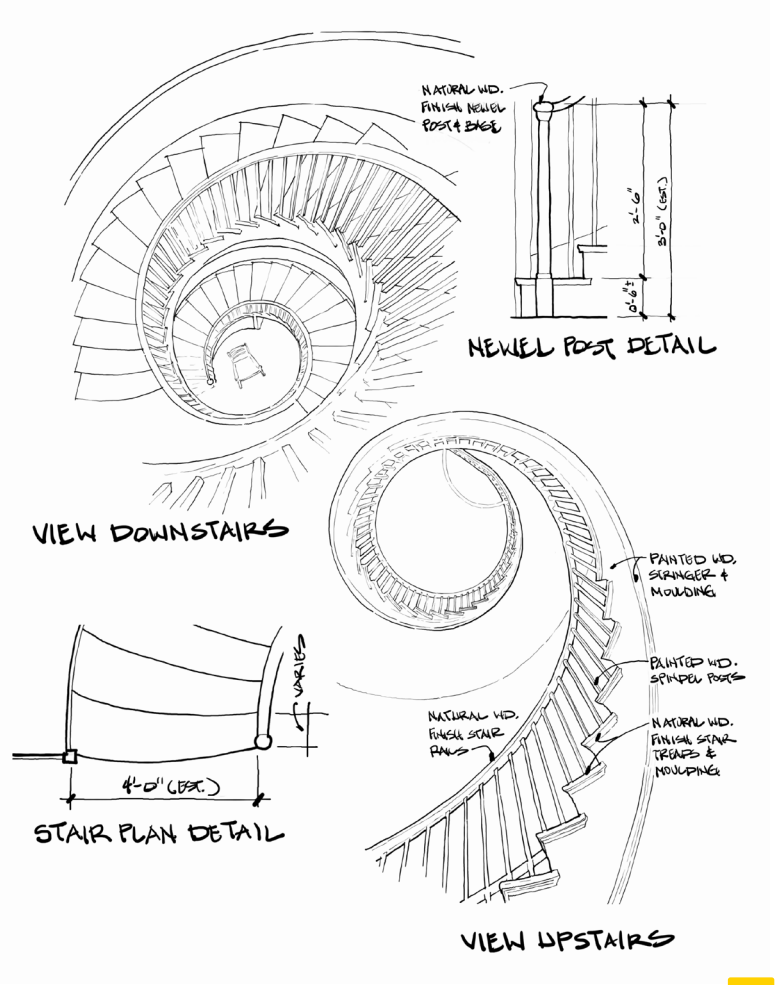

FIGURE 7.3 Exercise Thirteen: ~~Model View Before Render~~

Learning

This assignment module contributes to the following design learning outcomes, which finish the sentence "As a successful student in this course, I am now able to …"

- … make a complex electronic model of an architectural system, apply materials, textures, and lighting sources, and output a photorealistic rendering of the scene.

Scenario

There are many physics-based rendering engines we can use. Since each shares workflow similarly with minor differences, we will concentrate here on a readily available, open source, and free package called Blender (Blender Foundation, 2021). If you learn Blender well enough

to make a beautiful photorealistic rendering of your projects, you can be assured that your skills are transferable to other rendering engines and packages. There are, at the time of this writing, three primary rendering views available in Blender: Cycles, FreeStyle, and Real Time (EEVEE). FreeStyle resembles the cartoonish edge and line-based feel of SketchUp and requires the fewest computing resources. We will use this during the modeling phase of the project to move around the workspace quickly. The EEVEE engine of the Real Time view requires the next least amount of computing resources and produces good results. You should explore EEVEE Real Time rendering. There are significant differences between Real Time and Cycles rendering results and also, while sometimes slow to render, Cycles produces the most realistic and preferred rendering. This assignment will assume that you use the Cycles render engine for your final rendering.

Materials

- Blender Cycles Render Engine
- GIMP raster image editor
- External image resource file

Steps

1. Accurately measure a monumental stair system. (See Sketch I. Field Sketches of a Monumental Stair System.)
2. Use your documentation to create an accurate digital model in Blender. Assign materials, textures, and light sources as appropriate.
3. Set up a camera-based view of a scene that presents your stair model favorably. Render the scene using the Cycles ray tracing engine and save as a raster image. Using skills you have learned in other sketches and exercises, you may want to further paint and modify the rendering in an image editing program like GIMP (The GIMP Team, 2021).
4. Write a 200-word maximum description of the stair. How is the stair used? How does the stair design accommodate this use? How does the design go beyond this use to enhance the experience? Include the text as part of a unified and balanced composition.
5. Export the final perspective rendering composite for presentation.

Tips

- It is helpful to understand the basic workflow for adding materials, lighting, and doing a quick render before doing a complex model. Acquaint yourself with the following menus: material properties, base color, image texture, open image, viewport shading, render preview. When getting familiar with lighting, use a point light and increase the value to something like 2000W. With more familiarity you can move on to using sun instead.

- A good rule of thumb for setting your camera view is to use "adjust focal length" and initially choose one of three lengths to test: 50 mm (default) for less distortion, 35 mm for a point-and-shoot look, and 28 mm for architectural distortion.
- Blender sets the origin at the center of gravity of your initial object (cube). The cube is 2 m on all six sides. When doing a test render with the default cube, remember to move the cube in the z-axis by 1 unit (1m). It also helps to add a reference plane for the ground so that the light can cast a shadow from the cube to the plane.
- Extensive help is available on both LinkedIn Learning (LinkedIn, 2021) and YouTube (Google, 2021). LinkedIn Learning is subscription based, but it is common for universities to have a subscription for student use that is covered by tuition and fees.
- For more realistic renderings, remember that objects in real life are seldom razor sharp. On the default cube, for instance, add a modifier called "Bevel" with values such as 0.02 m offset and two segments to give the cube a more natural softer edge.

Criteria

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Craft	Illustrator demonstrates exemplary attention to work product and excellence.	Illustrator demonstrates good attention and care toward work product.	Illustrator completes work, but the product seems rushed to completion.	Illustrator demonstrates attention toward work product, but work quality is poor.
Rendering	Illustrator uses line to hold the viewer's attention. Image is controlled and evokes both power and subtlety. Image is descriptive and/or symbolic and supports compositional goals.	Illustrator's linework demonstrates several professional attributes. Rendering style does not distract the viewer and generally supports compositional objectives.	Illustrator's use of line is somewhat effective. Rendering style is consistent and competent. There are some non-contributing attributes.	Illustrator attempts to use line descriptively. Rendering is inconsistent and lacks attention to craft.
Technical	Illustrator observes and analyzes object data and translates it to a meaningful graphic representation. Professional conventions are followed, inclusive of line weight, orthographic and dimensional information.	Illustrator observes and analyzes object data and translates it to a meaningful graphic representation. Most professional conventions are followed, and some information is missing.	Illustrator is challenged to observe and analyze object data correctly. Few professional conventions are followed, and some information is missing.	Illustrator attempts to observe and analyze object data and representation is inconsistent. Professional drawing conventions are not followed.

(*Continued*)

DLO	Advanced (4 pts)	Proficient (3 pts)	Developing (2 pts)	Beginner (1 pt)
Professionalism	Student completes the work on time. Work demonstrates exemplary attention to learning objectives.	Student completes the work on time and demonstrates a good work ethic.	Student generally completes the work at a minimum level of expectation.	Student is missing parts of the work and makes a plan for completion of the remaining assignment.

Related Assignment

- Sketch I. Field Sketches of a Monumental Stair System

Hybrid Drawings Synthesize Analog and Digital Workflows

In biology, a hybrid means the offspring of two dissimilar animals. The word has been borrowed as a substitute for a mixture of things. Let's keep its meaning relatively narrow because many consider analog and digital workflows to be dissimilar. Many go further to question why analog drawings are still prevalent in contemporary practice. Why not simply make everything digital? Let's lay aside that polemical question and talk about what many architects consider the state of the art, hybrid drawing.

It doesn't really matter where the drawing is initiated to most architects. Here are some common starting points:

- Architect takes sketchbook on a site visit and makes an initial gestural sketch with a felt-tip pen in strong bold strokes to be developed later back at the studio.
- Intern architecture student takes a digital photograph during the same site visit of the main pedestrian approach and back at the office imports photo into image editor.
- Project architect takes a screenshot of an aerial view by reviewing project site on Google Earth and then begins 3D massing model.
- Junior designer draws interior vignette perspectives largely from imagination on an iPad Pro digital drawing tablet during a long staff meeting.
- Facility manager at client opens a REVIT model from the previous renovation of a lab space and begins virtually moving equipment and support offices ahead of sending the model to several architect offices for a request for proposal.

These imagined scenarios are believable to those in practice today. To the degree that you as a student become facile in many modes of design and illustration, you become a valued member of a design and production team. Let's take this scenario to a later stage in the process.

- The gestural sketch has developed into the main circulation idea for the project. It has been modeled electronically, turned into vector artwork, used as a wayfinding diagram, and ultimately 3D printed and mounted as signage for the project.

- The main pedestrian approach perspective was developed by the intern further "in-the-box." The senior design director saw it on screen and requested it be printed as a ghost image onto watercolor paper. The final rendering was presented to a client as a large hand-drawn watercolor.
- The 3D massing model from the Google Earth view was developed and expanded for surrounding neighborhood use on the zoning appeal. An aerial view was exported from the electronic model and imported to a raster image editor, digitally painted, and printed at a very large scale for the appeal.
- The junior designer turned out to be productive by not paying close attention at the staff meeting because the interior perspectives were developed and used as image assets for a competition board that brought the firm new work with a new client.
- The REVIT model ultimately shared with the architect who won the new renovation contract and with all the subcontracted engineers, interior designers, and ultimately the construction manager, saving considerable time and money. Along the way, slices and views were printed on paper and sketched directly over the top with redline pens, highlighters, and ballpoint pens—all instruments of service for the project.

These examples show how silly the debate between analog versus digital is to a working professional. We want all the tools in the box. Working this way is efficient, fun, and creative. What ideas do you have for moving in and out of the *box* … and back again?

References

Baudrillard, J., & Glaser, S. F. (2020). *Simulacra and simulation*. The University of Michigan Press.

Beiswanger, W. (1998). *Monticello in measured drawings*. Thomas Jefferson Memorial Foundation.

Blender Foundation. (2021). Blender.org—Home of the Blender Project—Free and Open 3d Creation Software. https://www.blender.org

LinkedIn. (2021). LinkedIn Learning with Lynda: Online Training Courses for Creative, Technology, Business Skills. https://www.linkedin.com/learning/

Mojang Studios. (2021). Minecraft Official Site | Minecraft. Mojang AB. https://www.minecraft.net/en-us

Ohio Dept. of Commerce, State of. (2017). Ohio Building Code 2017 (OBC). https://www.com.ohio.gov/documents/AG%2093%20OBC%20Adoption%20Announcement.pdf

GIMP Team. (2021). GIMP–GNU Image Manipulation Program. https://www.gimp.org

Trimble. (2021). 3d Design Software | 3d Modeling on the Web | SketchUp. Trimble Inc. https://www.sketchup.com

Index

COPYRIGHTED MATERIAL — DO NOT DUPLICATE, DISTRIBUTE, OR POST