How many times have you been asked the question, "What do you want to be when you grow up?" It can be one of the most difficult questions to answer if you are not sure of the career options available, the amount of education required, or future job market opportunities. Some careers require four or more years of college, whereas others require only a two-year degree or hands-on training that can be acquired through an apprenticeship program. Training for your career will be one of the most substantial time and financial commitments affecting your future. Many students enter college without a major, or change majors, several times resulting in additional years to complete their college program. To prevent this from happening, it is important to research options that match your academic strengths and interests and interview people with careers that interest you. Overall, the most common advice you may hear is to choose a career you will enjoy. How do you determine which career path would be most enjoyable for you, without knowing what the career entails?

In this chapter we are going to examine two careers: civil engineering and architecture. You will read about job descriptions and the education they require. We will examine the stages of professional development and research the future job outlook. Finally, to expand your list of career options, we will take a brief look at other careers and agencies related to the design and construction of a structure.

Figure 2-1: *The number of civil engineers and architects in the workforce is expected to increase by 18 percent over the next decade. (Occupational Outlook Handbook, U.S. Department of Labor, Bureau of Labor Statistics.)*

CIVIL ENGINEERING AS A CAREER

Civil Engineer: an engineer responsible for the structural design and construction specification of public and private works such as buildings, roads, and harbors.

In Chapter 1, you read that **civil engineers** design structural works such as buildings, bridges, canals, dams, roads, tunnels, water systems, and water treatment facilities (see Figure 2-2). Structural engineers, a type of civil engineer, are responsible for the structural design of factories, power plants, processing plants, transportation facilities, and public meeting spaces. A structural engineer is often described as the one who designs *how* to build a structure. Architects depend on structural and civil engineers to insure that their residential and commercial buildings are strong, safe, and durable. During the building design process, a civil engineer may perform a site investigation as part of structural analysis. Civil engineers must adhere to strict codes when they specify requirements for a building project. These requirements include construction materials and procedures.

Civil engineers must continue learning about innovations in both building materials and construction techniques. Structures must be able to withstand live loads, such as occupants, and dead loads, such as building materials. A strong background in math and science is necessary to correctly apply the theory of hydraulics, thermodynamics, and physics. The civil engineer must plan for expected and unexpected natural forces. Civil engineers are innovative and try new designs, which sometimes fail. If a failure occurs, knowledge is gained from determining the cause of the failure. In some cases the civil engineer could be held liable. You will read more about loads in Chapter 9: Residential Space Planning. Civil engineers are often involved in some very exciting projects. Occasionally, investigations by civil engineers into the properties of materials, such as steel and concrete, have led to the creation and development of less expensive, stronger, and easier to manipulate materials with greater sustainability. A civil engineer could also be involved in environmental impact and site design, which will be explained in greater detail in Chapter 5: Site Discovery for Viability Analysis and Chapter 6: Site Planning.

Figure 2-2: Civil engineers apply knowledge of hydraulics, thermodynamics, and physics to design safe and durable structures.

Education, Training, and Skills Needed to Become a Civil Engineer

Let's imagine that your favorite classes in high school are math, science, and technology, and you have been successful at designing and constructing projects such as model bridges, towers, catapults, and cantilevers. You enjoy testing materials and performing the calculations required to determine how your structure will perform under loads. Civil engineering might be a career path for you (see Figure 2-3). However, before you decide, you will need to give it serious thought and research further to find the answers to the following questions:

- What is it like to be a civil engineer?
- Do I have an interest in this field?
- Do I have the academic skills necessary to succeed?
- What is the outlook for job availability after college?
- How much money can I expect to make?
- What are the opportunities for advancement?
- How many years of college will I need?
- What college courses are required?
- Which colleges offer this program?
- What additional certifications beyond college will I need?
- Will I enjoy this program?

Figure 2-3: A typical job posting for a civil engineer.

CIVIL ENGINEER

A local design firm is looking for a Civil Engineer with a concentration in structural engineering. Job responsibilities will include design and development of bridges and roadways including drainage and site planning. You must be an organized, independent worker who is able to communicate with clients and meet the federal and state regulations. Candidates must have a BS Degree in Civil Engineering, PE or be able to obtain a PE in 2 years and 2 years of experience is a must. Experience in structural engineering a plus.

Salary: 60–75K DOE.

Many of these answers can be found by accessing the Occupational Outlook Handbook on the U.S. Department of Labor Bureau of Labor Statistics website at *http://www.bls.gov*. This site provides valuable information that will assist you in making an informed career decision. For example, did you know that civil engineering in the United States has the highest employment of all the engineering specialty fields, and is expected to grow by 18 percent between 2006 to 2016? In 2006, there were over a quarter of a million civil engineers in the United States, ranking above the number of mechanical, industrial, electrical, electronics, aerospace, computer, environmental, and chemical engineers (see Figure 2-4)! You might also be interested to learn that the median earnings of a civil engineer in May of 2006 was $68,600, with the lowest 10 percent of civil engineers making $44,810 and the highest 10 percent earning $104,420. A survey conducted in 2007 by the National Association of Colleges and Employers reported the average starting salary for a civil engineer was $48,509. This information and much more can be found on the *http://www.bls.gov* website.

Figure 2-4: Civil engineering has the highest employment rate of all the engineering specialty fields.

A bachelor's degree is required to obtain an entry-level position as a civil engineer, and continuing education is necessary to keep current with new and emerging technology. College admission requirements for a civil engineering program require you to have a strong background in math and science. Once accepted into a four-year engineering program, your coursework would include general engineering, mathematics, physical and life science, design, computer applications, social sciences, and humanities. In addition, your program will incorporate a concentration of study and laboratory experiences specifically related to civil engineering.

Stages of Career Development to Become a Licensed Civil Engineer

The United States requires licensure for engineers to offer services to the public. It is important to choose an ABET accredited college or university if you plan to apply for licensure. The Accreditation Board for Engineering and Technology

(ABET) accredits many U.S. colleges and universities offering bachelor's degrees in engineering. Many civil engineers are licensed Professional Engineers, generally called PEs. PE licensure requires a degree from an ABET accredited engineering program, four years of relevant work experience, and successful completion of state exams. The first exam, the Initial Fundamentals of Engineering, can be taken late in the senior year or upon graduation. After passing the first exam, the engineer would be called an EIT, Engineer In Training, or an EI, Engineer Intern. After acquiring the necessary work experience, typically four or more years, the EIT will take a second exam called Principles and Practice of Engineering. Passing this exam will complete the licensure requirements. Most states recognize licensure from other states; however, many states have mandatory continuing education requirements for re-licensure. Continuing education addresses new and emerging technologies and practice and increase an engineer's opportunities for job advancement. Beyond fulfilling licensure requirements, some engineers choose to complete certification programs offered by professional organizations, whereas others pursue graduate and postgraduate degrees.

Website Resources

American Society of Civil Engineers, 1801 Alexander Bell Dr., Reston, VA 20191. Internet: http://www.asce.org

Information about careers in engineering is available from: JETS, 1420 King St., Suite 405, Alexandria, VA 22314. Internet: http://www.jets.org

Information on ABET-accredited engineering programs is available from: ABET, Inc., 111 Market Place, Suite 1050, Baltimore, MD 21202. Internet: http://www.abet.org

Those interested in information on the Professional Engineer licensure should contact: National Council of Examiners for Engineering and Surveying, P.O. Box 1686, Clemson, SC 29633. Internet: http://www.ncees.org

National Society of Professional Engineers, 1420 King St., Alexandria, VA 22314. Internet: http://www.nspe.org

Information on general engineering education and career resources is available from: American Society for Engineering Education, 1818 N St. NW., Suite 600, Washington, DC 20036. Internet: http://www.asee.org

4

ARCHITECTURE AS A CAREER

What would it be like to be an architect? Would a career in architecture match your interest and ability? It might, if you like looking at buildings and analyzing the room arrangement and exterior appearance and composition. Do you think about the building location and how it fits within its surroundings? Have you ever had an idea that would make a building look or perform better? Have you created sketches or drawings of these ideas? These may be clues that indicate you have an interest in architecture. As you read in Chapter 1, architects design residential and commercial habitable structures and built environments. Their designs are based on the principles and elements of design, spatial relationships, and environmental,

Figure 2-5: A typical job posting for an architect/project manager.

cultural, and functional considerations. Architects utilize math and science in harmony with artistic talents to create designs that are functional, aesthetically pleasing, and sustainable (see Figures 2-5 and 2-6).

"**Architects:** licensed professionals trained in the art and science of building design."
U.S. Department of Labor Bureau of Labor Statistics Occupational Outlook Handbook.

To research architecture as a career, we return to the U.S. Department of Labor Bureau of Labor Statistics website, where we learn that 132,000 architects were employed in 2006. That number is projected to increase by 18 percent to 155,000 over the next decade. The statistics also show that one in five United States architects is self-employed. An architect's job generally begins by meeting with a client to discuss the building objectives and budget. Following this meeting, the architect will begin the research and development of a suitable and sustainable plan. Architects are masters of blending form and function to create an aesthetically pleasing plan that fully addresses the client's needs. Many of today's architects are "designing for tomorrow," with conservative designs requiring less energy and maintenance.

In addition to preparing drawings, the architect often conducts research to support his or her building plan. This research could include a feasibility study, environmental impact study, land-use study, or cost analysis. The architect may follow a project throughout the construction process. Once the plans are complete, the architect will often oversee construction and collaborate with engineers, urban planners, interior designers, codes, and zoning officers to make sure their vision is attained.

The Bureau of Labor Statistics surveyed architect's earnings in May of 2006. The median annual earning for architects was $64,150. The lowest 10 percent earned

Figure 2-6: Architects must be creative, understand spatial relationships, have strong computer and communication skills, and be able to work both independently and within a team.

Figure 2-7: The path to become an architect includes an internship experience under the guidance of an experienced architect.

© Plus/iStockphoto.com.

Point of Interest

A Professional Standard

> "It is important that the title 'architect' is only conferred upon individuals who can demonstrate the successful completion of a university level academic program and a period of assessed practical training.
>
> Members of the architectural profession are dedicated to the highest standards of professionalism, integrity, and competence, and to the highest possible quality of their output. Thereby they bring to society special and unique knowledge, skills, and aptitudes essential to the development of the built environment of their societies and cultures."
>
> *Reprinted from UIA Accord on Recommended International Standards of Professionalism in Architectural Practice,* June 1999, International Union of Architects. *http://www.aia.org/practicing/groups/international/uia/AIAP073960* (Accessed 4/2/2010)

around $39,400, and the highest 10 percent earned $104,940. Factors contributing to the wide range of earnings were experience, location, changing business conditions, and working for an architectural firm versus independent practice.

5 Education Training and Skills Required to Become an Architect

Like civil engineers, architects must complete a lengthy university study. The Bureau of Labor Statistics website identifies a five-year bachelor's degree in architecture as the most common degree for a student with no previous architectural training. In most states this degree must be from a college or university accredited by the National Architectural Accrediting Board (NAAB). A registered or licensed architect in the United States will have the designation initials RA. Most architects join the American Institution of Architects and use the initials AIA after their name. Many view architecture as a holistic discipline. Future architects learn to produce functional, attractive, and sustainable designs by collaborating with practicing architects and academia. An architect's preparation must include an internship at a structured, monitored, and assessed workplace. This is a valuable part of his or her preparation. It provides architecture students the opportunity to develop and demonstrate necessary critical reasoning, professional judgment, knowledge, and skill. Assessment of the future architect is comprehensive. It includes evaluation of case studies, review of the experiences recorded in his or her logbook, examinations, and interviews with experienced members of the profession. It is only after rigorous study, practice, and assessment that one will be considered for the title of architect.

6 Stages of Career Development to Become a Licensed Architect

Following graduation from a five-year architectural program, the graduate works as an intern for approximately three years to gain practical work experience preparing drawings and models and assisting in project design (see Figure 2-7).

Point of Interest

Recommended Training

In 1999, the International Union of Architects Assembly recommended a set of global guidelines for International Standards of Professionalism in Architectural Practice (the Accord). The following passages are from the UIA policies on Demonstration of Professional Knowledge and Ability and Practical Experience/Training/Internship:

Incremental Assessment

> "The scope and standard of competency at all stages of an architect's education and professional training should be subject to regular accreditation/validation by an objective panel. . . .
>
> "Architectural education and professional training must undergo continuous change and review if it is to keep pace with the changing nature of practice and expectations of the public. Concern with sustainability, health and safety, and access for the disabled are all examples of education and practice, which have changed significantly in a decade."

Recommended Guidelines for the UIA Accord on Recommended International Standards of Professionalism in Architectural Practice Policy on Demonstration of Professional Knowledge and Ability, International Union of Architects, June, 1999. http://www.aia.org/aiaucmp/groups/aia/documents/pdf/aias075206.pdf (Accessed 10/19/2010.)

3. Categories of Experience

An intern should receive practical experience and training under the direction of an architect in at least half of the areas of experience nominated under each of the following four categories:

3.1 Project and Office Management

Meeting with clients
Discussions with clients of the brief and the preliminary drawings
Formulation of client requirements
Pre-contract project management
Determination of contract conditions
Drafting of correspondence
Coordination of the work of consultant's office and project accounting systems
Personnel issues

3.2 Design and Design Documentation

Site investigation and evaluation
Meeting with relevant authorities
Assessment of the implications of relevant regulations
Preparation of schematic and design development drawings
Checking design proposals against statutory requirements
Preparation of budgets, estimates, cost plans, and feasibility studies

3.3 Construction Documents

Preparation of working drawings and specifications
Monitoring the documentation process against time and cost plans
Checking documents for compliance with statutory requirements
Coordination of subcontractor documentation
Coordination of contract drawings and specifications

3.4 Contract Administration

Site meetings
Inspection of works
Issuing instructions, notices, and certificates to the contractor
Client reports
Administration of variations and monetary allowances

From *Recommended Guidelines for the UIA Accord on Recommended International Standards of Professionalism in Architectural Practice, Policy on Practical Experience/Training/Internship*. International Union of Architects, 1999. *http://www.aia.org/practicing/groups/international/uia/AIAP073960* (Accessed 4/2/2010).

This experience helps the intern prepare for the challenging and comprehensive Architect Registration Examination (ARE). Following successful completion of all divisions of the ARE, many will take positions within an architectural firm and then advance as they gain experience. For example, Architect I would have 3 to 5 years of experience; Architect II, 6 to 8 years of experience; and Architect III, 8 to 10 years of experience. The next step might be advancement to Manager. Managers are generally licensed architects with more than 10 years of experience. Architects in senior management are generally referred to as Associates, and an owner or partner in an architectural firm holds the title of Principal. Architects must work effectively both independently and as part of a team, often working more than 40 hours a week. Computer-based productivity tools such as Computer Aided Design and Solid Modeling are essential for today's architect.

Website Resources

For information about education and careers in architecture, visit: The American Institute of Architects, 1735 New York Ave. NW, Washington, DC 20006. Internet: http://www.aia.org

Intern Development Program, National Council of Architectural Registration Boards, Suite 1100K, 1801 K St. NW, Washington, D.C. 20006. Internet: http://www.ncarb.org

Bureau of Labor Statistics, U.S. Department of Labor, Occupational Outlook Handbook, 2008–09 Edition, Architects, Except Landscape and Naval, on the Internet at http://www.bls.gov

OFF-SITE EXPLORATION

Access the official website for America's Favorite Architecture provided by the American Institute of Architects located at *http://www.favoritearchitecture.org/#*. Explore and read interesting stories about structures, buildings, and built environments such as stadiums. For example, did you know that the corners of the famous Chrysler Building in New York City are adorned with replicas of Chrysler hood ornaments and radiator caps? You will also find some surprising facts about the Golden Gate and Brooklyn Bridges. While you are at this website, see if you can find the first baseball stadium to be covered by a roof of semi-transparent dome panels (see Figure 2-8).

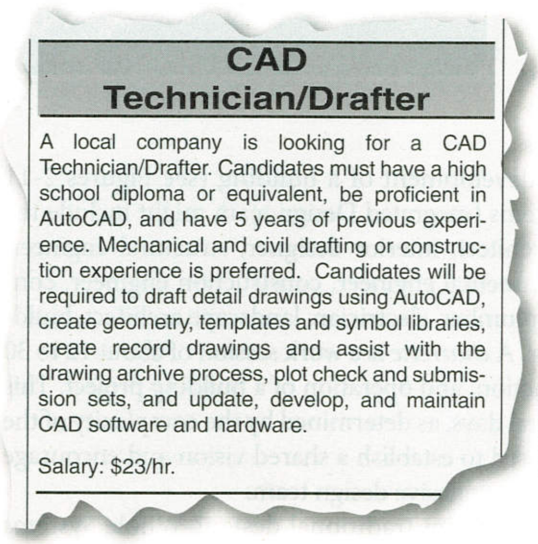
Figure 2-8: Why was the original field of grass replaced with artificial grass in the first stadium to be covered by a roof? The answer may surprise you.

CAREERS RELATED TO CIVIL ENGINEERING AND ARCHITECTURE

Following intense research and discussions with your guidance counselor, family, and career professionals, you may have concluded that you do not want to pursue becoming a civil engineer or architect. There are many other related careers that might be of interest to you. For example, you might want to consider a career as a Computer Aided Design (CAD) technician (see Figure 2-9), model maker, interior designer, building inspector, landscaper, or one of the many jobs in the construction field.

There are many job areas related to the built environment (see Figure 2-10). Specific areas include the following; surveying, geotechnical, estimating and bidding, planning, sales, marketing, health and safety, electrical, plumbing, HVAC, hydraulic, pneumatic, and mechanical systems. Based on local and state requirements, jobs in these fields require varying degrees of training and experience.

Figure 2-9: Job posting for CAD technician/drafter.



CAD Technician/Drafter

A local company is looking for a CAD Technician/Drafter. Candidates must have a high school diploma or equivalent, be proficient in AutoCAD, and have 5 years of previous experience. Mechanical and civil drafting or construction experience is preferred. Candidates will be required to draft detail drawings using AutoCAD, create geometry, templates and symbol libraries, create record drawings and assist with the drawing archive process, plot check and submission sets, and update, develop, and maintain CAD software and hardware.

Salary: $23/hr.

Figure 2-10: Each professional assesses the design and build of a structure from a unique perspective.

CIVIL ENGINEERS, ARCHITECTS, AND RELATED AGENCIES WORK TOGETHER IN THE DESIGN AND BUILD OF A STRUCTURE

Today's architects and civil engineers do not work in isolation, but instead seek out information and advice from other professionals. Architects and civil engineers are acutely aware of climate change, natural disasters, energy consumption, and shortages of water and other resources, all of which necessitate thoughtful selection and the use of economically and environmentally friendly materials and practice. Their goal is to create a healthy, economical, and sustainable building which strikes harmony between humans and their environment. A common practice applied to achieve this goal is the application of **integrative design**.

Integrative Design: a process that begins at the design stage and involves the entire building team uniting building elements and construction disciplines in a whole-building approach.

Figure 2-11: Academy of Sciences building in Golden Gate Park, San Francisco, California is a LEED-certified building with a living roof and photovoltaic panels.

Kim Steele/The Image Bank/Getty Images.

Figure 2-12: Using the Whole Systems Design Approach, various professionals work together to develop a shared vision of project goals and the strategies for attaining them.

Image copyright Yuri Arcurs, 2010. Used under license from Shutterstock.com.

Using a Whole Systems Integrative Design approach, engineers and architects work together with other experts and stakeholders in the design and development of a building (see Figures 2-11 and 2-12). For example, a Whole Systems Integrated Design team might include the following: client, project manager, architect, interior designer, structural engineer, urban planner, cost estimator, environmental engineer, construction engineer, construction manager, carpenter, mason, plumber, electrician, landscape architect, building inspector, and community director. A *charrette* is a work session of about 12 to 30 people involved in the design, construction, and operation of a building project. This work session may last one day, or several days, as determined by the complexity of the building project. A charrette is often used to establish a shared vision and encourage creativity and resource efficiency within a cohesive design team.

OFF-SITE EXPLORATION

Use the Internet to research the following standard:
ANSI/MTS Standard WSIP 2007

Identify the two prevalent concerns of the building industry addressed by the Whole Systems Integration Process Standard.

So how does integrated design differ from traditional design? Whole Systems Integrated Design is focused on collaboration within a multidisciplinary team, compared to a traditional *linear* approach in which each area develops design solutions separately. In a linear approach the architect would work on the floor plan layout and exterior design of the building. Then the engineer would determine the structural requirements, and others would work on the site development and **mechanicals**. Although a project director oversees the entire process, the individual disciplines do not meet as a group to provide input in the design development.

Mechanicals:
plumbing, electrical, HVAC (heating, ventilation, and air conditioning), and protection systems.

During a Whole Systems Integration Process, a team works together from the beginning to understand and develop the design. This "group think" process and resourceful input results in effective solutions for cost efficient, green, sustainable buildings. Dozens of successful projects support the fact that integrated design is an effective approach for creating comprehensive green buildings on reasonable budgets. The Syracuse Center of Excellence (CoE) provides an example of how the approach can work. The rendering in Figure 2-13 shows the team's vision for the CoE's green roof.

Figure 2-13: A rendering of the Syracuse Center of Excellence, Syracuse, N.Y.

Courtesy of Toshiko Mori.

Think of it this way: if your teacher gave you one test to complete individually and a second test that could be completed together as class, which score would be higher? Whole System Integration works much in the same way. Because each individual has different experience and knowledge, the combined intelligence of the group is far greater and typically provides a better outcome.

There are many ways to approach the integrated design process, and different firms will adapt best practices to suit their projects and staff. The Rocky Mountain Institute is a nonprofit group that studies our use of energy and resources in the built environment. The Institute has defined the following four principles as the foundations of integrated design:

1. **WHOLE-SYSTEMS THINKING:** taking interactions between elements and systems into account, and designing to exploit their synergies.
2. **FRONT-LOADED DESIGN:** thinking through a design early in the process, before too many decisions are locked in and opportunities for low-cost, high-value changes to major aspects of the design have dwindled.
3. **END-USE, LEAST-COST PLANNING:** considering the needs of a project in terms of the services (comfort, light, access) the end user will need, rather than in terms of the equipment required to meet those needs. For example, it's typically assumed that perimeter heating is essential to provide comfort at the edges of a building on cold mornings, but many green designers are now proving that high-performance buildings reduce energy use, noise, and maintenance demands.
4. **TEAMWORK:** Coming up with solutions, as a group, and collaborating closely on implementing those solutions aren't things that happen without strong facilitation and commitment.

Reprinted with permission from The Rocky Mountain Institute.

The CoE provides a shining example of the integrated design approach in practice. You can read about architect Toshiko Mori and the CoE team's process at *http://greensource.construction.com/features/0611mag_architects_Office.asp*.

The Whole Systems Integrated Process Guide (WSIP) 2007 for Sustainable Buildings & Communities was approved in 2007 as ANSI/MTS Standard WSIP 2007. Research this standard to find examples of building projects that have used the process. For example, the Syracuse CoE design team held a series of charrettes with architect Toshiko Mori and a team of internationally recognized consultants.

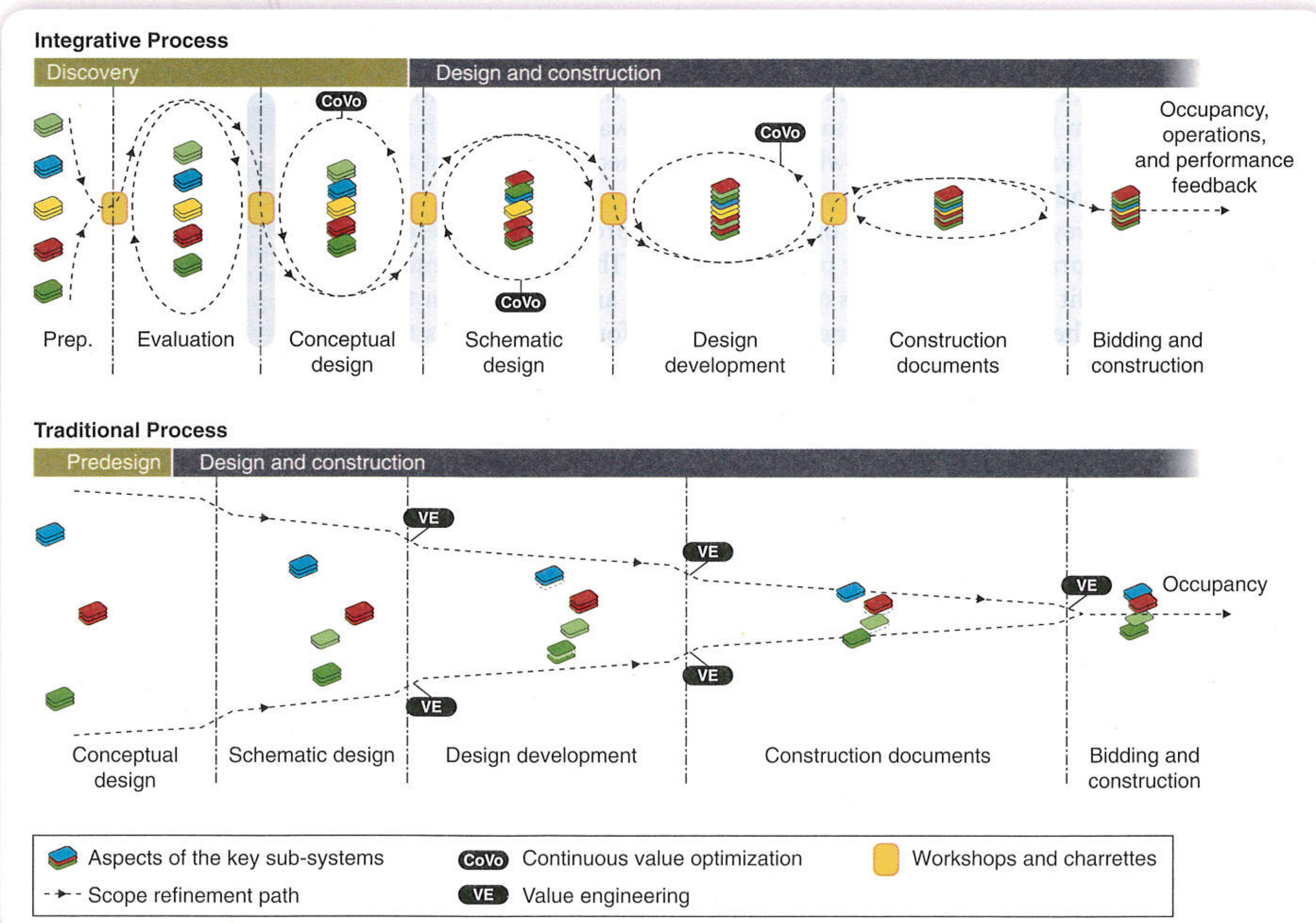
Table 2-1: Eight-Step Approach to Integration. Bunting Coady Architects, Vancouver

1: **Shape and shadow:** Massing and orientation decisions that involve function, daylight, and structural considerations.	5: **How the building breathes:** Natural ventilation and passive heating and cooling.
2: **SITE Opportunities:** Where to locate the building on the property, and how it will relate to its immediate context.	6: **Comfort system:** With heating and cooling loads largely determined, the team can get into systems design.
3: **Envelope:** Types of walls and location of windows	7: **Materials:** Materials chosen for various surfaces
4: **Lighting design:** Look at both daylighting and electrical lighting throughout.	8: **Quality Assurance:** Review the building as a system.

Reprinted with permission from Bunting Coady Architects.

Alternatively, Bunting Coady Architects in Vancouver, Canada, takes an eight-step approach to integration that allows goals to emerge throughout the process, Table 2-1. Figure 2-14 compares the integrated design process to the traditional design process.

Figure 2-14: *Comparison of integrated design process to traditional design process.*



Adapted with permission from Sevengroup and Bill Reed.

AGENCIES AND ORGANIZATIONS INVOLVED IN THE DESIGN AND DEVELOPMENT OF A STRUCTURE

9

The Whole Systems Integration Process must include communication with many agencies during the design and build process to insure a safe, well-built, sustainable structure constructed without injury or negative impact to the environment. The specific agencies and organizations which must be contacted, and their level of involvement, is determined by the structure's location and purpose (see Figure 2-15). For example, if you wanted to build a small footbridge on a nature trail through wetlands, you would need to contact the Department of Environmental Conservation (DEC), the Environmental Protection Agency (EPA), and the Army Corps of Engineers.

In addition to complying with codes established by regulatory organizations, today's conscientious design teams plan to achieve LEED certification for high performance buildings. LEED stands for Leadership in Energy and Environmental Design, a voluntary national rating system developed by the U.S. Green Building Council for construction of high-performance, sustainable buildings that reduce negative environmental impact and improve occupant health and well-being. Building projects are rated on site sustainability, water efficiency, energy and atmosphere, materials and resources, and indoor environmental quality to earn Certified Silver, Gold, and Platinum LEED Certification.

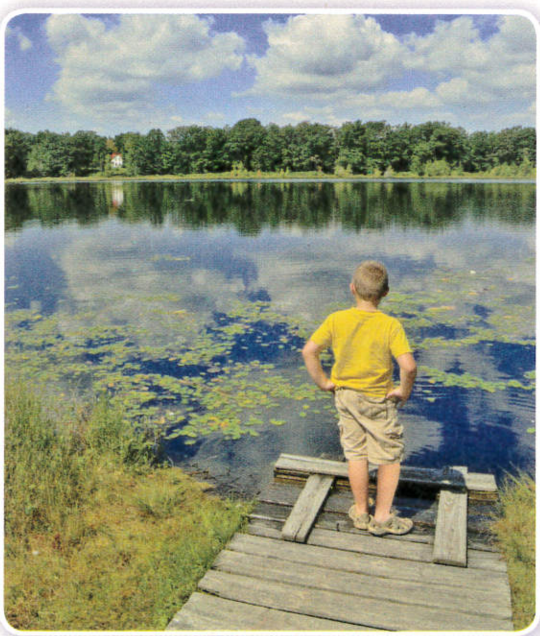
As you read future chapters of this textbook, you will learn more about other agencies, such as the International Code Council (ICC), which is dedicated to building safety and fire prevention. Many cities, counties, and states adopt the ICC construction codes to guide the planning and construction of residential and commercial buildings. In addition to state and federal organizations, local groups, such as the Community Development Agency and the Industrial Development Agency, are contacted to determine concerns of area residents and the impact the structure may have on the local economy and community.

Wetlands:
lands where water saturation is the dominant factor. The resulting bogs, marshes, swans, and fens provide a habitat for many species of plants and animals.

LEED:
Leadership in Energy and Environmental Design, a voluntary national rating system for construction of high-performance, sustainable buildings.

The U.S. Environmental Protection Agency (EPA):
an independent regulatory agency responsible for establishing and enforcing environmental protection standards.

Figure 2-15: Agencies provide detailed regulations established to protect the environment, humans, species, and their habitats.



Using EPA Website Tools

The EPA website contains interactive tools that provide regulatory information to assist architects and engineers. For example, in Region 3, you can find a link to an article on beneficial landscaping. Beneficial landscaping is designed with environmental friendly practices and materials that require less energy to maintain.

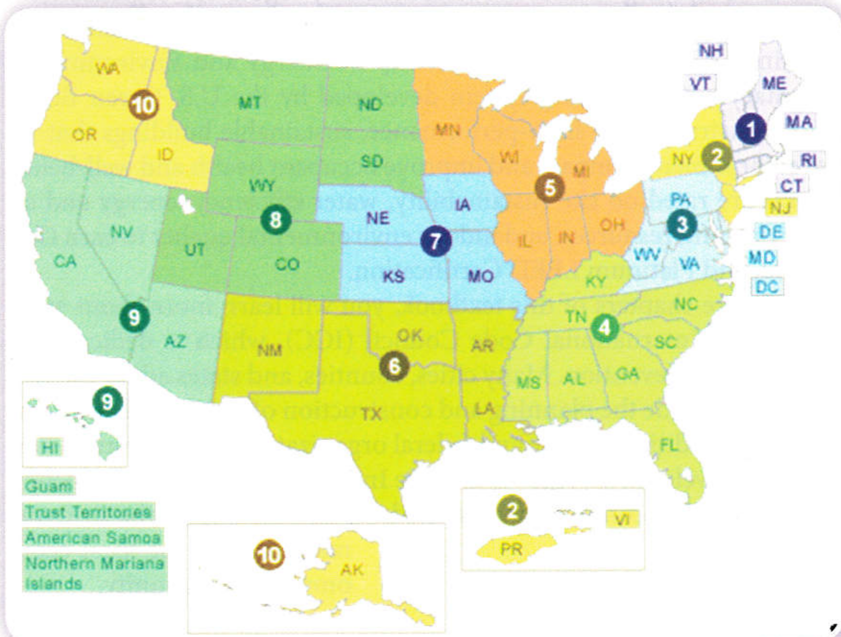
REGIONAL REGULATORY INFORMATION Searching the EPA.gov website can help you determine how to comply with Region regulations,

Check out regulatory information for your region of the United States. Make notes in your notebook for future reference. *http://www.epa.gov/lawsregs/where/index.html*

Figure 2-16. The EPA serves as the on-the-ground staff enforcing the regulations. Select an EPA Region from the following drop-down box or from the map to find regulatory information for your Region.

You can choose from two options to learn more about state-specific regulatory information: state plans and programs required by federal law and state resource locators. The EPA website provides links to state-level laws, regulations, and administrative agencies and provides plans, programs, and designations as required by federal regulations (e.g., your state's implementation plan under the Clean Air Act).

Figure 2-16: The EPA provides easy-to-access regulatory information for 10 regions of the United States at http://www.epa.gov/lawsregs/where/index.html.



Courtesy of the United State Environmental Protection Agency.

Careers in Civil Engineering and Architecture

The Representative for Everything

JENNIFER WORKMAN, PROJECT ARCHITECT, GOOD FULTON AND FARRELL ARCHITECTS

Clients give Jennifer Workman an idea of what they want, and she takes it from there. As a project architect, she manages a team that turns the idea into a functional building. That means seeing the project through every stage, from the drawings to construction. She gets approval from city officials, picks a contractor, and determines the best materials to use given the available funds.

"You're responsible for the client's happiness on the project," Workman says. "You need to make sure that the best product is being built."

On the Job

For most of her career, Workman has developed retail structures. Lately, she's moved on to a different kind of project, larger in scale. Her most important assignment to date is developing a 150,000 square feet museum in Dallas, Texas, called the Museum of Nature and Science. Two architectural firms are involved, and Workman is the contact between the two. She also deals with the contractor, the consultants, the exhibit designer, and the budget. The building will take four years to complete from start to finish.

"To work on one project for so long is pretty intense," Workman says. "It means you're really the representative for everything, and you need to know about everything on the project. It's very exciting."

Inspirations

As a child, Workman was always interested in math and science, as well as art. Her stepfather is an architect, and at 15 she went to work for him building models. She got to watch him draw plans, and he also took her to construction sites. She decided to go into architecture herself after high school graduation—just in time.

"With architecture, it is better to decide immediately when you go to college," Workman says. "You have long studios from the beginning, and if you miss those you could easily be in school for an additional few years."

Education

Workman studied architecture at the University of Texas-Austin. It's a big place, but her architecture classes felt as intimate as her small high school.

"The architecture students were divided into 15-person studios, which is typical for most college studios," she says. "You build close relationships with people."

Workman's favorite part of college was traveling abroad. Her program took her to several cities in Western Europe, where she spent time looking at buildings. She focused on museums, sketching and photographing them.

"It's really important to travel and see other things," Workman says. "It helps you think outside the box. In the museum project I'm working on now, I'm able to say, 'At the Louvre in Paris they do this kind of thing.'"

Advice for Students

Workman worries that students who feel they aren't good at art or math will avoid an architecture career. "There are so many areas of architecture where you don't have to draw well to create buildings people can enjoy," she says.

Workman suggests that high school students work at an architectural firm in any capacity, just to get a feel for the profession. She herself worked at one firm as a receptionist.

"This will help you decide if you want to be an architect," she says. "You have to be really passionate about the work."