



THE UNIVERSITY OF TEXAS AT AUSTIN

Civil, Architectural and
Environmental Engineering

Civil Engineering *Career Guide*

The civil engineering undergraduate curriculum in the Department of Civil, Architectural and Environmental Engineering at the University of Texas at Austin provides you, our students, with a strong foundation in the traditional areas of civil engineering practice. The structure of the curriculum allows you the flexibility to tailor your studies to one or more areas of practice: Construction Engineering and Project Management, Construction Materials, Environmental Engineering, Geotechnical Engineering, Structural Engineering, Transportation Engineering, or Water Resources Engineering. At the same time, the breadth and depth of our program will equip you with a solid background, should you decide to follow a non-traditional career path, or choose to pursue research and graduate studies either within or outside civil engineering.

To help you better understand the choices you can make when designing your course of study, this document provides a description of each of the most commonly encountered areas of practice, together with examples of typical employers and career paths, and the courses that can better prepare you for each area. Civil Engineering offers a broad spectrum of employment opportunities, in both the public and the private sectors, within the US and abroad. These opportunities exist in both technical and management positions within organizations of varying size that deal with a dizzying array of issues associated with both engineered and natural systems. Organizations that operate on a larger geographical scale frequently provide the opportunity for travel and have the expectation of occasional relocations as your career progresses. Some jobs afford the opportunity to work outside (e.g., construction-related

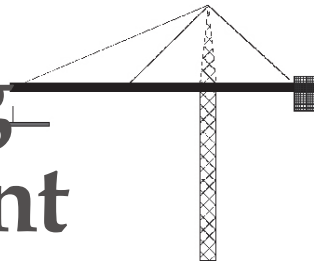
positions), some (e.g., design oriented) can allow you to qualify faster for a P.E. license than others, and some engineering specializations are centralized in large urban areas. Careers in engineering education and research are other possibilities for those who go on to earn a Ph.D. Given the variety and complexity of career choices, you should use this document only as a starting point for discussions with practicing engineers, faculty members, and career professionals (<http://ecac.engr.utexas.edu/>; <http://www.utexas.edu/student/careercenter/>) when considering your own career interests and the courses that will best serve those interests.

Your education at the University of Texas will provide an excellent foundation. To ensure a successful career you will need to further develop your technical and non-technical skills through a combination of practical experience and education. Because technology will continue to evolve, continuing education throughout your career is essential. Also, because many civil engineering jobs involve a significant amount of interaction with other team members, clients, and the general public, good communication and interpersonal skills will always be critical to success. Later in your career, business skills can be very useful as you move into management (and possibly ownership) positions in engineering organizations. More so than with other engineering fields, civil engineering has many entrepreneurial opportunities in businesses ranging from small consulting firms to the largest companies. Whatever career path you choose, this Department is committed to helping you succeed in meeting your goals.

Area of Practice

Construction Engineering

& Project Management



This area of practice, in general, tends to be more practical than theoretical. Excellent, broad-based people skills, as well as strong technical skills, are needed for success. Work on a project site is generally required, which provides outdoor work and the opportunity to interact with the various crafts. In a large company, this career path may offer opportunities for assignments at project sites in many locations, including international assignments. Frequent relocation or extended periods away from home are the norm with most large, national and international companies. Medium to smaller regional companies offer similar opportunities, but may allow career development through regional offices and hence require less relocation.

Typical Engineering Positions

Field Engineer	Cost Engineer
Project Superintendent*	Construction Administrator
Estimator	Project Manager*
Project Engineer	Scheduler
Operations Manager*	Project Controls Engineer
Construction Manager*	Project Executive*

* These positions typically require considerable experience

Tasks and responsibilities will vary depending on the type of employer and the experience of the employee. Even between similar types of firms, tasks will differ. Tasks that engineers may perform during their career include:

Project Planning	Estimating
Scheduling	Drawings/Plan Reviews
Labor Relations	Procurement
Value Engineering	Cost Analysis
Inspection	Constructability Analysis
Surveying & Layout	Leadership & Management
Contract and Subcontract Negotiations & Writing	
Materials Testing Coordination and/or Supervision	
Coordination of Construction Activities	
Recruiting, Hiring, Supervising & Training Craft Personnel	

In addition, certain companies may have engineers perform design functions. This work may include:

- Design, checking, and analysis of parts of or entire projects to be built.
- Construction systems or methods such as formwork for concrete,

reinforcing steel for lifting precast and tiltwalls, shoring, use of cranes and lifting devices.

- Supervising design work performed by other architecture or engineering firms or by in-house personnel.

Some of the unique capabilities that engineers can provide when they are employed by the construction industry are:

- Problem-solving ability
- Understanding of how the facility/structure/project to be constructed has been designed and how it will function
- Understanding business and technical relationships and the importance of communication and interaction between owners, contractors, sub-contractors, and suppliers
- Appreciation of the total process, teamwork, and coordination required by all parties to successfully design and build the project on schedule and budget

Typical Employers

• **Construction Companies/Contractors:**

- Types of firms include those who may specialize in one or more types of work including buildings, highways, bridges, utilities, power, petro-chemical, industrial, sanitary plants, mechanical, electrical and other trade specialties.
- Some construction companies, known as general contractors or Engineering, Procurement, and Construction (EPC) firms perform both design engineering and construction. They may employ engineers to do the design or outsource it to design/engineering firms and then direct and oversee their work. These companies are large and have a global presence. However, most of the construction firms in the USA build projects that have been designed by separate engineering and/or architectural companies.
- Generally, construction companies are required to sign contracts that require them to assume substantial risk by guaranteeing a price and completion date.

- **Industry:** These companies, also known as owner companies, may employ engineers to perform various project and construction functions related to their operations, process plants, manufacturing or facilities. Engineers may serve in roles where they are directly involved in the planning, contracting, engineering, estimating, inspecting, directing, and/or overseeing construction.



- **Multi-Unit Housing & Residential Construction:** A majority of companies in this country who build housing projects perform the construction functions in-house. Engineers often fill positions in planning, estimating and supervising construction.
- **Governmental:** Many government agencies employ engineers in various capacities to plan, estimate, supervise, coordinate, inspect and/or perform contract administration functions. Employers include municipalities, counties, state and federal agencies.
- **Military:** The Army, Navy and Air Force all have major construction programs and employ engineers either in a military or civilian capacity. All of these services have units of military construction personnel that are supervised by military officers who normally have engineering degrees. The Army and Navy have large construction contracting programs and employ engineers to perform many functions including planning, estimating and contracting. The Army Corps of Engineers has a major civil engineering/public works program throughout the USA.
- **Program & Project Management Firms:** Program and project management firms often are independent firms who work for an owner to perform various functions which may include planning, budgeting, estimating, contract negotiation and administration and inspection. They normally work for a fee and/or on cost reimbursable basis and are not at risk/responsible for the construction cost of the project, in contrast to construction companies.
- **Developers:** Companies that develop and build projects such as office buildings and retail projects may employ engineers. Generally engineers employed by these companies have gained prior experience in other construction or engineering areas.

Example Career Paths

- **Entry Level Positions:** Entry level positions could include positions in construction administration, project controls, assisting in estimating, material procurement, materials expediting, scheduling, cost control, limited project management responsibility, field layout, inspection of in-process and completed work, resolution of design issues encountered during construction, providing technical direction to crafts, labor, and subcontractors.
- **Advancement:** An experienced engineer may advance to a position of managing all field engineering activities on a large, complex project. Responsibilities might include quality control and progress reporting. The engineer's responsibilities might also include labor management. In this role, the engineer may be the superintendent for a specific area, such as civil work, earthwork, concrete, or structural steel. An engineer may be given a project assignment in scheduling, cost or estimating. Over time, the engineer would gain experience in many areas on increasingly complex projects. Later in a career, an engineer may become a project superintendent responsible for the work of all disciplines including concrete, steel, piping, mechanical and electrical. An engineer may advance further to become a site construction manager, responsible for all activities at the jobsite. After demonstrating competency in all areas of

project management, an engineer may be offered the opportunity to be a business manager or operations manager on a project, responsible for monitoring and accurately reporting all cost and schedule performance on a project. As an engineer demonstrates the ability to successfully lead and manage clients, employees and work quality, budget and schedule, areas of responsibility may increase to include all activities on large, complex projects, including engineering, procurement and construction, which are typically managed by a project manager or project executive. Later an engineer may manage an entire office. Eventually a construction engineer can be president of a construction company or become a general manager or vice president in some of the largest companies in the United States.

Educational Background and Licensing Requirements

Students should emphasize elective courses in the areas of project management, estimating, scheduling, contracts and business. An alternate is to take additional engineering courses in varied subjects so as to broaden the engineer's understanding in various areas. Examples might include foundation engineering, pavement design, steel and concrete design, building environmental systems, and hydraulics. The ability to work toward obtaining a P.E. license depends on the employer and the work assignments. An advanced degree in Construction Management or an MBA might enhance one's career in construction. However, before doing this an engineer should investigate the various construction career opportunities and employers to see if and when the advanced degree will be most beneficial. Engineering students without a strong background in project management related courses may also benefit from a Master's degree concentration in construction engineering and/or management to speed entry into the construction industry.

Major Professional Societies

- American Institute of Constructors (AIC);
<http://www.aicnet.org>
- American Society of Civil Engineers (ASCE);
<http://www.asce.org>
- Associated General Contractors of America (AGC);
<http://www.agc.org>
- Association for the Advancement of Cost Engineering (AACE);
<http://www.aacei.org/>
- Construction Industry Institute (CII);
<http://www.construction-institute.org>
- Design/Build Institute of America (DBIA);
<http://www.dbia.org>
- Project Management Institute (PMI);
<http://www.pmi.org/info/default.asp>

Area of Practice

Construction Materials



A thorough understanding of key construction materials, such as asphalt, concrete, steel, masonry, and composites, is essential to ensuring a long-lasting infrastructure. Engineers who specialize in materials are integral parts of design, construction, and forensics firms. Although some materials experts are versed in a range of materials, most tend to specialize in certain areas. For instance, engineers often specialize, for example, in asphalt for road construction or concrete for pavements, bridges, or buildings. Materials engineers typically work in close cooperation with structural engineers to integrate the use of innovative materials in construction or with other specialized areas of civil and environmental engineering.

Typical Engineering Positions

- Materials selection, specification and design: selection and design of materials for specialty applications and environments, design of concrete mixes, batch plant oversight, selection of grade for structural steel applications, design and specification of welding procedures, specification of composites for specialty applications.
- Materials performance: testing and qualification of materials for service, fracture and fatigue analyses and designs, finite element analysis of complex structural components, failure investigations.
- Construction quality assurance: specification and oversight of concrete, steel and soil materials testing programs for quality assurance during construction.

Typical Employers

- Consulting engineering firms
- Construction companies
- Highway and other governmental authorities responsible for civil infrastructure
- Industries with unique materials requirements (e.g., oil, chemical)
- Testing laboratories (for QC/QA tests associated with construction projects)
- Forensics firms (for determining the cause of structural failures or distress)

Example Career Paths

In a consulting engineering firm, initial assignments would involve assisting with mix design or material selection, design of QA programs for small construction projects, and oversight of field personnel performing QA testing. With increasing experience, responsibilities would grow to overall accountability for material QA on large projects. Later in their careers materials engineers may become involved with forensic investigations of materials-related failures, selection of materials for unique or exotic uses, or serve as the in-house technical expert for a large design firm or oil company.

Educational Background and Licensing Requirements

In addition to CE courses, students should take some ME courses in metallurgy, corrosion, and welding (if not available in CE), and coursework to understand the composition, performance and uses of composites (may be taught in Chem E or ME). Advanced degrees are recommended for those who want to be engaged in challenging problems earlier in their career. Some Universities, such as UT, offer specialized programs in construction materials for students pursuing MS or Ph.D. degrees.

Major Professional Societies (in alphabetical order)

American Concrete Institute (ACI),
<http://www.concrete.org>
American Institute of Steel Construction, Inc. (AISC),
<http://www.aisc.org/>
American Iron and Steel Institute (AISI),
<http://www.steel.org/>
Post-Tensioning Institute (PTI),
<http://www.post-tensioning.org/>
Precast/Prestressed Concrete Institute (PCI),
<http://www.pci.org/>
Structural Engineers Association of Texas (SEAoT),
<http://www.seaot.org/>
Transportation Research Board (TRB),
<http://www.trb.org>

Area of Practice

Environmental Engineering



Environmental engineers address problems related to public health and the environment including drinking water treatment and distribution systems, wastewater collection and treatment systems, solid waste disposal, air pollution control, recycling and conservation methods, water reclamation and reuse, hazardous-waste management, containment, and site remediation, and ecosystem protection and restoration. Environmental engineers also work on large-scale issues such as acid rain, global warming, and ozone depletion.

Typical Engineering Positions

- Planning, design and operation of treatment processes for drinking water, municipal and industrial wastewaters, water reuse, industrial process waters, contaminated air, solid wastes, and remediation of hazardous waste sites.
- Planning, design, and operation of distribution systems for drinking water and collection systems for wastewater. Modeling of water quantity and quality in distribution systems.
- Assessment and modeling of contaminant fate and transport in the environment including groundwater, surface water, air, soil, and interactions among these media.
- Developing regulations and policy or reviewing compliance with state and national environmental regulations, including drinking water, wastewater treatment, air, solid wastes, and hazardous wastes.
- Planning and designing facilities or programs for natural environment protection or ecosystem restoration.

Typical Employers

- Consulting engineering firms
- Government planning, operating, and regulatory agencies
- Municipalities and utility authorities
- Affected industries (e.g., oil, chemical, manufacturers)
- Non-profit environmental organizations

Example Career Paths

- Engineers focusing on design and process engineering are often employed by consulting engineering firms. At first they assist with small portions of an overall planning and design, with their responsibilities increasing as they become more experienced. More experienced engineers are in responsible charge of projects and typically develop client relationships with the goal of business development. Later in their careers, consulting engineers can become involved in management of the firm or serve as an in-house technical expert.
- Engineers employed by public agencies may have responsibility for operation of civil works infrastructure. For example, water supply and flood management agencies will employ environmental engineers as decision makers for operating reservoir systems or systems of aqueducts, pipes, pumps, diversions, and other water control measures. Initially, engineers in these positions will complete analyses with mathematical models and field surveys to provide information for the decision making. Experienced engineers will be responsible for operations that meet multiple, sometimes conflicting, objectives.
- Engineers who want to focus on project management early in their careers can often do so working for municipalities and utilities. Typically, these jobs require a combination of basic design skills, some process knowledge, and an interest in operational challenges. Depending on the size of the utility, the jobs may be more narrowly defined as engineering design, project management; process engineering or environmental. Experienced engineers in municipal and utility positions often advance to management positions, but in larger organizations technical experts do play a role.
- Regulatory agencies have a serious need for well-trained engineers to manage the implementation of increasingly complex regulations. Beginning engineers will likely find that they have a significant level of responsibility very rapidly in regulatory agency positions. These positions can include providing technical assistance to utilities, developing regulations and the guidance for rule implementation, and compliance reviews of regulated entities. Positions at the federal and state level will be slightly different with respect to hands on connection with the regulated community because the state regulators are typically in charge of enforcement. More experienced



engineers will be in positions of management and be in responsible charge of developing governmental policies.

- Working for a private industry as an environmental engineer could include responsibility for environmental compliance or development and operation of pretreatment for waste streams produced by the industry.

Air and Waste Management Association (AWMA),

<http://www.awma.org>

American Water Works Association (AWWA),

<http://www.awwa.org>

Environmental and Water Resources Institute of ASCE,

<http://www.ewrinstitute.org/>

Water Environment Federation (WEF),

<http://wef.org>

Educational Background and Licensing Requirements

Students should emphasize elective courses in environmental engineering and water resources and should include science courses (biology, chemistry, geology) beyond those required. A number of positions in this area require a Master's degree for career advancement; some students obtain a graduate degree immediately upon completion of their BS, while others work for several years before obtaining a graduate degree.

Working as a consulting engineer requires registration as a Professional Engineer. Responsible positions in many government planning, operating, and regulating agencies require PE registration. Students should take the Fundamentals of Engineering (FE) Examination before leaving undergraduate school and be aware of the registration requirements for the states in which they wish to work. PE registration requirements are defined by the States.

Major Professional Societies

Area of Practice

Geotechnical Engineering



Geotechnical engineers deal with soil, rock, and underground water, and their relation to design, construction, and operation of engineering projects. Nearly all civil engineering structures are supported on or built into the ground, and thus require geotechnical engineering. Geotechnical engineering also has evolved and branched off into new areas such as geoenvironmental engineering, which deals with underground environmental problems. Some geotechnical engineering positions provide an opportunity to spend considerable time outdoors, collecting samples, testing ground areas, and advising on work in progress.

Typical Engineering Positions

- Site investigations (conducting field work, in situ and laboratory testing, data reports)
- Design of foundations, embankments, retaining walls, slope stability analyses.
- Construction quality control (compaction testing, pile inspection, testing anchors, etc.)
- Investigation and assessment for contaminated soil and groundwater (link to environmental engineering, but frequently required of geotechnical engineers)
- Design of earth dams, tailing ponds, waste management facilities and other mainly geotechnical structures
- Seismic analysis (hazard identification, ground response analysis, liquefaction evaluation)
- Geotechnical aspects of mining (slopes, underground openings, waste piles, tailings)
- Geotechnical aspects of pipelines
- Ground improvement; design, construction, quality control, testing.
- Dewatering for construction
- Design and construction of underground excavations, such as tunnels and caverns.

Typical Employers

- Specialist consulting engineering firms (usually geotechnical and environmental).
- Oil and gas exploration and production companies.
- Mining companies
- Large engineering/procurement/construction (EPC) contractors.
- Architectural and engineering (AE) firms.
- Federal, state, and local transportation agencies.
- Specialist contractors (soil improvement, piling, foundations, retaining structures)

Example Career Paths and Project Activities

- At the beginning of their careers, geotechnical engineers will probably tend to do site investigations and be involved in preparation of site investigation reports. Because soils laboratory testing will be part of these investigations, the geotechnical engineer will need to specify the laboratory program and interpret the results. There will also be opportunity for analysis of foundations, slopes, retaining walls, etc. as part of the engineering following site investigations, under supervision of a P.E.
- Other typical early career duties include quality control during earthworks construction – density testing, making sure materials meet specifications, etc.
- After a few years, and licensure as a P.E., the geotechnical engineer will work with less supervision, and may become responsible for planning investigations and supervising others doing the work. The individual may be involved also in evaluating alternative foundation systems and making recommendations on preferred systems.
- After a decade or more experience, a geotechnical engineer may be responsible for more complex projects, working with project owners or other engineers to develop suitable geotechnical engineering solutions on difficult sites, and undertake projects such as earth dam or water retention structures.
- In a large Architecture-Engineering or Engineering, Procurement and Construction company, a geotechnical engineer may advance to become involved in many projects at one time, being responsible to each project for the geotechnical aspects, e.g., ensuring the appropriate foundations are recommended. Rather than carrying out the work, the individual may recommend appointment of specialist consultants to carry out the work and oversee their work.



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- Resource exploration companies that have a need for geotechnical services (typically the oil and gas and mining sectors) will frequently employ geotechnical engineers, sometimes straight out of school or more typically once they have accumulated some experience in consulting or contracting. In this position the geotechnical engineer may be responsible for understanding the employer's business and how geotechnical engineering services add value. The engineer will either do geotechnical work, or manage consultants, or most probably a combination. There may also be a role for a research and development component to advance technologies that are useful to the employer.
 - Geotechnical issues are important for most civil engineering contracts, so that contractors have a need for geotechnical engineers of all levels. In addition to some of the duties described above for the consulting engineering industry, the geotechnical engineer will have to prepare cost estimates for tenders and spend significant effort devising alternative solutions to soil improvement and foundation designs.

<http://www.asfe.org>
Geo-Institute of ASCE,
<http://www.geoinstitute.org/>
International Society for Soil Mechanics and Geotechnical
Engineering (ISSMGE),
<http://www.issmge.org/>
North American Geosynthetics Society,
<http://www.nagsigs.org>

Licensing Requirements and Educational Preparation

- In addition to geotechnical engineering electives, prospective geotechnical engineers should consider elective courses in geology, engineering geology, and geophysics.
- To advance in a career in geotechnical engineering, a Professional Engineer's (PE) license is generally a requirement.
- In the geotechnical consulting field, a master's or higher degree is almost essential for career advancement. Many companies will employ staff with bachelor's degrees and then encourage further education part-time or allow leave of absence to study full time.

Major Professional Societies

American Rock Mechanics Association (ARMA),

<http://www.armorocks.org/>

ASFE (Formerly American Society of Foundation Engineers),

Area of Practice

Structural Engineering



Structural engineers generally establish the geometrical layout and member proportions of structural systems to economically resist the forces induced on the structure throughout its life. Design forces are dependent on the type of structure as well as the geographic location and can result from a variety of sources including gravity, wind, waves, or earthquakes. Structural engineers must be familiar with the behavior and interaction of different materials such as steel, concrete, masonry or wood so that they can proportion and combine the materials to produce innovative solutions to challenging problems. Structural engineers often work with architects, builders, and engineers from other disciplines to organize and supervise the construction of large-scale projects. Structural engineers also analyze the capacity and condition of existing structures, investigate the causes of structural failures, and design retrofits to problematic systems.

Typical Engineering Positions

Design

- Design of building superstructures, garages, foundations, bridges, offshore and marine structures, and industrial facilities.
- Repair, rehabilitation, and strengthening of existing facilities, historic structures, and aging infrastructure.

Analysis

- Analysis of structures subjected to gravity, lateral (earth, wind, and seismic), vehicular, vibration, blast, and fluid loads.

Safety Inspection; Forensics; Investigation

- Inspection and condition assessment of existing structures.
- Evaluation of serviceability, durability, stability, and strength problems with structures.

Research

- Assessment of new and novel structural materials and systems and advanced applications of conventional structural materials and systems.


Computer Programming

- Development of structural engineering software.

Typical Employers

- Consulting engineering firms.
- Oil, petrochemical, and other major industrial companies.
- Large engineering/procurement/construction (EPC) contractors.
- Architectural and engineering (AE) firms.
- Federal, state, and local transportation agencies.
- Regional transportation toll authorities.
- Building code authorities.
- Industry associations.
- General contractors and specialty structural contractors.
- Real estate owners and developers of significant and high profile structures.
- Management consulting firms involved in construction dispute and claims analysis.

Example Career Paths and Project Activities

- At the beginning of their careers, structural engineers work under licensed professional engineers (P.E.) or structural engineers (S.E.) designing small structures or components of more complex structures. Structural engineers are expected to determine applicable loads, determine load paths, analyze the structure or component for maximum load effects, and size and select members to resist maximum load effects and ensure compliance with applicable building codes. Typical project activities include design modeling, calculations, fieldwork, and extensive oral and written communication.
- Subsequent to professional registration, a structural engineer will be responsible for selection of appropriate systems for structural efficiency that meet project budgetary constraints. At this level, the structural engineer will generally work independently or in a small team led by a senior structural engineer. The engineer may supervise other engineers-in-training (E.I.T.).
- After a decade or more experience, a structural engineer may be in responsible charge of advanced and complex projects, leading a large team or division of structural engineers. The individual will generally be responsible for resource allocation from start to finish, project scheduling, and monetary profit or loss. The individual will be responsible for setting direction, developing proposals for new work, maintaining existing clients, and addressing problems.
- In a large company, an experienced structural engineer may advance to a position of managing all engineering activities on a large, complex project, including other disciplines such 

architectural, mechanical, and electrical.

- A senior engineer may specialize in a technical area, such as seismic analysis of LNG tanks, or cold weather design of dynamically loaded structures. A technical expert in a large company has the opportunity to solve unique problems in projects located all around the world. An engineer may also participate in code committees, speak at conferences, write papers, and influence future engineering research and design.
- As an engineer demonstrates ability to manage clients, employees and work quality, budget and schedule, areas of responsibility may increase to include all activities on large, complex projects, including engineering, procurement and construction. Later an engineer may manage an entire office. Eventually a structural engineer can become a general manager, partner, and owner in businesses ranging from small consulting firms to some of the largest companies in the US.

Licensing Requirements and Educational Preparation

- To advance in a career in structural engineering, a Professional Engineer's (PE) license is generally a requirement.
- To become licensed, the structural engineering student should take the Fundamentals of Engineering (FE) Examination as a junior or senior. In most states (including Texas), after at least four years of relevant experience one can take the Principles and Practice Examination in either Civil Engineering or Structural Engineering (see the subject list from a recent "Structural I" P.E. exam). Upon passing this exam, the structural engineer becomes a licensed Professional Engineer. In some states, such as Illinois, California, and Washington, in order to practice all aspects of structural engineering, an additional examination is required for registration as a Structural Engineer (S.E.)
- For a career in structural engineering, a master's degree is encouraged, and is almost essential to pass the Principles and Practice Examination. Some employers encourage continuing education, even paying for a portion of tuition to obtain a master's degree while working; however, many employers require students to complete their education prior to commencing work. With a master's degree, one can generally take the Principles and Practice Examination after three years of experience.
- To be prepared for the exam and a career in structural engineering, student should take as many Level I and Level II electives in structural engineering as possible, along with a course in foundation engineering.

Major Professional Societies (in alphabetical order)

American Concrete Institute (ACI),

<http://www.aci-int.org/>

American Institute of Steel Construction, Inc. (AISC),

<http://www.aisc.org/>

American Iron and Steel Institute (AISI),

<http://www.steel.org/>

American Segmental Bridge Institute (ASBI),

<http://www.asbi-assoc.org/>

National Concrete Bridge Council (NCBC),

<http://www.nationalconcretebridge.org/>

National Society of Professional Engineers (NSPE),

<http://www.nspe.org/>

National Steel Bridge Alliance (NSBA),

<http://www.aisc.org>

Post-Tensioning Institute (PTI),

<http://www.post-tensioning.org/>

Precast/Prestressed Concrete Institute (PCI),

<http://www.pci.org/>

Structural Engineers Association of Texas (SEAoT),

<http://www.seaot.org/>

Structural Engineering Institute of ASCE,

<http://www.seinstitute.org/>

Area of Practice

Transportation Engineering



Transportation engineers are concerned with the planning, design, construction, operation, maintenance and management of all forms of transportation systems for both people and goods. Transportation engineers design, test, and optimize systems and structures used to move people, cars, trucks, trains, airplanes, and ships in a safe, efficient, and sustainable manner. They also plan future travel needs of urban and rural areas as populations increase and economic activities evolve, and design proactive strategies to alleviate traffic congestion and related environmental problems.

Typical Engineering Positions

- Planning and preliminary design of proposed transportation facilities and services
- Design of transportation system components, such as pavements, structures, airport terminals and runway configurations, roadways, rail lines, ports and shipping channels, and transit stations.
- Construction supervision and quality control and quality assurance
- Operation of transportation and traffic systems, including traffic signal control, signage, transit operations, sea vessel operations, and airline operations
- Planning and management of transportation infrastructure maintenance
- Modeling of traveler behavior and infrastructure performance in response to changes in transportation service
- Designing logistics systems as part of a larger supply-chain framework to move raw products to production/manufacturing systems and move finished products from production/manufacturing systems to the end-customer.

Typical Employers

- Consulting engineering, planning, and management firms
- Federal/State transportation and environmental agencies
- Metropolitan planning organizations
- Regional/local transit and other government transportation agencies
- Regional/local air quality agencies
- Major airline, sea vessel, and road carriers
- Private construction contractors and suppliers

Example Career Paths

- Increasingly, civil engineers do not spend an entire career with one

employer. An engineer may begin a career with a state department of transportation, move to a consulting firm or local agency, and possibly return to a state transportation agency at a later career stage.

- Most transportation engineers will begin their careers by concentrating in one or another technical specialty area (e.g., pavement design, planning, operations, logistics) and one of a few transportation modes (e.g., surface motorized modes, non-motorized modes, sea transportation, or air transportation). Within a specialty area and one or more mode(s), most individuals will complete analyses using travel surveys, traffic data, mathematical models, and software packages to inform decision-making. As more experience is obtained, an engineer may continue to concentrate in that specialty area and develop highly focused technical expertise, or may instead gravitate toward project and program management responsibilities that cut across technical specialties. Mid-level professionals generally play a technical-managerial role within their organization, and interact with other agencies and the public. A senior transportation professional may lead regional, state, and federal transportation agencies, and take a leadership role in shaping the transportation system through broad transportation policy initiatives (e.g. toll roads, speed limits). At all technical levels, transportation engineers are likely to make oral presentations; they will also be expected to write technical reports for diverse audiences, including other professionals, policy makers, and the general public.

Educational Background and Licensing Requirements

- Students should emphasize elective courses in transportation engineering. It would also be valuable to include mathematics, programming, economics, optimization, and statistics courses.
- A Master's degree will be required in many technical areas for advancement; for some it will be a prerequisite for an entry level position. Professional registration is always a good idea, and is particularly critical for design-related positions.

Major Professional Societies

American Association of State Highway and Transportation



Officials (AASHTO),

<http://www.aashto.org>

Association of Asphalt Pavement Technologists (AAPT),

<http://www.asphalttechnology.org>

Institute for Operations Research and the Management Sciences (INFORMS),

<http://www.informs.org>

Institute of Transportation Engineers (ITE),

<http://www.ite.org>

Intelligent Transportation Society (ITS) of America,

<http://www.itsa.org>

International Society for Asphalt Pavements (ISAP),

<http://www.asphalt.org/>

International Society of Concrete Pavements (ISCP),

<http://www.concretepavements.org/>

Institute for Operations Research and the Management Sciences (INFORMS),

<http://www.informs.org>

Transportation Research Board (TRB),

<http://www.trb.org>

Transportation and Development Institute of ASCE,

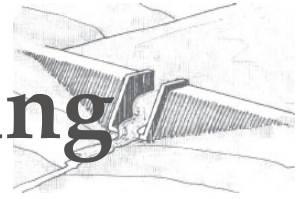
<http://www.tanddi.org/inside/mission.cfm>

World Conference on Transport Research Society (WCTRS),

<http://www.wctrs.org>

Area of Practice

Water Resources Engineering



Water resources engineering deals with the engineering aspects of hydrology and hydraulics as applied to water supply management, water excess management, and environmental protection and restoration. Water resources engineers focus on flood prevention; water supply for cities, industry, and agriculture; protection of beaches from erosion, management of rivers and estuaries; and habitat protection for aquatic species. The water quality aspects of water resources engineering have much in common with environmental engineering; thus, a considerable overlap exists for these two areas of practice.

Typical Engineering Positions

- Planning, designing, or operating facilities or programs for flood and storm water modeling and management, floodplain management, and flood response.
- Planning and designing facilities or programs for natural environment protection or ecosystem restoration.
- Planning, designing, or operating facilities or programs for water supply.
- Developing and using computer software to analyze and design water management systems.
- Developing policies for management, preservation, and enhancement of watersheds.

Typical Employers

- Consulting engineering firms
- Government planning, operating, and regulatory agencies
- Municipalities, utility, and river authorities
- Non-profit environmental organizations

Typical Career Paths

- Engineers employed by public agencies may have responsibility for operation of civil works infrastructure. For example, water supply and flood management agencies will employ water resources engineers as decision makers for operating reservoir systems or systems of aqueducts, pipes, pumps, diversions, and other water control measures. Initially, engineers in these positions will complete analyses with mathematical models and field surveys to provide information for the decision making. Experienced engineers will be responsible for operations that meet multiple, sometimes conflicting, objectives.

- Engineers with an emphasis in water resources could work for either a consulting firm or a government agency that focuses on developing or protecting water resources, protecting natural ecosystems, restoring altered ecosystems, or providing for safety of the public and property. At first this work might include basic evaluation of hydrologic processes or modeling of watersheds. At a more advanced level, management and policy decisions regarding water resources would be part of the position.

Educational Background and Licensing Requirements

Students should emphasize elective courses in water resources and environmental engineering. Courses that emphasize mathematical modeling and geographic information system application will be especially useful. A number of positions in this area require a Master's degree for career advancement; some students obtain a graduate degree immediately upon completion of their BS, while others work for several years before obtaining a graduate degree.

Working as a consulting engineer requires registration as a Professional Engineer. Responsible positions in many government planning, operating, and regulating agencies require PE registration. Students should take the Fundamentals of Engineering (FE) Examination before leaving undergraduate school and be aware of the registration requirements for the states in which they wish to work. PE registration requirements are defined by the States.

Major Professional Societies

American Geophysical Union,
<http://www.agu.org/>

American Water Resources Association,
<http://www.awra.org/>

Environmental and Water Resources Institute of ASCE,
<http://www.ewrinstitute.org/>

American Water Works Association (AWWA),
<http://www.awwa.org>

Water Environment Federation (WEF),
<http://wef.org>

Organizations Recently Hiring BSCE Graduates

Aguirre and Fields
Alan Plummer Associates
Archer Weston
Architectural Eng.Collabo
Axiom and Blair Engineering
Binkley & Barfield, Inc.
Birkhoff, Hendricks, & Company
Brown & Gay Engineers Inc
Brown Consulting
Burlington Northern Santa Fe Railroad
Bury & Partners
C. Faulkner Engineering
C.F. Jordan
Capital Excavation
Carter & Burgess
CBD Engineering
CenterPoint Energy
Centex Construction
Chiang, Patel & Yerby Inc.
City of Dallas - Engineer
Control Engineering
CTL Thompson of Texas
Cunningham-Allen, Inc.
D.E. Harvey Builders
Dallas Water Utilities
Drash Engineering
El Paso Corporation
ExxonMobil
Ferrell Geotech
Fluor Corporation
FM Global
Freese & Nichols Inc.
Gibson & Associates
Goodwin & Marshall Inc.
Granite Construction
Halff Associates Inc.
Halliburton Company
HDR Engineering Inc.
HVJ Associates, Inc.
Jones & Carter, Inc.
KBR
Kimley-Horn
Klotz Associates
KSA Engineers
Lentz
Lina T. Ramey & Associates
Linbeck Construction Corp
Llano-Permian Environmental
Lockwood, Andrews, and Newnam
Los Angeles County Dept. of Public Works
Lower Colorado River Authority
Mactec Engineering & Consulting
Metcalf & Eddy
MFG, Inc.
Michael Baker Jr., Inc.
National Oilwell
Pape Dawson Engineers, Inc.
Parkhill, Smith & Cooper
Pate Engineers Inc.
PBS&J
RJN Group, Inc.
Sandia National Labs
Schlumberger
Skanska
Texas Dept. of Transportation
Turner Collie & Braden
Turner Construction Company
U.S. Army Corps of Engineers
United States Marine Corps
URS Corporation
Van De Wiele Engineering
Vigil & Associates
Zachry Construction Corporation
