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## CIVIL ENGINEERING

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Civil engineers are concerned with the structures in which we live and work, the transportation systems by which we travel, and the environment around us. They plan, design, and supervise the construction of facilities essential to modern life in both the public and private sectors. Facilities that vary widely in nature, size and scope: space satellites and launching facilities, offshore structures, bridges, buildings, tunnels, highways, transit systems, dams, airports, irrigation projects, treatment and distribution facilities for water and collection and treatment facilities for waste water.

If one becomes a civil engineer one will be in the forefront of high technology's newest application; one will be involved in community development and improvement; one will be a problem solver, a doer. The opportunity for creativity is unlimited, since each end product is custom designed.

There are basically seven different fields of civil engineering: structural, water resources, geotechnical, environmental, construction, and survey engineering. Within each of these seven different disciplines of civil engineering one could become even more specialized by choosing between design, construction, research, teaching or management.

Structural engineers are planners and designers of buildings of all types: bridges, dams, power plants, supports for offshore projects, space programs, transmission towers, telescopes, and many other kinds of projects. Structural engineers analyze the forces that a structure must resist (its own weight, wind forces, temperature forces, earthquake forces, etc.), and develop the combination of appropriate materials which will withstand those factors. Wherever concrete, steel, aluminum, or other metals and materials are required to carry a load, structural engineers are responsible for the planning and design. They visit the construction site to make sure the work is done properly. Structural engineers usually work within a team that includes architects, mechanical and electrical engineers, contractors, owners of the project, bankers, lawyers, and officials of local government.

Hydraulic, waterway, irrigation, port, coastal, and ocean engineers deal with all aspects of the physical control of water. They analyze and predict water demands, supply and run-off. They work to prevent floods, to supply water for irrigation projects, to protect beaches, to manage and train rivers. They construct and maintain hydro-electric power systems, canals, lakes, port facilities and offshore structures.

Geotechnical engineers analyze the properties of soil and rock that support and affect the behavior of structures, pavements and underground facilities. They evaluate the settlements of buildings, the stability of slopes and fills, seepage of ground water and the effects of earthquakes. They take part in the design and construction of earth structures (dams, levees, etc.), foundations of buildings, and such structures as offshore platforms, tunnels, and dams.

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Environmental engineers design and supervise systems to provide safe drinking water and to prevent and control pollution in water, in air, on land, and in the groundwater. Their efforts are vital to many areas of water resource management, including the design of water treatment facilities, and the containment of hazardous wastes.

Transportation engineers are involved with the safe and efficient movement of both people and goods. They design and maintain all types of transportation facilities, including highways and streets, mass transit systems, railroads and airfields, ports and harbors. Transportation engineers apply technological knowledge as well as an understanding of the economic, political, and social factors in their projects. They work closely with urban planners, since the quality of the community is directly related to the quality of the transportation system.

The transportation of gas, oil, coal slurries, and commodities through pipelines has created another technical specialty, one which requires knowledge in geotechnical engineering and hydraulics as well as the structural properties of pipeline materials.

A wide-ranging specialization, construction engineering uses both technical and management skills to plan and build public and private projects and commercial developments. They apply knowledge of construction methods and equipment along with principles of planning, organizing and financing each job from start to finish, determining the equipment, plants, and men required. They estimate costs and monitor expenditures.

In urban and community planning, civil engineers are concerned with the full development of a community. They project street patterns, identify park and recreation areas, determine areas for industrial and residential growth, and act as consultants to airports and other related facilities. They coordinate the activities of just about everyone involved in a project, and in this role they must be people-oriented as well as technically knowledgeable.

Photogrammetry, surveying, and mapping engineers are involved in the precise measurement of the Earth's surface to obtain reliable information for location and for designing engineering projects.

To become a civil engineer you must of course attend college, and which college to choose is a big question. There are 190 institutions in the United States which offer accredited programs in civil engineering. The civil engineering programs at these colleges have much in common but vary in emphasis and detail. Most programs offered by these colleges are four- or five-year programs and consist of a curriculum of approximately one year of mathematics and basic sciences; one year of engineering science and analysis, one year of engineering theory and design; and one year that includes social sciences, humanities, communication, ethics and professionalism, along with electives which complement the overall education of the individual.

California Polytechnic State University, San Luis Obispo, civil engineering education emphasizes the study of engineering principles and the application of scientific

knowledge and technology for the betterment of mankind. The goal of the Civil Engineering Department is that the graduates of the program will be trained for the expanding needs of the society in transportation, structure, and environment under the broad Civil Engineering degree.

## APPENDIX

The *Employment Status Report 1983-84* is a report about all the graduated civil engineers of the 1983-84 school year. Cal Poly sent out a questionnaire near the end of 1984 and the statistics are taken from the returned questionnaires. Cal Poly had only fifty-four students graduate as civil engineers, forty-eight men and six women. Out of fifty-four graduates, thirty-three returned their questionnaires, twenty-nine men and four women. Their jobs range from teacher, a technician and a tool engineer, to a civil engineer. The salaries range from eight hundred and fifty dollars to three thousand six hundred dollars a month, with an average salary of one thousand nine hundred and eighty-two dollars a month. Even though they say jobs for engineers are scarce, these statistics show that most Cal Poly engineering graduates obtain jobs. They also reveal that salaries vary a great deal depending on one's specialization, where one works and for whom one works.

Once one has obtained one's C.E. degree one will want to become a professional civil engineer. To become a professional civil engineer one must complete the requirements for registration or licensure established by states and territories. Registration requires education, experience and successful completion of an exam conducted by an examining board.

The examination has two parts. The first part tests the basic and fundamental engineering knowledge of the applicant. This test is based on the average curriculum of all the departments of the engineering colleges. Young engineers are encouraged to take the first examination and obtain an Engineer-in-Training (EIT) certificate as soon after graduation as possible.

The second part of the test should be taken as soon as the minimum requirements for experience and age established by the state's board are met. In California, one must have five years of working experience to take the second part of the test.

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