CAREER GUIDE FOR ENVIRONMENTAL ENGINEERS

SOC Code: 17-2081

Pay Band: 5 (Salary Structure)

Standard Occupational Description:
Design, plan, or perform engineering duties in the prevention, control, and remediation of environmental health hazards utilizing various engineering disciplines. Work may include waste treatment, site remediation, or pollution control technology.

Environmental Engineer positions in the Commonwealth are assigned to the following Roles in the Architecture and Engineering Career Group:

Architect/ Engineer I

Architecture/ Engineering Manager I

While Environmental Engineers within the Commonwealth are all located within the Architecture and Engineering Career Group, individuals may want to pursue other managerial opportunities within the Commonwealth depending upon individual training, education, knowledge, skills, abilities, and interests.

Other Career Group(s) that may be of interest are:
General Administration

Program Administration

Skills
Note: *The technical and functional skills listed below are based on general occupational qualifications for Environmental Engineers commonly recognized by most employers. Typically, you will not be required to have all of the skills listed to be a successful performer. Recruitment and selection standards for an individual state job must be based on the specific knowledge, skills, and abilities for that job as indicated in the job announcement and job description in the Employee Work Profile.*

1. Using mathematics to solve problems.
2. Understanding written sentences and paragraphs in work related documents.
3. Developing approaches for implementing an idea.
4. Analyzing needs and product requirements to create a design.
5. Knowing how to find information and identifying essential information.
6. Identifying the nature of problems.
7. Using logic and analysis to identify the strengths and weaknesses of different approaches.
8. Communicating effectively with others in writing as indicated by the needs of the audience.
9. Weighing the relative costs and benefits of a potential action.
10. Inspecting and evaluating the quality of products.
11. Using scientific methods to solve problems.
12. Talking to others to effectively convey information.
13. Listening to what other people are saying and asking questions as appropriate.
14. Identification of Key Causes-Identifying the things that must be changed to achieve a goal.
15. Determining the long-term outcomes of a change in operations.
16. Evaluating the likely success of an idea in relation to the demands of the situation.

17. Working with new material or information to grasp its implications.
18. Adjusting actions in relation to others' actions.
19. Developing an image of how a system should work under ideal conditions.
20. Looking at many indicators of system performance, taking into account their accuracy.

Knowledge

Note: *The technical and functional knowledge statements listed below are based on general occupational qualifications for Environmental Engineers commonly recognized by most employers. Typically, you will not be required to have all of the knowledge listed to be a successful performer. Recruitment and selection standards for an individual state job must be based on the specific knowledge, skills, and abilities for that job as indicated in the job announcement and job description in the Employee Work Profile.*

The **Knowledge** of:

1. Equipment, tools, mechanical devices, and their uses to produce motion, light, power, technology, and other applications.
2. Design techniques, principles, tools and instruments involved in the production and use of precision technical plans, blueprints, drawings, and models.
3. Principles and processes involved in business and organizational planning, coordination, and execution. This includes strategic planning, resource allocation, manpower modeling, leadership techniques, and production methods.
4. Physics and prediction of physical principles, laws, and applications including air, water, material dynamics, light, atomic principles, heat, electric theory, earth formations, and meteorological and related natural phenomena.
5. Materials, methods, and the appropriate tools to construct objects, structures, and buildings.
6. Numbers, their operations, and interrelationships including arithmetic, algebra, geometry, calculus, statistics, and their applications.
7. The structure and content of the English language including the meaning and spelling of words, rules of composition, and grammar.
8. Electric circuit boards, processors, chips, and computer hardware and software, including applications and programming.
9. Weaponry, public safety, and security operations, rules, regulations, precautions, prevention, and the protection of people, data, and property.
10. Principles and methods for moving people or goods by air, rail, sea, or road, including their relative costs, advantages, and limitations.
11. The composition, structure, and properties of substances and of the chemical processes and transformations that they undergo. This includes uses of chemicals and their interactions, danger signs, production techniques, and disposal methods.
12. Instructional methods and training techniques including curriculum design principles, learning theory, group and individual teaching techniques, design of individual development plans, and test design principles.
13. Media production, communication, and dissemination techniques and methods including alternative ways to inform via written, oral, and visual media.
14. Plant and animal living tissue, cells, organisms, and entities, including their functions, interdependencies, and interactions with each other and the environment.
15. Machines and tools, including their designs, uses, benefits, repair, and maintenance.
16. Policies and practices involved in personnel/human resource functions. This includes recruitment, selection, training, and promotion regulations and procedures; compensation and benefits packages; labor relations and negotiation strategies; and personnel information systems.

Abilities

Note: *The technical and functional abilities listed below are based on general occupational qualifications for Environmental Engineers commonly recognized by most employers. Typically, you will not be required to have all of the abilities listed to be a successful performer. Recruitment and selection standards for an individual state job must be based on the specific knowledge, skills, and abilities for that job as indicated in the job announcement and job description in the Employee Work Profile.*

The **Ability** to:

1. Apply general rules to specific problems to come up with logical answers. It involves deciding if an answer makes sense.
2. Read and understand information and ideas presented in writing .
3. Communicate information and ideas in speaking so others will understand.
4. Combine separate pieces of information, or specific answers to problems, to form general rules or conclusions. It includes coming up with a logical explanation for why a series of seemingly unrelated events occur together.
5. Listen to and understand information and ideas presented through spoken words and sentences.
6. Correctly follow a given rule or set of rules in order to arrange things or actions in a certain order. The things or actions can include numbers, letters, words, pictures, procedures, sentences, and mathematical or logical operations.
7. Understand and organize a problem and then to select a mathematical method or formula to solve the problem.
8. Add, subtract, multiply, or divide quickly and correctly.
9. Details of objects at a close range (within a few feet of the observer).
10. Communicate information and ideas in writing so others will understand.
11. Come up with a number of ideas about a given topic. It concerns the number of ideas produced and not the quality, correctness, or creativity of the ideas.
12. Tell when something is wrong or is likely to go wrong. It does not involve solving the problem, only recognizing there is a problem.
13. Quickly and accurately compare letters, numbers, objects, pictures, or patterns. The things to be compared may be presented at the same time or one after the other. This ability also includes comparing a presented object with a remembered object.
14. Come up with unusual or clever ideas about a given topic or situation, or to develop creative ways to solve a problem.
15. Speak clearly so that it is understandable to a listener.
16. Imagine how something will look after it is moved around or when its parts are moved or rearranged.
17. Concentrate and not be distracted while performing a task over a period of time.
18. Quickly make sense of information that seems to be without meaning or organization. It involves quickly combining and organizing different pieces of information into a meaningful pattern.
19. Efficiently shift back and forth between two or more activities or sources of information (such as speech, sounds, touch, or other sources).
20. Identify or detect a known pattern (a figure, object, word, or sound) that is hidden in other distracting material.

Tasks

Note: *The following is a list of sample tasks typically performed by Environmental Engineers. Employees in this occupation will not necessarily perform all of the tasks listed.*

1. Analyzes survey reports, maps, drawings, blueprints, aerial photography, and other topographical or geologic data to plan projects.
2. Plans and designs transportation or hydraulic systems and structures, following construction and government standards, using design software and drawing tools.
3. Estimates quantities and cost of materials, equipment, or labor to determine project feasibility.
4. Directs construction, operations, and maintenance activities at project site.
5. Computes load and grade requirements, water flow rates, and material stress factors to determine design specifications.
6. Directs or participates in surveying to lay out installations and establish reference points, grades, and elevations to guide construction.
7. Inspects project sites to monitor progress and ensure conformance to design specifications and safety or sanitation standards.
8. Conducts studies of traffic patterns or environmental conditions to identify engineering problems and assess the potential impact of projects.
9. Tests soils and materials to determine the adequacy and strength of foundations, concrete, asphalt, or steel.
10. Provides technical advice regarding design, construction, or program modifications and structural repairs to industrial and managerial personnel.
11. Prepares or presents public reports, such as bid proposals, deeds, environmental impact statements, and property and right-of-way descriptions.
12. Quality control of engineering applications, plans, reports, and specifications review for facilities for the purpose of approval to proceed with construction.

INTERESTED?

Like people, occupations have traits or characteristics. These characteristics give important clues about the nature of the work and work environment, and give you an opportunity to match your own personal interests to a specific occupation. When you choose a job in an occupation that matches your own interests you have taken an important step in planning a successful and rewarding career.

Environmental Engineering work is considered a “Realistic Occupation” because it involves work activities that include practical, hands-on problems and solutions. They often deal with plants, animals, and real-world materials like wood, tools, and machinery. Many of the occupations require working outside, and do not involve a lot of paperwork or working closely with others. It can also be “Conventional” since it may frequently involve following set procedures and routines, include working with data and details more than with ideas, and usually there is a clear line of authority to follow.

LICENSURE, REGISTRATION, OR CERTIFICATION REQUIREMENTS

Generally this is not required for Environmental Engineer positions in state government. However, to improve career advancement opportunities, you should consider the advantages of certification and include this step in your self-development plan. The Professional Engineer

license may be required for some Environmental Engineer positions. These positions are identified by each state agency.

Licensing information can be found on the Department of Professional & Occupational Regulations' web site at http://www.dpor.state.va.us

EDUCATIONAL, TRAINING, AND LEARNING OPPORTUNITIES

Professional occupations like Environmental Engineers usually require a college degree and may require some job-specific training.

Sources of educational, training, and learning opportunities include:

1. Graduate from an engineering curriculum accredited by the Accreditation Board for Engineering and Technology.
2. Join professional organizations.
3. Specific data regarding a number of engineering disciplines follows:

ENGINEERING, GENERAL: An instructional program that generally prepares individuals to apply mathematical and scientific principles to solve a wide variety of practical problems in industry, social organization, public works, and commerce.

ENVIRONMENTAL HEALTH ENGINEERING: An instructional program that prepares individuals to apply mathematical and scientific principles to the design, development and operational evaluation of systems for controlling contained living environments and for monitoring and controlling factors in the external natural environment, including pollution control, waste and hazardous material disposal, health and safety protection, conservation, life support, and requirements for protection of special materials and related work environments.

COMMONWEALTH COMPETENCIES

Competencies are a set of identified behaviors, knowledge, skills, and abilities that directly and positively impact the success of employees and the organization. Competencies can be observed and measured. When consistently demonstrated, competencies make employees particularly effective in their work. Competencies help lay out a road map to career success. You can use the Commonwealth Competencies to help improve your individual performance by adopting behaviors that make high performing employees successful in their jobs. In this way, you can use the Commonwealth Competencies for your further professional development.

The Commonwealth Competencies are:

1. Technical and Functional Expertise
2. Understanding the Business
3. Achieving Results
4. Serving the Customer
5. Teamwork
6. Interpersonal and Communication Skills
7. Leadership and Personal Effectiveness

The above competencies may be applied to employees throughout the Commonwealth of Virginia. They can be rank-ordered by agencies and hiring managers to represent the needs of a specific job. The rank ordering will change depending upon the occupation, an organization's priorities, the actual job requirements, and the supervisor's preferences.

Career success is both about what you do (applying your technical knowledge, skills, and ability) and how you do it (the consistent behaviors you demonstrate and choose to use) while interacting and communicating with others. Hopefully, by studying the Commonwealth competencies, identifying your developmental opportunities, and working to refine your own competence, you can take charge of your career!

For additional information about the **Commonwealth Competencies** go to: http://jobs.state.va.us/cc_planningctr.htm. For the competencies, we first list the competencies and then define each. Finally, we list competency indicators; to describe what successful performance looks like.

COMMONWEALTH CAREER PATH

Career opportunities in the Commonwealth are not limited to moving "up" to the next highest role and pay band, changing positions, or to becoming a supervisor. That's because most roles describe a broad group of occupationally related positions that perform a range of work that requires increased knowledge and skills. For that reason, Commonwealth roles describe the career paths within the same or higher-level role for the same or different Career Group. The broad salary range and the Commonwealth's pay practices provide flexibility in recognizing career development and advancement. (Salary Structure)

For example:

Pay Band	Practitioner Role
5	Architect/Engineer I
	⬇
6	Architect/Engineer II

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Pay Band	Manager Role
5	Architect/Engineer Manager I
	⬇
6	Architect/Engineer Manager II
	⬇
7	Architect/Engineer Manager III
	⬇
8	Architect/Engineer Manager IV

Sample Career Path

Architect/Engineer I

The Architect/Engineer I role provides career tracks for architects or engineers whose expertise levels range from trainee to advanced level. Responsibilities include applying architecture/engineering principles and practices to projects of varying complexity in specialty areas. Specialty areas include those requiring knowledge of civil, environmental, structural, mechanical, electrical, transportation, traffic, safety, materials, or rehabilitation engineering and architecture.

Architect/Engineer II
The Architect/Engineer II role provides career tracks for architects or engineers who serve as an expert or first line supervisor. Duties include evaluating the plans and specifications for capital outlay projects prepared by other architects and engineers; or for applying related engineering principles and practices to complex, extensive and diversified engineering projects in specialty areas.

Architecture/Engineering Manager I

The Architecture/Engineering Manager I role provides career tracks for managers who manage various administrative, budgetary, planning, scheduling and technical activities related to multiple complex architectural/engineering projects or programs and the staff performing related functions. These functions draw upon knowledge of specialty engineering; capital outlay or other construction projects, transportation, water and wastewater projects or programs and health and safety related operations.

Architecture/Engineering Manager II

The Architecture/Engineering Manager II role provides career tracks for managers who manage, coordinate, and direct the activities of one or more specialized transportation or environmental engineering or health and safety related program operations in their assigned geographic or divisional area. This role also provides career tracks for managers who manage staff and resources related to the procurement, design, construction or renovation of capital projects or non-capital outlay for an entire agency's construction and maintenance reserve programs. This includes budgetary, planning, scheduling, public relations, human resource functions, and technical activities related to a broad range of engineering, administrative and other projects or programs.

ADDITIONAL OCCUPATIONAL INFORMATION CAN BE FOUND AT:

O*NET (Occupational Information Network)

http://online.onetcenter.org/gen_search_page

Virginia Employment Commission
http://www.alex.vec.state.va.us/

Department of Professional & Occupation Regulation
http://www.state.va.us/dpor/conNEW_reg.pdf

Career One Stop
http://www.careeronestop.org/

Virginia Career Resource Network
http://www.vacrn.net/