Water & Wastewater Engineer

Snapshot

Career Cluster: Engineering; Environment & Conservation; Natural Resources Development; Science & Technology
Interests: Engineering, civil engineering, mechanical engineering, environmental science, science
Earnings (Yearly Average): $85,520
Employment & Outlook: Faster Than Average Growth Expected

OVERVIEW

Sphere of Work

Water and wastewater engineers design, supervise, and upgrade water-supply and wastewater systems. They also develop and design contemporary wastewater-treatment facilities that minimize pollution and meet the latest environmental protection standards. Water and wastewater engineers are generally considered part of the broader field of environmental engineers.

Work Environment

Water and wastewater engineers most commonly work in an office or a laboratory. Some projects may require field trips to the site of particular water- or wastewater-treatment facilities. Teamwork is very common, and water and wastewater engineers work often with other environmental engineers. Many water and wastewater engineers have to liaise with public authorities. They are also expected to present their ideas and findings to non-engineers, including lawyers, businesspeople, and politicians. Good verbal and written communication skills are required, both within a team and when interacting with outsiders such as clients or public agencies.

Profile

Working Conditions: Work both Indoors and Outdoors
Physical Strength: Light Work
Education Needs: Bachelor's Degree, Master's Degree
Licensure/Certification: Required
Physical Abilities Not Required: No Heavy Labor
Opportunities For Experience: Internship
Holland Interest Score*: IRC

* See Appendix A

Occupation Interest

This occupation tends to attract people with strong interests in engineering and science who are drawn to work in the environmental sciences. As the field has very wide range of applications, workers can focus on an area of particular interest. Water and wastewater engineers seek practical solutions to provide and improve upon an essential human service. They often have opportunities to work abroad, particularly in developing countries. This field can also be approached from a more general engineering background, such as civil or mechanical engineering.

A Day in the Life—Duties and Responsibilities

A Day in the Life—Duties and Responsibilities
Since many water and wastewater engineers work in a team, most work regular business hours. This is especially true for those who work in an office and must attend team meetings and meet with clients or third parties during the working day. During peak project times, particularly if working as a consulting engineer, water and wastewater engineers may either begin their day very early or stay at work later in the evening to finish any tasks made urgent by tight project deadlines.

Contemporary engineering work requires a lot of time spent using computers and working in an information-technology-supported environment, and the work of a water and wastewater engineer is no exception. As members of a team, in addition to meeting with the team to coordinate their work with that of their colleagues, water and wastewater engineers pursue their own tasks and put their results into the common project.

Working on a water or wastewater project in a foreign country often includes a heavier daily workload. In domestic positions, most water and wastewater engineers enjoy regular working hours and are requested to work overtime only on a case-by-case basis as necessitated by special projects.

Duties and Responsibilities

- **Designing systems that provide environmentally sound fresh water and waste water solutions**
- **Reworking and troubleshooting systems as environmental standards change or as problems arise**
- **Preparing project plans and specifications**
- **Estimating the costs and requirements of projects**
- **Overseeing project construction and maintenance**
- **Inspecting newly constructed and existing systems**
- **Conducting technical research studies**

WORK ENVIRONMENT

Relevant Skills and Abilities

Analytical Skills
- Collecting and analyzing data

Communication Skills
- Speaking and writing effectively

Interpersonal/Social Skills
- Being able to work independently
- Working as a member of a team
- Having good judgment

Organization & Management Skills
- Initiating new ideas
- Paying attention to and handling details
- Managing time
- Promoting change
- Making decisions
- Meeting goals and deadlines
- Performing duties that may change frequently

Research & Planning Skills
- Creating ideas
- Identifying problems
- Determining alternatives
- Identifying resources
- Solving problems
- Developing evaluation strategies
- Using logical reasoning

Technical Skills
- Performing scientific, mathematical or technical work
- Working with data or numbers

Unclassified Skills
- Using set methods and standards in your work

Physical Environment

Generally, water and wastewater engineers work in an office, with occasional time spent in a laboratory as well. Project sites are often in outdoor settings. Their physical conditions are determined by the specific site, which can be located in a variety of physical environments.

Plant Environment

Water and wastewater plants exist in a variety of settings, ranging from urban locations such as the waterworks of a metropolitan city to remote destinations such as a desalination plant on a desert shore. Office buildings are either permanent, mostly in cities, or temporary at project sites.

Human Environment

Offices and laboratories are generally shared with colleagues working on the same or different projects. Water and wastewater engineers must work well both with members of their own profession within a team and with non-engineers.

Technological Environment

Contemporary water and wastewater engineers rely

heavily on state-of-the art technology, and their work is supported by specialized software applications. Word processing and spreadsheet work is also required to communicate their work.

EDUCATION, TRAINING, AND ADVANCEMENT

High School/Secondary

In high school, students should focus on the sciences, mathematics, and computer literacy, though they should not neglect to acquire good written and oral English and communication skills. Classes in chemistry, biology, physics, and earth science are particularly useful. Mathematics courses should include algebra, calculus, geometry, and trigonometry. Students should also enroll in specialized courses in drafting, electronics, and special physical-science topics if available. Computer-science classes would be beneficial as well.

Students should join science or engineering clubs whenever possible. They should look for offers from professional associations in the field that target high school students. Toward the end of high school, a student should also look into science or technology camps offered by domestic and international colleges and universities.

Suggested High School Subjects

- Algebra
- Applied Biology/Chemistry
- Applied Communication
- Applied Math
- Applied Physics
- Biology
- Blueprint Reading
- Calculus
- Chemistry
- College Preparatory
- Computer Science
- Drafting
- Earth Science

- Electricity & Electronics
- English
- Geometry
- Humanities
- Mathematics
- Physical Science
- Physics
- Science
- Social Studies
- Trigonometry

Famous First

The first water delivery system designed to clean and purify city water was set up in Lawrence, Massachusetts, in 1893. An open filter of 2.75 acres purified water from the Merrimack River by slow sand filtration.

College/Postsecondary

A bachelor's degree in engineering is required for work as water and wastewater engineer. Some universities offer an environmental engineering major, but this specialization is not necessary; a degree in civil engineering, mechanical engineering, or general engineering is typically sufficient. In the last two years of study, courses relating to the field, such as water-treatment-plant design, should be taken. Students should take care to obtain a degree from an engineering program that is accredited by the Accreditation Board of Engineering and Technology (ABET), the prime accrediting institution in the field. They should also seek to obtain an internship or participate in co-op studies before graduating.

A master's degree provides additional professional qualifications. Some universities offer the option to earn both a bachelor's and a master's degree in a combined five-year program. Students interested in research and teaching can also pursue a doctoral degree in engineering.

Related College Majors

- Civil Engineering
- Electrical, Electronics & Communications Engineering
- Engineering
- Environmental & Pollution Control Technology
- Environmental/Environmental Health Engineering
- Mechanical Engineering

Adult Job Seekers

For an adult job seeker, both networking, ideally supported by membership in a professional association, and direct contact with potential employers can be beneficial. State employment offices are an additional resource. Adults transitioning to this field should have some sort of background in engineering or the sciences.

Professional Certification and Licensure

Engineering licenses in the United States are awarded by individual states. A prospective engineer must pass both a Fundamentals of Engineering (FE) exam and a Principles and Practice in Engineering (PE) exam and acquire a certain amount of experience in order to be licensed as a professional engineer in his or her state.

Additional Requirements

A water and wastewater engineer must have a solid background in the sciences, strong engineering skills, and the ability to work in teams and communicate ideas well. Ideally, he or she should also be dedicated to the profession and have a genuine interest in the work.

EARNINGS AND ADVANCEMENT

Mean annual earnings of water and wastewater engineers were $85,520 in 2013. The lowest ten percent earned less than $50,000, and the highest ten percent earned more than $122,000.

Water and wastewater engineers may receive paid vacations, holidays and sick days; life and health insurance; and retirement benefits. These are usually paid by the employer.

Metropolitan Areas with the Highest Employment Level in this Occupation

Metropolitan area	Employment[1]	Employment per thousand jobs	Hourly mean wage
Boston-Cambridge-Quincy, MA	2,030	1.16	$38.98
Washington-Arlington-Alexandria, DC-VA-MD-WV	1,710	0.72	$49.64
Los Angeles-Long Beach-Glendale, CA	1,570	0.39	$50.92
New York-White Plains-Wayne, NY-NJ	1,550	0.30	$45.51
Atlanta-Sandy Springs-Marietta, GA	1,330	0.58	$36.89
Philadelphia, PA	1,230	0.67	$40.11
Sacramento--Arden-Arcade--Roseville, CA	1,200	1.43	$45.33
Houston-Sugar Land-Baytown, TX	1,040	0.38	$52.59
Seattle-Bellevue-Everett, WA	920	0.64	$43.98
Oakland-Fremont-Hayward, CA	850	0.84	$47.03

[1] Does not include self-employed; includes environmental engineers. Source: Bureau of Labor Statistics

EMPLOYMENT AND OUTLOOK

Environmental engineers, of which water and wastewater engineers are a part, held about 53,000 jobs nationally in 2012. Employment is expected to grow faster than the average for all occupations through the year 2022, which means employment is projected to increase 15 percent or more. Demand for water and wastewater engineers will be created by a number of factors, including an increasing emphasis on preventing environmental problems, the need to comply with environmental regulations, and the growth of public health concerns due to the expanding population.

Employment Trend, Projected 2012–22

Water, Wastewater, and Other Environmental Engineers: 15%

Total, All Occupations: 9%

Engineers (All): 8%

Note: "All Occupations" includes all occupations in the U.S. Economy. Source: U.S. Bureau of Labor Statistics, Employment Projections Program.

Related Occupations

- Agricultural Engineer
- Biological Scientist
- Chemical Engineer
- Civil Engineer
- Electrical & Electronics Engineer
- Energy Engineer
- Environmental Engineer
- Environmental Science Technician
- Forester & Conservation Scientist
- Hazardous Waste Manager
- Mechanical Engineer
- Water Treatment Plant Operator
- Wind Energy Engineer

Conversation With . . .
MARK HUDAK, P.E.

Associate, Project Manager, Stantec
Water-Wastewater Engineer, 13 years

1. What was your individual career path in terms of education/training, entry-level job, or other significant opportunity?

I got a degree in mechanical engineering from Ohio State University. I graduated right after the 9/11 attacks and that impacted what field I went into due to ensuing economic problems. I had wanted to go into the automotive industry, but there was a hiring freeze. I ended up getting a job with a small civil and environmental engineering firm and did a lot of site work for developers in private development. I transferred to water/wastewater a few years later when I saw the real estate market starting to crash. Water-wastewater interests me; hydraulics and fluid mechanics are involved. I started as a design-level engineer, then moved up to project engineer, then to project manager, and I'm looking to move up further as a leader.

2. What are the most important skills and/or qualities for someone in your profession?

You need the science and numbers background, but you've got to be able to communicate. I'm a numbers guy, and I am really good at Math and English.

3. What do you wish you had known going into this profession?

Seeing how infrastructure is actually built in the field is a huge advantage. If I had known that early on, I would have spent my first two years on the construction side.

4. Are there many job opportunities in your profession? In what specific areas?

There's a lot of opportunity, with more jobs than a couple of years ago. If you're interested in water-wastewater engineering, you can go into one of three streams working in fields such as product manufacturing or supply; professional consulting engineer; government agency or regulatory; and construction management.

The three streams are:

- Technical: Start as a design engineer and build expertise in a particular area, such as wastewater treatment or hydraulic modeling.The further up you go, the more specialized you get.

- Sale Engineer: You can transition from a technical role to selling a service or product within the industry. You could be a sales representative for equipment or sell a service such as engineering.
- Management or Operations: People in these positions start out in an entry-level position in a technical field. Typically they are organized and have a skill set as a manager They might manage projects, engineers and field staff, or product lines.

5. How do you see your profession changing in the next five years, what role will technology play in those changes, and what skills will be required?

Technology will increase on many fronts. In water-wastewater, trenchless technology is growing. For old sanitary and waterlines that have reached the end of their useful life and are in need of replacement, trenchless technology is the new normal. The days of open cut excavation or building new trenches and installing new pipes and abandoning or removing the old pipes are dwindling. Trenchless rehabilitation such as cured-in-place pipe; pipe bursting; and micro tunneling allow for increasing the life of the pipe without the social impact of digging up the ground. Others emerging areas are energy reuse and recovery, water reuse; biogas reuse; and nutrients.

6. What do you like most about your job? What do you like least about your job?

I enjoy working with people. It's really satisfying to see something built that you've designed from conception and to see a facility or infrastructure commissioned for the benefit of a community.

What I least enjoy is a necessary evil that comes with any profession, and that's the work-life balance. The higher you move in a company, the more responsibility you take on, the harder you work. There are things you're going to have to do to relax and be outside your career. Your career's important, but it needs to be sustainable.

7. Can you suggest a valuable "try this" for students considering a career in your profession?

See if you can connect with someone in the industry and shadow them, or do an internship or a co-op; keep that relationship. Also, when you start a new job, remember to be humble. There is a tendency to want everything immediately, but if you aren't willing and ready to learn, you put yourself at a disadvantage. There is a team around you, and this business is all about relationships. Nobody is ever done learning– ever.

SELECTED SCHOOLS

Most colleges and universities have bachelor's degree programs in science and engineering, sometimes with a specialization in environmental engineering. The student may also gain an initial grounding in the field at an agricultural, technical, or community college. For advanced positions, a masters or doctoral degree is usually obtained. For a list of selected schools, refer to the chapter "Environmental Engineer" in the present volume.

MORE INFORMATION

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