

Professional Engineer Licensing: Do I Really Need One?



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Origin of the Word “Engineer”

- Latin ingenium, meaning cleverness
- Latin ingeniare, meaning to contrive or devise
- Reference to someone who creates machinery dates back to 1300s

Military Engineering



Civil Engineering



Some History

- By the Middle Ages, an engineer was a deviser and constructor of military roads, bridges, towers, ladders, catapults, & siege engines
- They worked alongside other military specialists such as muleteers, grenadiers, and musketeers
- When not at war they satisfied civilian needs for roads, dams, and bridges, hence “civil engineering”
- Egyptian pyramids and Roman aqueducts are ancient examples

Stationary Engineers



Stationary Engineering

- Arose during the industrial revolution and steam power
- Today Stationary Engineers work in factories, large buildings, hospitals, warehouses, etc.
- They operate and maintain boilers, heat exchangers, HVAC, turbines, etc.

19th Century Engineering



Railroad Engineers

- 19th Century designers of motive power, tracks, tunnels, coal and water stations, rolling stock, and routing and signaling systems
- Complexity meant the designers often also operated the machinery, which is why we still refer to train drivers as engineers
- Today, the 19th century types of engineers are still around, but they are operators, not designers
- Basic qualification is a high school diploma

A Huge Shift in Engineering

- The rise of engineering as an academic discipline happened at the end of the 19th century and beginning of the 20th
- In roughly three decades we invented or implemented commercial electricity generation, electric motors and lighting, the phonograph, the telephone, motion pictures, early radio, automobiles, and heavier-than-air aviation
- The rapid rise in the importance of technology outstripped the ability of the scientists of the day to address needs beyond research

The New Engineering



The 20th Century Paradigm

- Mechanical and electrical engineering are applied physics
- Substantial academic preparation is required
- Colleges and universities added programs alongside civil engineering
- The 20th century academic approach is a thing of a different kind from the historical reliance on empirical methods

Design versus Engineering

- “Anyone” can design
- Floral designers, landscape designers, fashion designers, website designers, graphics designers
- Generally restricted to available tools and materials
- Largely empirical and artisinal, uses “cut and try” methods

Engineering (Modern Sense)

- Theoretical understanding is the most definitive attribute
- Designs most often work first time or with minimal tweaking
- Engineers can conceive things that never existed before
- Can devise new methods and materials
- Creates designs that are optimal in some manner: highest performance, exceptional reliability or durability, high maintainability, least initial cost, lowest life cycle cost, etc.
- Aircraft and modern communications systems cannot be “designed”, they must be engineered

The Rise of Regulation

- Deemed necessary whenever there are potentially serious health, safety, or financial consequences and...
- Users lack the ability to judge the competence of providers, or
- Users lack choice regarding usage (how many drivers stop to inspect a bridge before driving over it?)
- The State intervenes to protect the public through qualifying exams and provider licensing
- 1st bar exam in 1773, doctors and dentists mid 19th century
- Engineers first licensed 1907

St. Francis Dam



Failure of the St. Francis Dam

- Part of the water system for Los Angeles
- Construction began in 1926
- Leaks were deemed normal for a dam of its size
- Catastrophic failure just before midnight on March 12th, 1928
- Wall of water was initially ~140 feet high
- At least 450 people died
- Deluge traveled 54 miles to the Pacific Ocean, with bodies washing up as far south as Mexico

The Result



1929

- Given the demonstrated public hazard, the California legislature passed laws to regulate Civil Engineering
- Municipal exemption was eliminated
- Created the predecessor to the Board for Professional Engineers, Land Surveyors, and Geologists
- Engineers are regulated and licensed along with CPAs, architects, doctors, lawyers, also barbers, cosmetologists, and automobile drivers

Professional Engineer Licensure



Who is (legally) an Engineer?

- In Canada, it is illegal to call yourself an engineer without being licensed
- Both Canada and the USA base their legal systems on English Common Law
- The US states have the same restriction, but offer an industrial exemption for tech employers
- The employer is assumed able to judge the competence of prospective employees without the assistance of the State
- Many products lack compelling public health or safety concerns

Things You Can and Cannot Do

- You can work your heart out for a tech employer, but...
- You may not sign or seal documents that require a PE signature
- You may not offer, advertise, or provide services to the public
- You may not use “engineer” or “engineering” in the name of a business
- You may not assert that you are an engineer in a court of law or in a legal document

Licensing Boards

- ...are quick to jump on anyone who calls themselves an engineer without licensure, in advertising, business names, public offers to provide consulting, etc.
- Will issue fines, seek court orders, etc.
- If someone is injured as a result of work that should have involved licensed engineering, they can sue the bejabbers out of you and your employer

California Practice Acts and Title Acts

- Practice Acts cover mechanical, electrical, and civil engineering
- Only licensed persons may practice or offer to practice these branches of engineering
- Title Acts do not limit the work of individuals, but only licensed persons may refer to themselves as engineers in any manner
- Titles Acts cover agricultural, chemical, control systems, fire protection, industrial, metallurgical, nuclear, petroleum, and traffic engineering.

How to Obtain a License

- Obtain a four year college degree
- Pass the Fundamentals of Engineering (FE) exam
- Work at least four years under supervision of a PE
- Pass the Professional Engineering (PE) exam
- Alternative path (CA): at least twelve years of applicable experience allows skipping the FE exam and supervisory requirement to go right to the PE exam
- Four reference letters required

The Exam

- Paper and pencil format held twice per year
- Computer based format held year round at approved test centers
- High security, no programmable calculators or cell phones, ID checked thoroughly
- Open book (like employment)
- Timed, eight hours
- Rigorous and demanding

Question Format

- Multiple choice
- Formulated to filter those who understand the concepts at a sufficiently deep level from those reliant upon simplifying assumptions, shortcuts, rules-of-thumb, and cookbook methods
- Wrong answers include shortcuts and rules-of-thumb results
- The intent is to separate 19th century approach from 20th century approach, i.e. design from engineering

Test Results

- Notification takes about three month for paper tests, one to two weeks for computer-based testing
- If you fail you get your score, if you pass you don't
- Pass rate varies by branch of engineering, 40 to 80%, 60% average
- Second attempt pass rate more like 40% average

Ongoing Responsibilities

- Annual renewal fee is currently \$180 (CA)
- Many states have continuing education requirements
- Out-of-state work that requires a license can use the principle of comity to get permission or a second license
- This is similar to the ability of attorneys to participate in out-of-state trial work with court permission, or of doctors to practice out-of-state with permission from local licensing boards

Why Should it Matter to Me?

- It didn't matter to me at first
- I was already a competent engineer
- I knew it and didn't need to take any test to prove it to myself
- No prospective employer ever asked about a license
- I felt insulted that anyone could say that I wasn't an engineer
- I was living in the industrial exemption cocoon
- Consulting does not offer a safe place!

Why I Took the Plunge

- My employer made licensure a condition for promotion into a division-level role
- The employer paid for study materials and time, application and test fees, and required travel
- I enjoyed brushing up on and expanding my skillset
- Employer tuition reimbursement benefits should apply to pursuit of licensure
- A license will make you stand out for challenging assignments and promotion

Since Then...

- Got the license in January, was laid off in February!
- The license walked out the door with me
- A lot of subsequent consulting work has not per se required a license, but a license is a credential for finding work
- It has been formally required for seeking regulatory approval for medical devices
- I have legally accepted work from the general public
- It is important for establishing credibility as an expert witness
- Some Federal and State contracts require PE oversight

This Happens Too...

- Credibility with contractors and architects
- Requests to apply for employment from municipal utility districts, makers of critical instrumentation, and others who need PEs
- These positions are stable and pay very well
- If I wanted to pivot exclusively to PE-required work, I could totally do that

The Bottom Line

- When licensure is important, it can be really, really important
- Licensure has unshackled me from legal boundaries. I can pursue engineering however employers or clients want within my personal limits of inclination and expertise
- You can keep it unimportant to your career or make it everything, but this should be an informed and deliberate choice
- ...and I've been pleased with my choice!