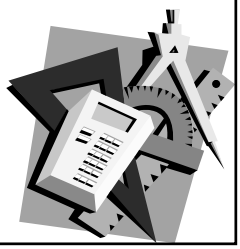
Engineer

Majors and Specialties



Engineer

(in-ja-neer')

A person trained and skilled in any of the various branches of engineering: a *civil engineer*

(Random House Webster's College Dictionary, 1991)

Engineering

… the practical application of science and mathematics, as in the design and construction of machines, vehicles, structures, roads, and systems …

(Random House Webster's College Dictionary, 1991)

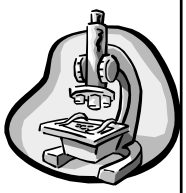
"Scientists explore what is; engineers create what has not been."

(Paul Wright)

Engineering Functions

Development
Research
Design
Testing
Management
Analysis
Systems
Manufacturing
Sales
Construction
Operations
Consulting
Maintenance
Support
Other

Research



- MS, & PhD level
- Investigations
- Experiments
- Computer modeling
- Laboratory and field work
- Example: Auto crash tests

Development

- Research and development (R&D)
- Applying research findings
- Working with prototypes
- Combination of design and practical application

Testing

- Tied to R&D
- Field and Lab
- Collecting data
- Designing tests

Design & Analysis

- What most people think of
- Relating to “structures” for CE’s
- Providing plans & specifications
- Modeling
- Math, scientific laws, materials, and EXPERIENCE !

Systems, Operations, & Maintenance

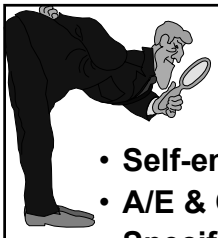
- Often tied to manufacturing
- Work with overall design, development, manufacture, and operation
- Work with the “complete unit”
- Interface with many engineers and non-engineers

Technical & Customer Support

- Links customer and product
- Assists with installation, setup, and operation
- Troubleshoot problems
- Feedback to design and other engineers

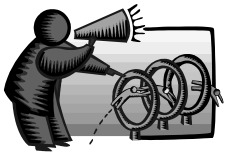
Sales

- Yes … sales!
- Technical background & experience
- Customers are often engineers as well
- Think of not only manufacturing but also land development



Consulting

- Self-employed
- A/E & Consulting firms
- Specific design knowledge
- EXPERIENCE!
- Typically requires PhD and PE
- Often utilized for emergencies and problems



Management

- Project management
- Majority of engineers have management responsibilities
- People skills
- Communication
- Leadership

Other Fields ?

- SURE!!!!!!!!!
- Law, education, medicine, business … just a few
- Graduate degrees (Masters and Doctorates)

Set your goals high … and don't stop … keep climbing toward them!

Why do you want to be an engineer?

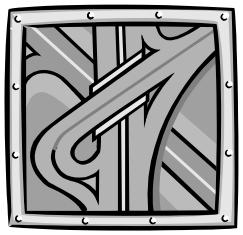
A question that we ask every year … and we typically receive answers similar to that of the author …

Why do you want to be a Civil Engineer?

- **Proficiency in math and science**
- **Suggested by a high school counselor**
- **Has relative that is an engineer**
- **Great opportunities**
- **High starting salaries**

Some Valid Reasons … To be a Civil Engineer

- **"I want to design/build bridges, tunnels, buildings, dams…"**
- **"I would like to manage people and engineering will provide a foundation for this …"**
- **"Demolishing buildings has always interested me …" BOOM !**



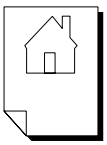
What exactly do Civil Engineers do?

Common CE Specialties

- Structural
- Transportation
- Water
- Surveying
- Geotechnical
- Geological
- Environmental
- Construction

Structural

- Buildings, bridges, dams, railroads, highways, canals, towers
- Evaluation of loads and forces
- May tie into architectural & forensic engineering
- Most common type of CE



Transportation

- Highways, railroads, canals, waterways, airports, mass transit, pedestrian pathways …
- Planning, design, optimization, construction, and maintenance

Water

- Dams, canals, aqueducts, pipes, canals, aquifers, reservoirs
- Distribution, Handling, & Treatment – Drinking, Waste, Storm, Fire
- Many eng. problems with H_2O
- Col Page quote " WATER BAD ! "

Surveying

- Location and alignments – property lines, structures, etc.
- Mapping & Navigation
- Planning, Design, & Construction areas
- GPS & GIS technology
- Allied with Land Surveying

Geotechnical

- Soil Mechanics (some Rock Mechanics)
- Deep & Shallow Foundations
- Landslides & Earthquakes
- Groundwater
- Soil & Rock as eng. Materials
- Exploration & Testing
- Allied w/ Geological Engineering

Geological

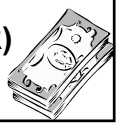
- Engineer working with geology Landslides, Earthquakes, Faults, Sinkholes, & other geo-hazards
- Soil & Rock Mechanics – design & analysis: tunnels, foundations, etc.
- Soil & Rock as eng. Materials

Environmental

- Remediation (e.g. cleaning up) – past, present, future
- Disposal
- Prevention
- Industrial and residential wastes
- Rules/regulations
- Chemistry

Construction

- Building with plans and specifications
- Project management and supervision – time, $R, methods, materials, logistics, equipment, people, … and … and … (whew!)
- Demanding and rewarding (personal satisfaction and $R)
- Travel and working outside



The "ME" Viewpoint: Mechanical Engineers build "weapons systems" and Civil Engineers build "targets".

The "CE" Viewpoint: Civil Engineers build all the things that the "ME's can't live or work without …

Let us consider a project or two that includes all of the typical CE specialties !

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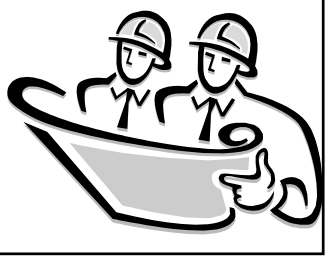

Engineering Projects !

The structural engineer may ask:

How much a load to plan to carry and how long do you want the bridge to last. Do I have to go out in the field too?

The transportation engineer may ask:

Trains, autos, or people … and how many … how fast ? Do you mind if the bridge turns into a parking lot from time to time?

The water engineer may say:

This stream has a huge watershed … do you want a 100 year flood design … or are amphibious vehicles an option transpo engineer?

The engineering surveyor may ask:

Just how precise a location do you want? Nearest meter good enough?

The geotechnical engineer will probably say:

Great! Another swamp in which to place a foundation!!! Say structural engineer … you may want to make this a flexible bridge.

The geological engineer will no doubt note:

By the way … there is large fault under your proposed swamp location … and this is an active seismic area.

The construction engineer will laughingly stutter…

You want it WHEN? … and for HOW MUCH? … before he falls on the ground laughing.

And finally … the environmental engineer will add:

Ah … look there in the creek … that's the rare and endangered red eyed, green tailed, bald salamander *mullenitus crawling amongst us …* too bad about the bridge.

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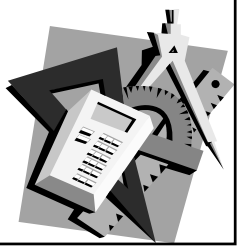
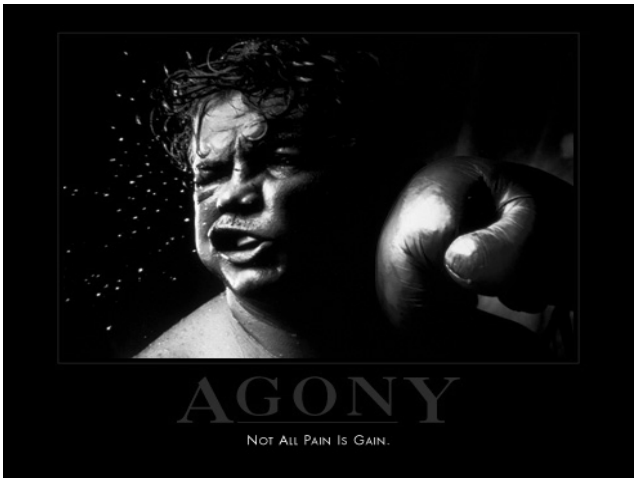


From Assignment 2

What are your short, intermediate, and long-term career goals?



From Assignment 2

At what age would you like to retire, and what income would you like to have at this time (today's $R)?

WE

We the willing, led by the unknowing, are doing the impossible, for the ungrateful.

We have done so much, for so long, with so little, we are now qualified, to do anything, with nothing.