

# ENGINEERS WEEK PRESENTATION

## Slide 1. *ENGINEERS WEEK*

- This is National Engineers Week

## Slide 2. *CIVIL ENGINEERING IN THE PAST*

### Slide 3. Pyramids/Sphinx

- The history of engineering is ancient
- Early Egyptian designers practiced what today would be called structural engineering – one branch within Civil Engineering

### Slide 4. Roman Bridge

- Early engineered highways and water aqueducts gave a superior military advantage to the Romans.
- The term “Civil” engineer developed to differentiate between “Military” engineers

### Slide 5. Old Steam Train

- U.S. train system helped our nation to develop
- Will America continue to be a leader in technology?
- Will America be able to compete against other nations?
- The U.S. needs young men and women to pursue careers in engineering

## Slide 6. *IS CIVIL ENGINEERING FOR YOU?*

- If you have an interest in math or science you should consider Civil Engineering
- We hope this slide show explains to you what modern day Civil Engineers do, and what they will be doing in the future.

### Slide 7. Plan Being Revised

- Briefly explain what it means to be a registered engineer
- Engineers are registered similar to other professions: Doctors, Dentists, Lawyers
- Registration is to protect the public and ensure professional competence
- A registered engineer is required to sign all engineering documents such as project plans, projects, specifications, and engineering studies/ reports
- Some of the things engineers design are:
  - Water Supply
  - Flood Control
  - Municipal improvements (streets, traffic signals, water, sewer, drainage, etc.)
  - Railroads
  - Highways
  - Water and Sewer treatments plans
  - Trash Disposal
  - Foundations
  - Buildings
  - Bridges

## BRANCHES OF CIVIL ENGINEERING

- Civil Engineering is more diverse than any other field of engineering. There is such a wide variety within Civil Engineering that for our discussion today, we will break civil engineering into several branches.

- Structural
- Geotechnical
- Water Resources
- Environmental
- Transportation
- Planning
- The field of civil engineering is so large that I will only be able to give you an overview of it today

Slide 8.                    ***STRUCTURAL***

- Structural engineers are civil engineers that have special training and experience in the design of structures.

Slide 9.                    Airport Terminal

- Structural engineers are concerned with the interaction between forces and structures:
- Structural engineers calculate forces from earth quakes, wind, snow, soil, equipment, people, and many other things to determine what loads will be on a structure:
- Then they design the Structure to safely carry the loads
- Today's structures are largely made of concrete, steel, glass, and wood
- Structural engineers sometimes work closely with architects in the design of buildings

Slide 10.                  Roof/Space frame

- Unique and complex frequently call for the skills of a structural engineer

Slide 11.                  Arrowhead Regional Medical Center

Slide 12.                  Foundation- Arrowhead Regional Medical Center

- This hospital has been designed to withstand a strong earthquake and be able to take in and treat patients after the shaking stops. This hospital was built on BASE ISOLATORS (rubber pads) and DAMPERS (giant shock absorbers), allowing the building to move four feet without sustaining any damage. It was one of the first buildings in the world to have such safety features and engineers from around the globe have come to study it.

Slide 13.                  Oil Platform

Slide 14.                  Brooklyn Bridge

Slide 15.                  Arch Bridge

Slide 16.                  Buildings

Slide 17.                  Empire State Building

- High rise structures are designed by structural engineers
- The plans for any building, designed in California, higher than 5 stories, must be signed by a registered structural engineer.
- All public facilities-schools-hospitals, etc.

Slide 18.                  Power Transmission Towers

- Tower structures to carry telephone, power, TV lines, etc. are designed by structural engineers

Slide 19.                  ***GEOTECHNICAL***

- Geotechnical engineers are civil engineers that have special training and experience with interaction of forces on soil

Slide 20. Split Spoon Sample

- If you like playing in the dirt!
- Materials are taken from the ground at strategic location to determine properties of the soil. These properties are important indicators of how the soil will respond when placed under various forces.

Slide 21. Playing with clay

Slide 22. Building adjacent to a steep cut

- An example of Geotechnical investigation that might be performed can be illustrated with this picture:
- Material Suitability
- Ground Water
- Slope Stability
- Foundation Design
- Corrosion Potential
- Consolidation
- Differential Settlement

Slide 23. Shoring

- Geotechnical engineers are involved in designing systems to hold back soils both temporarily (for construction) and permanently

Slide 24. Another Example of Shoring

Slide 25. Tunnel Excavation

- Water/ Sewer/ Transportation
- Channel Tunnel under the English Channel

Slide 26. ***WATER RESOURCES***

- Concerned with the behavior of fluids

Slide 27. Rectangular Concrete Channel

- With the information I just talked about, properties can be protected by designing appropriate structure to store flood water or drain them away.

Slide 28. Dam

- Large engineering structures such as a dam require the integration of many civil engineering disciplines:
- Environmental reports/ studies to determine the impacts to existing wildlife
- Hydrologic studies to determine flooding potential
- Geotechnical investigations to determine the strength of existing soils
- Hydraulic studies of the gates and spillway structures.
- Civil engineers would also need to integrate their design with other professionals such as an electrical engineers, mechanical engineers, and surveyors.

Slide 29. State Water Project 1

- As we all know, water is valuable resource in Southern California
- The California State Water Project imports water from Northern to Southern California
- Water is imported from Northern California through a series of canals, pipelines, tunnels, reservoirs, and pumping stations

Slide 30. Recharge Santa Ana River in Orange County

Slide 31-32. Water Tank

- Usually, water is stored in large tanks

- These tanks store water for use during peak water demands. They are pumped full at night when the demand for water is low and empty during the day when demands for water are high.
- Water tanks are also used to maintain pressures in the local pipe system and to provide water storage during fire fighting.

Slide 33. Piping-Water Tank

- Designs of water systems include the designs of pumps and control equipment, piping and valves.

Slide 34. ***ENVIRONMENTAL***

Slide 35. Earth

- We are facing major problems today with the environment. Our pollution sins of the past have caught up with us. Global problems are a collection of smaller pollution problems.

Slide 36. Trash Dump

- Our existing landfills are rapidly filling and there is limited space for opening new landfills. Our old landfills sometimes leak dangerous chemicals and gases which threaten to pollute our water and affect our health.
- Civil Engineers are designing new landfills to contain the wastes that we produce.
- Civil Engineers are involved in implementing designs for facilities to reclaim recyclable items, and to burn trash to produce energy.

Slide 37-38. Reverse Osmosis

- New technologies such as reverse osmosis are being developed and used by civil engineers to purify water from chemical and organic contaminants.
- These same technologies are also being developed to cost effectively desalinate water.

Slide 39. Water Reclamation

Slide 40. Sewer Treatment Plant

Slide 41. ***TRANSPORTATION***

Slide 42. Airport

- Civil Engineers design support facilities for airports

Slide 43. Ship Docking

- Marina's

Slide 44. Traffic Jam

- How familiar this looks!
- Our highway systems are becoming overburdened as more and more people use the freeways

Slide 45. Archibald Ave and I-10 Interchange

- The Freeway Exit and Entrance serving the reconstructed Ontario Airport needed to be designed to handle high traffic volumes. The solution was a unique interchange design called a "Single Point" interchange where the traffic to and from the freeway meets at the center of the interchange over the freeway. The design eliminates one traffic signal, increases flow, and decreases that potential of missing a flight.

Slide 46. Road Failure

- America's existing roads are also in need of civil engineering attention. Many of our roads need to be rehabilitated.

Slide 47. Subway

- Railroad systems of all sorts are designed by civil engineers.
- Public transportation systems may be part of the solution to air pollution and crowded freeways

Slide 48. Subway

Slide 49. ***PLANNING***

Slide 50. Satellite Picture

- When regions begin to grow there is a need to plan for facilities that will be needed in the future.

Slide 51-52. City Model

- Cities develop master plans to plan for future growth. Civil engineers are called upon to assist cities in determining locations for future facilities.

## **ASPECTS OF CIVIL ENGINEERING**

Slide 53. ***WIDE RANGE OF OPPORTUNITIES-DESIGN***

Slide 54. AutoCAD Software

- Civil Engineers design many different types of facilities

Slide 55. Close-up of AutoCAD

- If you enjoy solving problems or expressing your ideas on paper or computer, civil engineering might be a good profession for you.

Slide 56. ***CONSTRUCTION***

Slide 57-58. Storm Drain Construction

- Civil engineers design many facilities to be constructed. When it comes time to construct, civil engineers stay involved in the process.
- Civil engineers compare the plans with the project as it is being constructed. They are on site to ensure that what is constructed is of the same quality as shown on the plans.

Slide 59. Pipe Installation

- Good records are essential for facilities, such as this pipeline, which will be buried underground.

Slide 60. ***RESEARCH***

Slide 61. Combo Slide (4)

- There is a need for civil engineering researchers. Significant advances need to be made in many different processes and materials.

Slide 62. Quake Damage

- We need to understand the forces of nature more and develop new methods for safe designs.
- More research needs to be done to determine how buildings react to complex forces like earthquakes.