A Career In CIVIL ENGINEERING:

Improving the Quality of Life

What Do Civil Engineers Do?

As a Civil Engineer, you may be involved in **planning**, **designing** and **managing** a variety of projects. Your assignments might place you at a computer work station, in front of a public hearing, or on a project work site. You will usually work within a team that may include other engineering and scientific disciplines, contractors, project owners, architects, bankers, lawyers and government officials.

Civil Engineering Specialties

- Structural
- Construction
- Transportation
- Water Resources
- Geotechnical
- Environmental
- Urban Planning
- Surveying

Types of Jobs

- Design
- Construction
- Management
- Sales & Marketing
- Testing Labs
- Teaching and Research
- Surveying
- Computer Activities

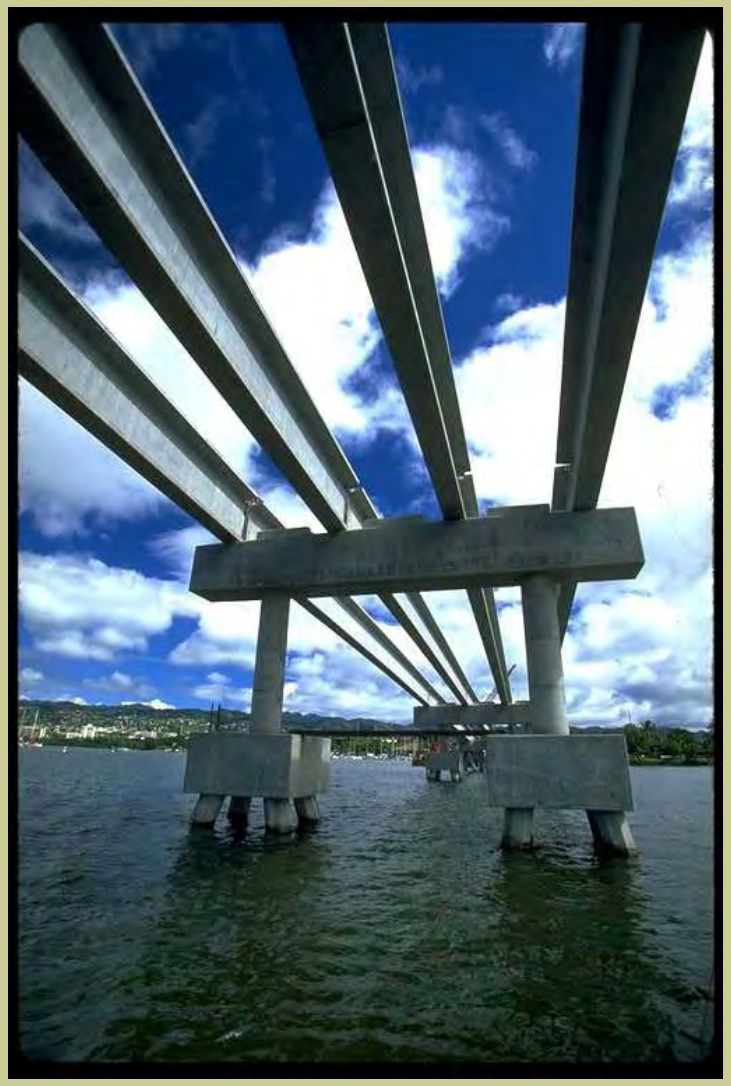
  (Designing, Drafting, Estimating, Scheduling, Illustrations)

Structural Engineering

- Analyzing and designing structures to ensure safety and performance
- Structures must support their own weight and resist live loads (earthquakes, wind, water)
- Learn about properties of steel, concrete, aluminum, timber and plastics
- Examples: Stadiums, arenas, skyscrapers, space platforms, amusement park rides, bridges, offices, schools and hospitals

Busch Stadium, Downtown St. Louis

Photos from New
Cardinals Stadium
Downtown St. Louis
Construction July 2005



Bridges, Sports Facilities

Interstate 64 Bridge Deterioration

Lindbergh Boulevard Tunnel
In North St. Louis County

Box Culvert

Construction Engineering

- Be the builders of our future
- Use technical and management skills to turn a design on paper into a reality
- Projects must be on-time and within budget
- Apply knowledge of construction methods and equipment along with knowledge of financing, planning and managing into a successful facility

Metro Link
Cross County
Construction

Lower Meramec Treatment
Plant Construction

Lambert Airport Construction

Transportation Engineering

- Move people, goods and materials safely and efficiently
- Meet the increasing community travel needs on land, air and sea
- Design, construct and maintain highways, railroads, airfields, light rail and ports
- Improve traffic control and mass transportation systems for the future

Lambert Airport Expansion Program

Source: http://www.lambert-pmo.org

Airports

Intelligent Transportation Systems

Freeways

Traffic Signals

Metro Link Light Rail
St. Louis County


BUDROVICH
BUDROVICH

Water Resources Engineering

- Water is essential to all life
- Deal with issues concerning the quality and quantity of water
- Work to prevent floods, supply water to cities, industry and irrigation, and treat waste water to protect natural resources
- Design, construction and maintenance of hydroelectric power facilities, canals, dams, pipelines, locks and seaport facilities

Downtown Flood Wall near St. Louis Arch

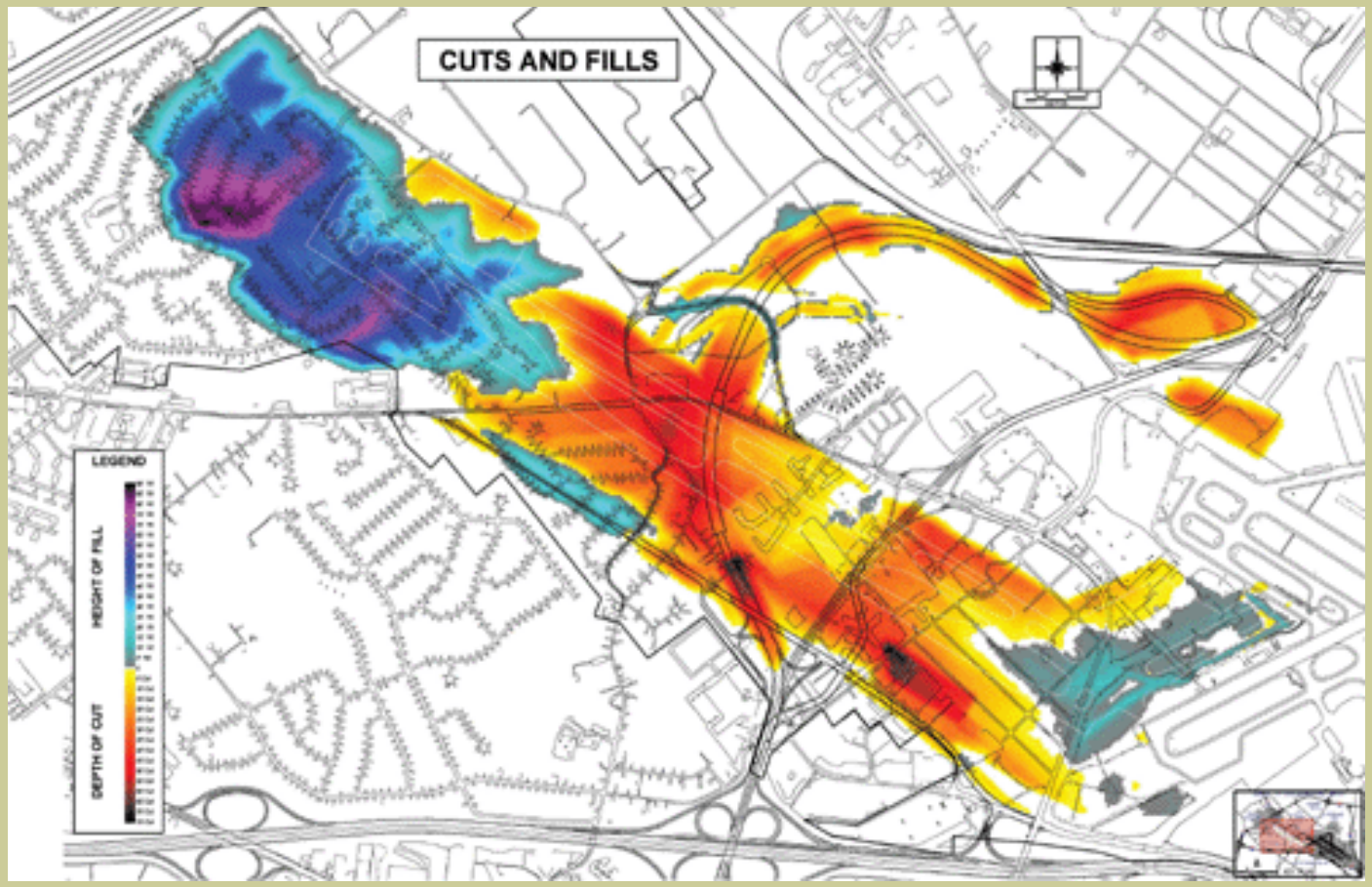
Great Flood of 1993 – Photos from Downtown St. Louis and Grafton, IL

Lambert Airport Water Resource Engineering

Geotechnical Engineering

- Earth soil materials are the foundation for all other infrastructure
- Apply soil properties and mechanics to solve problems
- Laboratory and field test data used to determine proper type of foundation for a particular project
- Examples: Tunnels, buildings, bridges, pavements, pipelines, dams, levees, embankments and slopes

Construction
Grading and Earthwork



8 Million Cubic Yards of Soil Were Moved During the Lambert Airport Expansion Program!

Source: http://www.lambert-pmo.org

Tunnel Through Hawaiian Mountains

On-Site Investigation:
Dr. Susan Chang investigates a rock slide after
a seismic event in the Pacific Northwest

Environmental Engineering

- Protect the fragile resources of our planet
- Translate physical, chemical and biological processes into system solutions
- Destroy toxic substances, remove water pollutants, reduce hazardous wastes, clean air and ground water
- Provide safe drinking water, treat wastewater and manage solid wastes

Air Quality

Chemical Testing

Underground Storage Tank Clean-Up and Removal

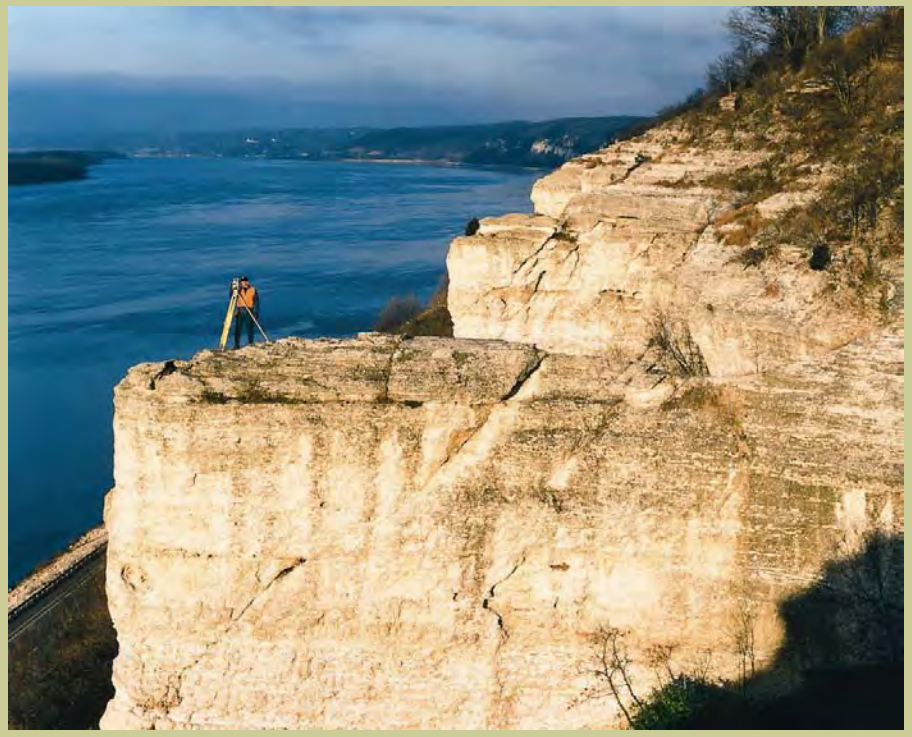
Urban Planning

- Develop the community around us
- Coordinate projects such as projecting street patterns and identifying areas for park/recreation, residential and industrial growth
- Integrate freeways, airports and other facilities with the communities they serve
- Work with local governments and the public

Urban Planning Concepts

Surveying

- Determine horizontal and vertical data to aid in civil engineering design of roads, bridges and buildings
- Determine boundaries of private property and various political divisions (city limits)
- Provide advice and data for Geographical Information Systems (GIS) computer databases with data on land features and boundaries



Surveyors and Their Equipment
In Downtown St. Louis

Suggested High School Courses

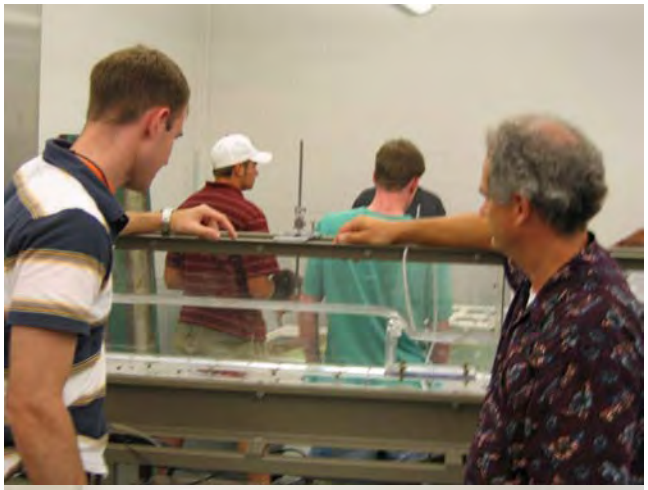
- Math - 4 Years
- Science - 3 Years
- Communications - 4 Years
- Foreign Languages - 2 Years
- Social Studies - 2 Years
- Computer Activities - 4 Years (Word Processing, Database, Spreadsheets, Design)
- Personal Relationships and Extracurricular Activities

Civil Engineering Classroom

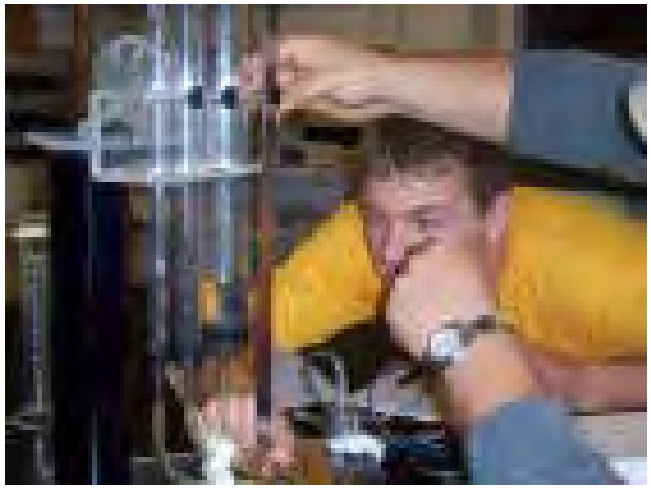
- Instructors in the classroom

Civil Engineering Laboratory

- Hands-on experience in the lab



Civil Engineering Laboratory



Civil Engineering Laboratory

Road to Becoming a Civil Engineer

- High School Diploma
- Bachelor of Science Degree in Civil Engineering (Typically 4 - 5 Year Program)
- Professional Registration after obtaining on-the-job work experience

Area Colleges

- University of Missouri (Columbia, Rolla, St. Louis, Kansas City campuses)
- Washington University
- Southern Illinois University (Edwardsville and Carbondale campuses)
- University of Illinois
- St. Louis Community Colleges (Pre-Engineering)

Websites for More Info

- American Society of Civil Engineers

www.asce.org
http://sections.asce.org/stlouis (Local Chapter)

- National Society of Civil Engineers

www.nspe.org

- Society of Women Engineers

www.swe.org

- National Society of Black Engineers

www.nsbe.org

Many others exist - check the web for discipline specific organizations!

What will Civil Engineers need to do in the future?

- 2005 ASCE Report on the U.S. Infrastructure evaluates existing conditions and lists needs for the future
- How did the United States score?

A = Exceptional
B = Good
C = Mediocre
D = Poor
F = Failing
I = Incomplete

Source: www.asce.org

AVIATION

D+

- Air travel and traffic have increased on America's runways in recent years and are expected to grow annually through 2015. Airports will face the challenge of growing numbers of regional jets and new super-jumbo jets.

Source: www.asce.org

- Lambert International Airport – St. Louis, MO

BRIDGES

C

- Between 2000 and 2003, the percentage of the nation's bridges rated structurally deficient or functionally obsolete decreased slightly from 28.5% to 27.1%. However, it will cost $9.4 Billion a year for 20 years to eliminate all bridge deficiencies.

I-35W Bridge Collapse: Minneapolis, 2007

Local Area Bridges

Panoramic View of Clark Bridge near Alton, IL

Completed Clark Bridge

Proposed New Mississippi River Bridge Downtown, St. Louis

DAMS

D

- Since 1998, the number of unsafe dams has risen by 33% to more than 3500. $10.1 Billion is needed over the next 12 years to address all critical non-federal dams-those which pose a direct risk to human life should they fail.

Source: www.asce.org

- Melvin Price Locks and Dam, South of Clark Bridge near Alton, IL

Price Locks and Dam

National Great Rivers Museum

DRINKING WATER  D-

- America faces a shortfall of $11 Billion annually to replace aging facilities and comply with safe drinking water regulations. Federal funding for drinking water in 2005 remained at $850 Million, less than 10% of the total national requirement.

Source: www.asce.org

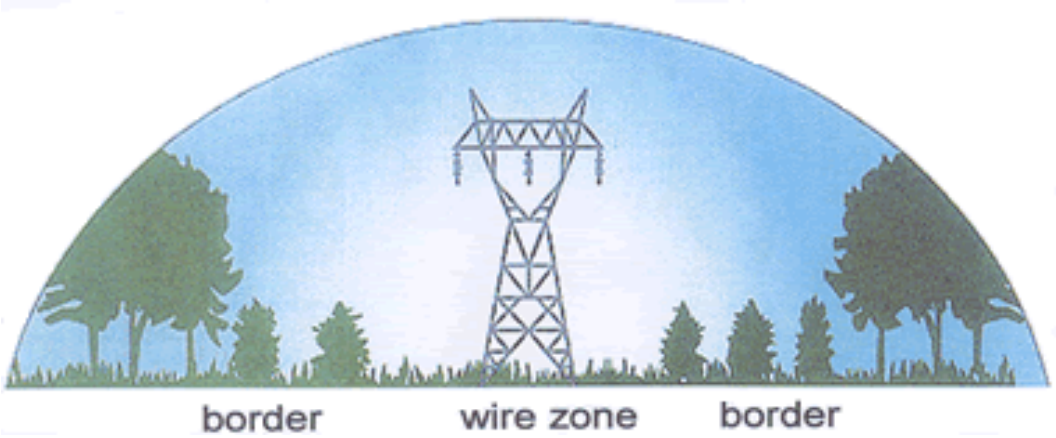
ENERGY

D

- The U.S. Power Transmission system is in urgent need of modernization. Existing transmission facilities were not designed for the current load of demand, which increase cost to consumers and elevate risk of blackouts.

Source: www.asce.org

- Ameren UE Transmission Lines



Source: www.ameren.com

HAZARDOUS WASTE D

- Federal funding for the “Superfund” cleaning of the nation’s worst toxic waste sites has steadily declined since 1998, reaching its lowest level since 1986 in FY 05. There are 1237 contaminated sites on the National Priorities List, with possible listing of additional 10,154.

Source: www.asce.org

- Engineers Take Part in Waste Clean-Up Efforts

NAVIGABLE WATERS D-

- A single barge traveling the nation's waterways can move the same amount of cargo 58 semi-trucks can at one-tenth of the cost, reducing highway congestion and saving money. Of the 257 locks operated by the U.S. Army Corp of Engineers, nearly 50% are functionally obsolete, and this number is expected to increase to 80% by 2020.

Source: www.asce.org

- Barge Traffic on Mississippi River

Source: www.memcobarge.com

PUBLIC PARKS AND RECREATION

C-

- The National Park Service estimates a maintenance backlog of $6.1 Billion for the facilities. Additionally, there is a great need for maintenance, replacement and construction of new infrastructure in our nations, state and municipal park systems.

Source: www.asce.org

- Forest Park in St. Louis, MO

RAIL  C-

- The freight railroad industry needs to spend $175-$195 Billion over the next 20 years to maintain existing infrastructure and expand for freight growth. Expansion of the railroad network to develop intercity corridor passenger rail service is estimated to cost approximately $60 Billion over the next 20 years.

Source: www.asce.org

ROADS

D

- Poor road conditions cost U.S. motorists $54 Billion per year in repairs and operating costs. Americans spend 3.5 Billion hours a year stuck in traffic, at a cost of $63.2 Billion a year to the economy. Total spending of $59.4 Billion annually is well below the $94 Billion needed annually to improve transportation conditions nationally.

Source: www.asce.org

Local Area Roadway Projects

Highway 21 at Butler Lake

Page Avenue Extension

Hwy. 40 & K Interchange

SCHOOLS

D

- The Federal government has not assessed the condition of America's schools since 1999 when it estimated that $127 Billion was needed to bring facilities to good condition. Other sources have since reported a need as high as $268 Billion.

Source: www.asce.org

SECURITY

- While the security of our nation's critical infrastructure has improved since September 11, 2001, the information needed to accurately assess its status is not readily available to engineering professionals.

Source: www.asce.org

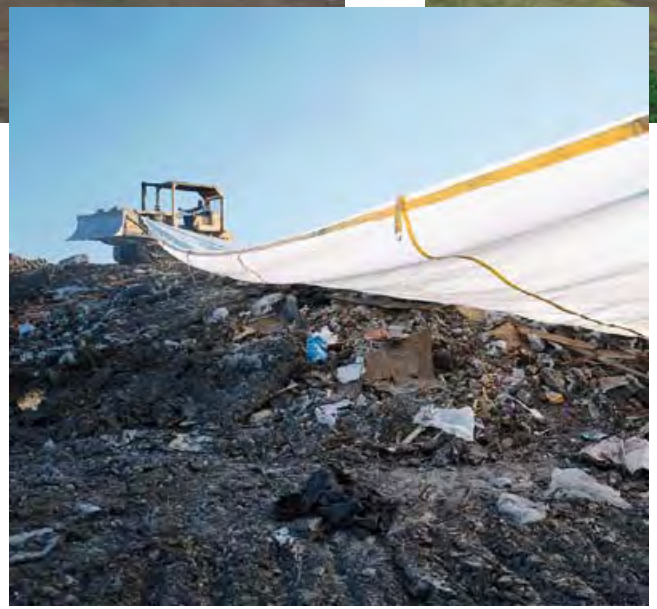
SOLID WASTE

C+

- The nation's operating municipal landfills are declining in total numbers, but capacity has remained steady due to the construction of numerous regional landfills. In 2003, the United States produced 369 Million tons of all types. Only about a quarter of that total was recycled or recovered.

Source: www.asce.org

Solid Waste Landfills



TRANSIT

D+

- Transit use increased faster than any other mode of transportation, 21% between 1993 and 2002. The Federal Transit Administration estimates $14.9 Billion is needed annually to maintain conditions, and $20.6 Billion is needed to improve to “good” conditions.

Source: www.asce.org

- Metro Link Construction in St. Louis, MO

WASTEWATER

D-

- Aging wastewater management systems discharge billions of gallons of untreated sewage into U.S. surface waters each year. The EPA estimates that the nation must invest $390 Billion over the next 20 years to replace existing systems and build new ones to meet increasing demands.

Source: www.asce.org

- Metropolitan St. Louis Sewer District (MSD)

Lower Meramec River
Wastewater
Treatment Plant

OVERALL SCORE = D (2005)

- Total Investment Needs = $1.6 Trillion
- We need more Civil Engineers!!!