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

A1480
IS 64 WB / IS 170
Girder 5 near west abutment
heavy pack rust & section loss in stringer

K0501
Spoede / IS 64
under WB span

9-23-2005

10-12-2005
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
Lower Meramec Treatment Plant 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
Airports

Freeways

Intelligent Transportation Systems

Traffic Signals
Metro Link Light Rail
St. Louis County
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
Great Flood of 1993 – Photos from Downtown St. Louis and Grafton, IL

Downtown Flood Wall near St. Louis Arch
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
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?


How did the United States score?

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

Source: www.asce.org
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
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.
Local Area Bridges

Panoramic View of Clark Bridge near Alton, IL

Completed Clark Bridge

Proposed New Mississippi River Bridge
Downtown, St. Louis
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
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
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
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
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
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
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
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
- Hwy. 40 & K Interchange
- Page Avenue Extension
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
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
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 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
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!!!