

## Civil Engineering Overview

*Sanj Malushte, Ph.D., PE, SE, F.ASCE  
Bechtel Fellow and Sr. Principal Engineer  
Adjunct Faculty, Johns Hopkins University*

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## *Objectives*

- Increase awareness about Civil Engineering
  - Introduce various career paths within CSA professions
  - Convey understanding of design process and challenges
  - Provide Introduction to some major structures
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*Civil Engineering includes:*

- Coastal Engineering
  - Structural Engineering
  - Architectural Engineering
  - Construction Engineering
  - Geotechnical Engineering
  - Transportation Engineering
  - Environmental/Water Resources Engineering
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## *Some Statistics*

- There are about 200,000 civil engineers in the US
  - Starting salary ranges from 45K to 65K
  - Earnings after 5-10 years generally range from 70K to 110K
  - Top-notch engineers can earn well in excess of 150K
  - Most engineers can reach 125K as peak compensation
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## *Additional Resources*

- Building Big : <http://www.pbs.org/wgbh/buildingbig/>
  - American Society of Civil Engineers:  
<http://www.asce.org>
  - American Institute of Architects: <http://www.aia.org>
  - Johns Hopkins University – Perspectives on the Evolution of Structures (includes structures in and around the city of Baltimore):  
<http://www.ce.jhu.edu/perspectives/libraries.htm>
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## *What is Coastal Engineering?*

- Multi-disciplinary branch of civil engineering working in waterway environments
  - Sustainable development and protection of coastal, ocean, ports, waterways, and wetlands
  - Examples of work: Ports (piers, wharves, jetties) and Harbors, Waterways, Coastal Structures, Wetlands and Sediment Management, Offshore Facilities, Shore Protection, etc
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# *What is Coastal Engineering?*



Chek Lap Kok Airport  
Location: Hong Kong  
Photo Date: 1/1/1993

Qatar North Field development  
Location: Qatar  
Photo Date: 1/1/1992

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## *What is Structural Engineering?*

- Design and analysis of structures to withstand forces of nature (gravity, wind/tornado, earthquake, rain, ice, waves, fluid pressure, temperature, etc) and forces from equipment/accidents (blast, impact, loads due to weight, vibration, thrust, operating torque, etc)
  - Understanding of behavior of construction materials such as steel, concrete, timber, masonry (stress-strain, ductility, durability, jointability, etc)
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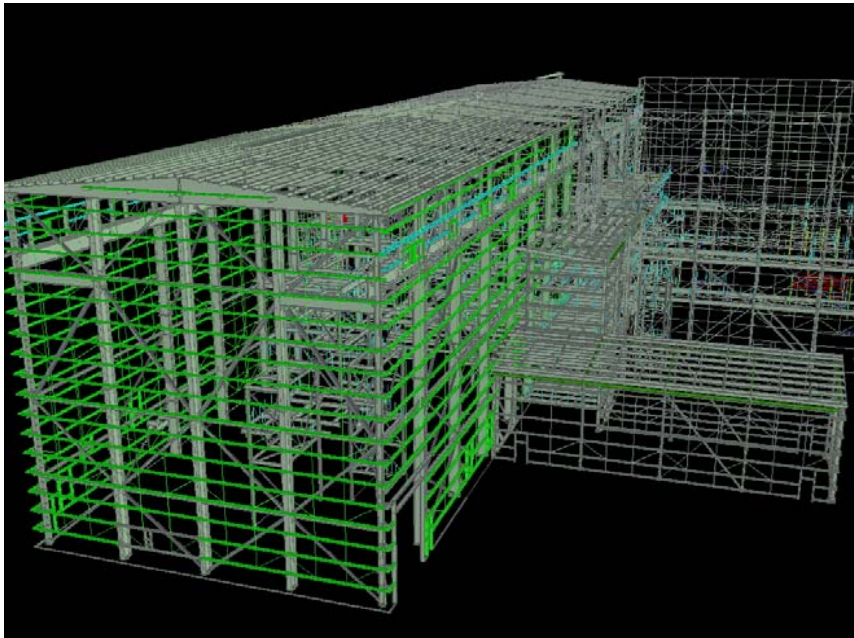
# *What is Structural Engineering?*



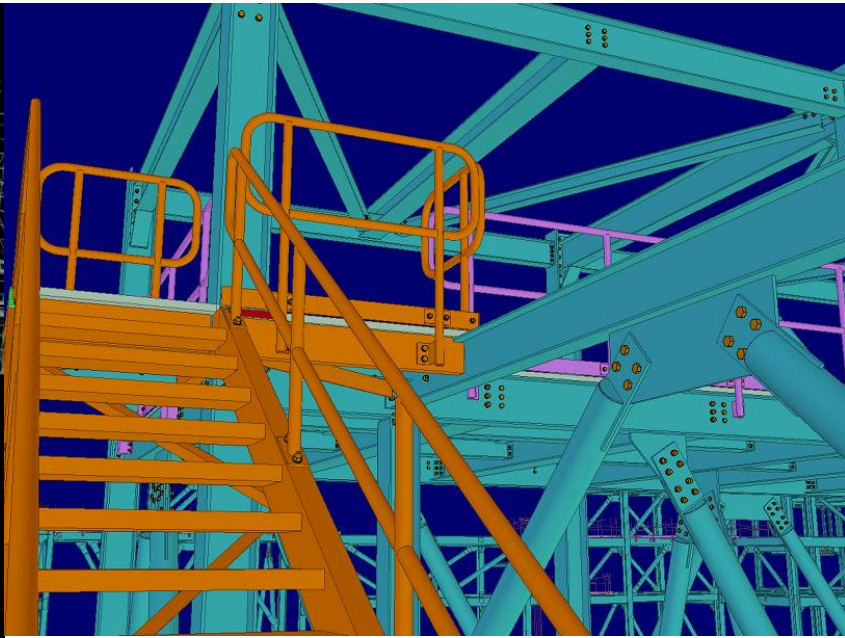
**Chek Lap Kok Airport**  
Location: Hong Kong  
Photo Date: 1/1/1993

**Palo Verde nuclear power plant**  
Location: Phoenix, AZ  
Photo Date: 3/1/1987

# *What is Structural Engineering?*



Turbine Building Analytical Model



Structural Steel Detailing

## *Structural Design Challenges*

- Safety, Performance, Economy
- Site Specific Conditions
- Unique Owner Requirements
- International Codes
- Local Materials & Methods
- Design, Fabrication and Construction Lead Times



## *What is Architectural Engineering?*

- Design/Manufacturing of architectural (non-structural/mechanical/electrical) systems of the building; including but not limited to windows, cladding, doors, ceilings, roofing, waterproofing, etc.
  - Architectural systems for buildings and secured facilities (blast/impact resistant doors, windows, and cladding)
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## *What is Construction Engineering?*

- Deals with engineering and management issues associated with construction of building and industrial structures
  - Includes construction planning, quality control, field inspections, surveying, site safety, construction tools and techniques, etc
  - Addresses temporary facilities, hauling, rigging, construction equipment, etc
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# *What is Construction Engineering?*



Tacoma Narrows Bridge  
Location: Tacoma, WA  
Photo Date: 8/1/2005



Nuclear Steam Generator Replacement  
Location: Byron, IL  
Photo Date: 1996



## *What is Geotechnical Engineering?*

- Use of soil for the purpose of supporting foundations and pavements
  - Evaluation of soil properties, seismic effects, lateral earth pressure loading, slope stability, etc
  - Involves shallow/deep foundations, earth retaining structures, soil dynamics, earth dams/embankments, soil improvement techniques, geosynthetics, soil erosion, pavement sub-bases, etc
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## *What is Transportation Engineering?*

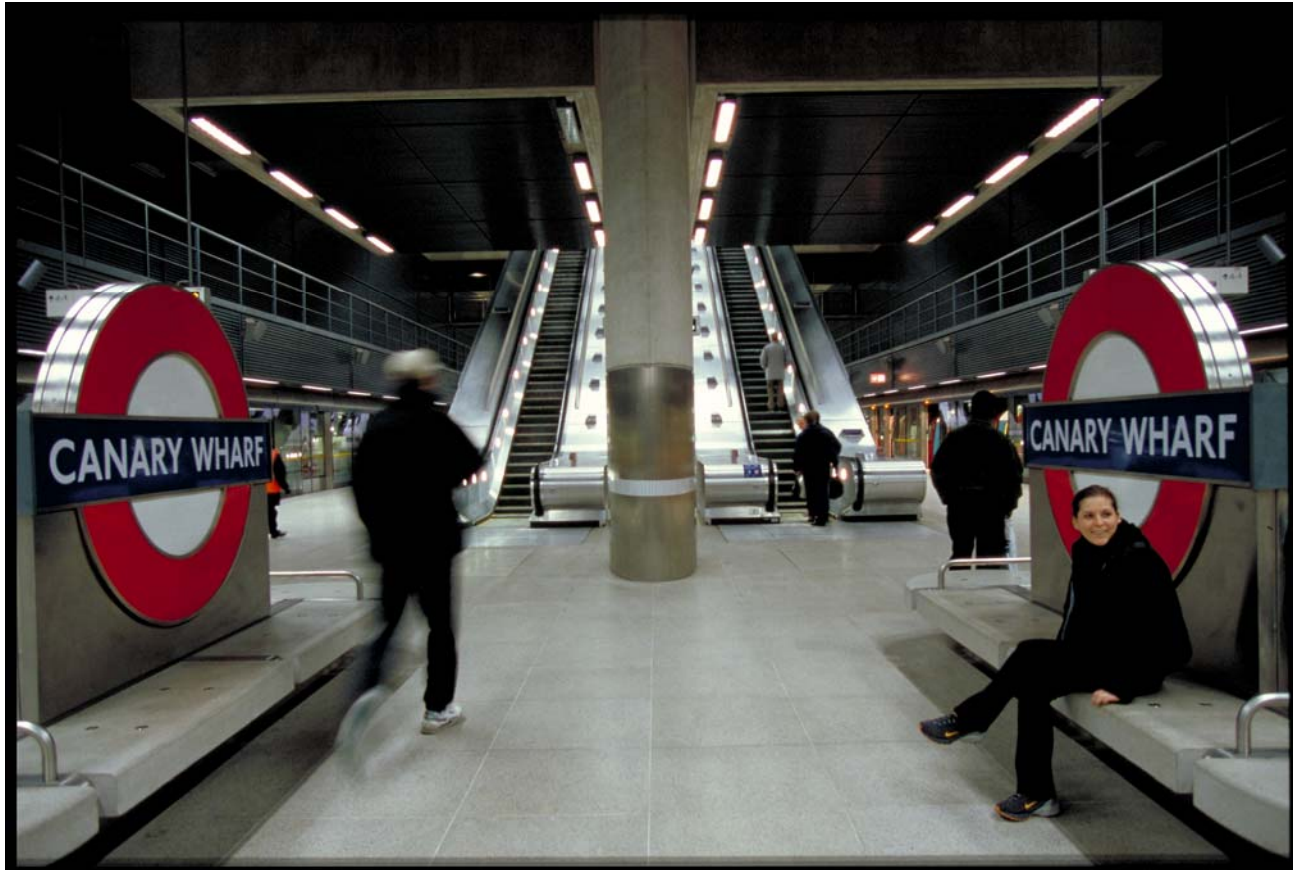
- Planning and design of public transportation projects such as highways, airports, mass-transit systems
  - Involves surveying/planning traffic needs, layout of highways, airports, subway/light-rail/monorail/railway systems
  - Negotiating rights-of-way, land acquisitions, etc
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*ACE Mentoring Program*

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# *What is Transportation Engineering?*



Jubilee Line Project  
Location: London, UK  
Photo Date: 1/1/2000

*What is Environmental/Water Resources Engineering?*

- Study of hydraulics, waterways, ground water hydrology, water treatment, sewage treatment, storm drainage, watershed management, treatment of hazardous waste
  - Applications are irrigation projects, water/sewage treatment plants, dams, canals, landfills, soil/site remediation projects
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# Make Civil Engineering Your Future!

