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1.133 M.Eng. Concepts of Engineering Practice  
Fall 2007

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**THE ENGINEERING  
AND  
CONSTRUCTION  
INDUSTRY**

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**Lecturer**

# AGENDA

- Monday, October 22 @ 8:45AM
  - E&C Industry Overview
  - Assignment: Profile a Company
- Wednesday, October 24 @ 8:45AM
  - Strategic Management Issues
- Wednesday, October 31 @ 8:30AM
  - Student Presentations
  - Summary

# SKILLS OF AN EFFECTIVE ENGINEER

- Skills
  - Technical
  - Human
  - Conceptual
- Levels
  - Industry
  - Company
  - Project
  - Task/Assignment

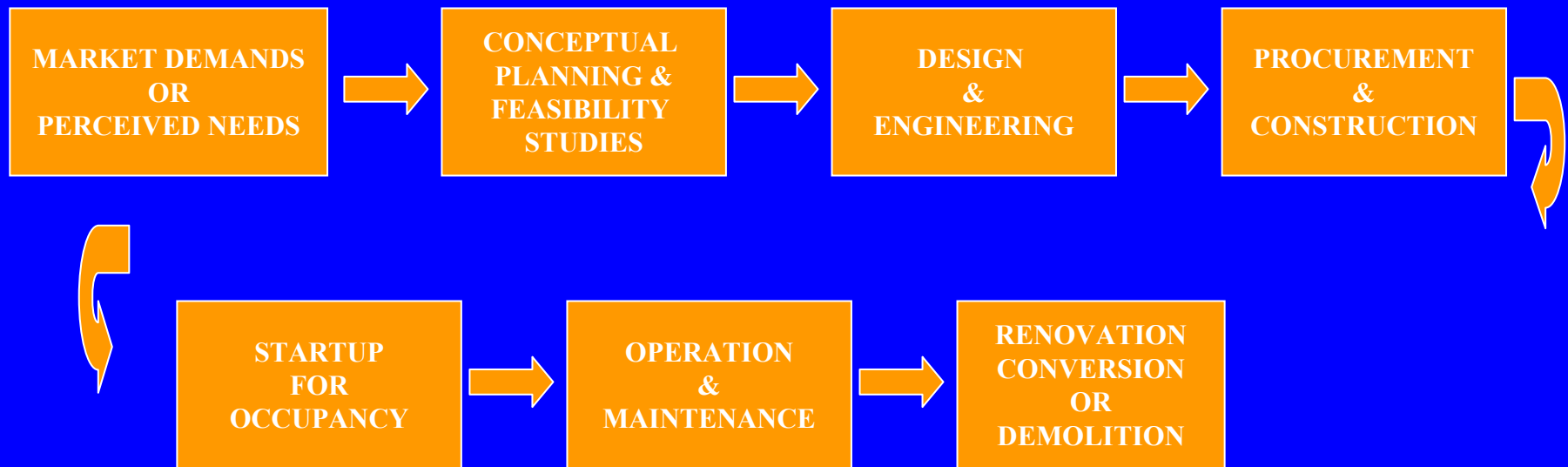
# **ROLE OF THE E&C INDUSTRY**

Through planning, design, construction, operation, and maintenance activities, the E&C industry transforms resources of labor, capital (money, materials, & equipment), and knowledge into the physical facilities required to meet a broad range of social and economic needs.

# PRODUCTS OF THE E&C INDUSTRY

- Buildings
- Industrial Plants
- Infrastructure Systems
- Environmental Restoration & Remediation  
Projects

# FACILITY PROJECT LIFE CYCLE\*



\* Adapted from: “Project Management for Construction”; Chris Hendrickson & Tung Au  
Prentice Hall; 1989

# **GLOBAL PERSPECTIVE**

## **Year 2000**

- **WORLD TOTAL** **\$3.41 Trillion**
  - **ASIA** **\$1,113 Billion**
  - **EUROPE** **\$1,017 Billion**
  - **NORTH AMERICA** **\$ 885 Billion**
  - **LATIN AMERICA** **\$ 241 Billion**
  - **MIDDLE EAST** **\$ 101 Billion**
  - **AFRICA** **\$ 56 Billion**



# TOP COUNTRIES

- **UNITED STATES (1)**      **\$819 B**      **8.2%**
- **JAPAN(2)**      **\$618 B**      **13.9%**
- **GERMANY(3)**      **\$253 B**      **11.4%**
- **CHINA(4)**      **\$181 B**      **17.0%**
- **UNITED KINGDOM(5)** **\$109 B**      **7.7%**
- **BRAZIL(6)**      **\$109 B**      **13.8%**
- **FRANCE(7)**      **\$107 B**      **7.0%**

# TOP COUNTRIES (Cont'd)

• ITALY(8)	\$96 B	8.1%
• SPAIN(9)	\$86 B	14.8%
• KOREA,Rep(10)	\$68 B	15.4%
• CANADA(11)	\$65 B	10.2%
• INDIA(12)	\$60 B	12.3%
• MEXICO(13)	\$45 B	9.0%
• RUSSIAN FED(14)	\$43 B	10.8%

# TOTAL CONSTRUCTION 2000-2006

- 2006 \$1,167,261 million
- 2005 1,194,492
- 2004 1,075,307
- 2003 972,958
- 2002 895,422
- 2001 873,279
- 2000 840,333

# BLS INDUSTRY SUPERSECTORS

- Construction
- Education & Health Services
- Financial Activities
- Government
- Information
- Leisure & Hospitality

# BLS INDUSTRY SUPERSECTORS (Cont'd)

- Manufacturing
- Natural Resources & Mining
- Other Services
- Professional & Business Services
- Transportation & Utilities
- Wholesale & Retail Trade

# ECONOMIC CONTRIBUTIONS IN THE USA IN 2006

- US GNP \$13,615 Billion
- Construction \$1,167 Billion
- GFCF: 45-50%
- Employment: 7.3 million (5.4% of workforce)
- Backward & Forward Linkages
- Establishments: 9.8%
- Entrepreneurial Opportunities

# NATURE OF USA DEMAND 2005

- TOTAL \$1,194,492 Million
- PRIVATE \$940,237 (79%)
  - Residential Building \$665,615 (56%)
  - Nonresidential 274,622 (23%)
- PUBLIC \$254,255 (21%)
  - Residential Building 8,481 (1%)
  - Nonresidential 245,774 (20%)

# PRIVATE NONRESIDENTIAL KEY SECTORS (Billion)



# PUBLIC NONRESIDENTIAL KEY SECTORS (Billion)

# PARTICIPANTS

- Clients/Owners
- Designers (Architects, Engineers)
- Contractors & Subcontractors
- Labor Organizations
- Suppliers (Materials, Equipment)
- Finance, Legal, Insurance, etc. Firms
- Regulators

# ENR TOP XYZ LISTS

- 500 Design Firms (April)
- 400 Contractors (May)
- 100 Design-Build, CM for Fee, CM at Risk (June)
- 200 International Design Firms (July)
- 200 Environmental Firms (July)
- 225 International/Global Contractors (Aug)
- 600 Specialty Contractors (October)
- Top Owners (November)

# TOP 500 DESIGN FIRMS

## 2006

- Billings: \$69.6 Billion
  - Domestic: \$ 54.7 Billion
  - Internat'l: \$ 11.9 Billion
- Profitability:
  - Domestic: 11%, 455 Profit, 9 Loss
  - Internat'l: 11%, 135 Profit, 23 Loss
- Professional Staff:
  - 466 Increase, 145 Same, 35 Decrease

# MARKET STRUCTURE

• Building	\$ 16.46 Billion	23.7%
• Transportation	\$ 13.39 “	19.2%
• Petroleum	\$ 10.82 “	15.5%
• Hazardous Waste	\$ 7.32 “	10.5%
• Power	\$ 4.95 “	7.1%

# MARKET STRUCTURE

• Sewer/Wastewater	\$ 4.91 Billion		7.1%
• Water	\$ 4.19	“	6.0%
• Industrial	\$ 3.47	“	5.0%
• Manufacturing	\$ 1.40	“	2.0%
• Telecom	\$ .79	“	1.1%
• Other	\$ 1.90	“	2.7%

# TYPES OF FIRMS

- E = Engineer 183
- EA = Engineer-Architect 101
- EC = Engineer-Contractor 55
- AE = Architect-Engineer 72
- A = Architect 51
- ENV = Environmental 11
- GE = Soils or Geotech Eng 12
- P = Planner 0

# TYPES OF FIRMS

- AP 3
- AEC 3
- AEP 6
- CEP 1
- EAP 1
- ECA 1



# FIRM INFORMATION

- Rank (2005 & 2006)
- Headquarters Location
- Type of Firm
- Billings (Total:\$2.9 B-\$16 M, & Int'l )
- Market Distribution of Billings
- Top Designers in Market Sectors
- Subsidiaries
- International Operations

# TOP 400 CONTRACTORS

- Revenues: \$ 194 Billion
  - Domestic: \$ 167 Billion
  - Internat'l: \$ 27 Billion
- Profitability:
  - Domestic: 2.3%, 325 Profit, 32 Loss
  - Internat'l: 2.7% 50 Profit, 17 Loss
- Professional Staff:
  - 147 Increase, 159 Same, 60 Decrease

# MARKET STRUCTURE

• Building	\$ 98.7 Billion	51.0%
• Transportation	\$ 29.4 “	15.2%
• Petroleum	\$ 14.5 “	7.5%
• Power	\$ 12.3 “	6.4%
• Industrial	\$ 11.2 “	5.8%
• Manufacturing	\$ 5.0 “	2.6%

# MARKET STRUCTURE

• Hazardous Waste	\$ 6.1 Billion		3.2%
• Sewer/Wastewater	\$ 3.6	“	1.8%
• Water	\$ 2.9	“	1.5%
• Telecom	\$ 2.4	“	1.2%
• Other	\$ 7.3	“	3.8%

# COMPANY INFORMATION

- Rank (2005 & 2006)
- Headquarters Location
- Total Revenues(\$9.7 Billion-\$98 Million)
- International Revenues
- New Contract Awards
- Market Distribution (% of Revenues)
- Construction Management Revenues

# COMPANY INFO (Cont'd)

- Subsidiaries
- Locations of Overseas Operations
- Top 20 in Major Market Sectors
- Narrative & Strategic Issues
  - General Building
  - Heavy Construction
  - International Market

# **VIEW FROM October 2000**

- **General economic environment**
  - **Industry 10 years without recession**
  - **Economic predictions universally optimistic**
  - **Continued growth in 2001 but at slower pace**
    - **Annual growth rate down from 10% to 3%**
    - **Tighter labor & materials markets**
    - **Increasing pressure on inflation**
  - **Large increases in Federal construction**

# **VIEW FROM October 2000(Cont'd)**

- **Strong office building construction**
- **Continued strong demand from bio-tech, dot-coms, semiconductor manufacturers**
- **Need for innovation to meet demand**
  - **design-build**
  - **innovative financing**
  - **streamlining regulations**
  - **Application of IT to project delivery method**



# **VIEW FROM October 2000**

## **(Cont'd)**

- **Nature of Projects**
  - **High-profile high-rise**
  - **Signature-architect buildings**
  - **telecom hotels and towers**
  - **Innovative water resources facilities**
    - **ground water replenishment systems**
    - **microfiltration**
    - **reverse osmosis**
    - **ultraviolet disinfection**

# **VIEW FROM October 2000 (Cont'd)**

- **Information-rich project tools**
  - **Information Age to the Knowledge Age**
  - **Turning data into knowledge**
  - **Knowledge based on experience**
    - **Realistic assessment of past performance & capabilities of individuals on a team**
    - **Assessment of organizational structure that is formed to accomplish a complex task**
  - **Mining searchable data**

# **VIEW FROM OCTOBER 2007**

- **General Economic Environment**
  - **Few signs of market slowing any time soon**
  - **Sound Bites**
    - **Things look good for high-end contractors for next ten years**
    - **But, can we handle the boom with current resources?**

# **VIEW FROM OCTOBER 2007**

- **Overall Industry Trends**
  - **Continuing mergers & acquisitions**
    - **For additional capacity**
    - **Geographic**
    - **Market specialties (healthcare, security, research facilities)**
    - **Value Adding Services**
    - **Regional to National Capabilities**

# **VIEW FROM OCTOBER 2007**

- **Construction Industry Trends**
  - **Insurance/Bonding Requirements**
    - **Increased emphasis on management**
    - **Active management of costs & risk**
  - **Increasing self-performance vs use of subs**
  - **Information Technology less of a novelty and selling point, more of a requirement**
  - **Increasing Emphasis on safety**

# **VIEW FROM OCTOBER 2007**

- **Design Industry Trends**
  - **Accelerating Mergers/Acquisitions**
    - **Technical Expertise**
    - **Geographical Coverage**
    - **New Services**
    - **International Assets/Local Presence**
  - **Increasing Public Ownership**
    - **Emphasis on Growth & Shareholder Demands**

# **VIEW FROM OCTOBER 2007**

- **Design Industry Trends (cont'd)**
  - **Staffing Issues**
    - **Shortage of Professionals**
    - **Increasing Competition for Students**
    - **Company Involvement in Teaching & Research**
    - **Recruiting Through Internships**
  - **Increasing Client Expectation of Perfection in Design**

# **VIEW FROM OCTOBER 2007**

- **Design Industry Trends (cont'd)**
  - **Building Information Modeling (BIM)**
    - **Streamlining Design Process**
    - **Engineering Driven/Informed Design**
    - **Consideration of Constructability Issues During Design**
    - **Changing Relationships Among Contractors, Subs, Design Professionals, Suppliers**
    - **Increasing Upfront Effort & Cost**



# **VIEW FROM OCTOBER 2007**

- **Design Industry Trends (cont'd)**
  - **Green Building/Sustainability**
    - **Increasing Public Awareness**
    - **Increasing Corporate Interest & Action**
    - **LEED (Leadership in Energy & Environmental Design)**
    - **Durability of Materials**
    - **Energy Savings**
    - **Carbon Footprint Minimization**