The Learning Bridge

for Advancing Civil Engineering and its Education

A Coordinated, Multi-Institutional, Multi-Disciplinary, Academe-Industry-Government Collaborative Research Project

Growing to an International Center of Best Practices for Civil Engineering Education

Kick-off Meeting
13 Nov. 2009
Palmyra Cove

Civil Engineering Curriculum

Fundamental Questions

- **21st Century Student:** How can we motivate and reinforce/leverage the positive attributes of the new generations and mitigate the generational divide in the education and practice of civil engineering?
- **21st Century Technology:** How can we properly leverage new technologies for improving the performance of civil eng services and products?
- **21st Century Societal Problems:** How can we better recognize, conceptualize and formulate effective solutions for the societal challenges which demand civil engineers' leadership and coordination?

Relevance

Recent Recommendations

- I. Make ***Research-Based*** Learning the Standard
- II. Construct an ***Inquiry-based*** Freshman Year
- VI. Use ***Information Technology*** Creatively
- VII. Culminate With a ***Capstone*** Experience

1998 Boyer Commission Report

- "…Students should be introduced to the "***essence***" of engineering early in their undergraduate careers."
- "…Should introduce ***interdisciplinary learning*** in the undergraduate curriculum and explore the use of case studies of engineering successes and failures as a learning tool."
- "Institutions should encourage domestic students to obtain the MS and/or PhD degrees."

National Academy of Engineering (2004) "Educating the Engineer of 2020: Adapting Engineering Education to the New Century"

Relevance

Recent Recommendations

ASCE 24 Outcomes

Foundational

1. Mathematics
2. Natural sciences
3. Humanities
4. Social sciences

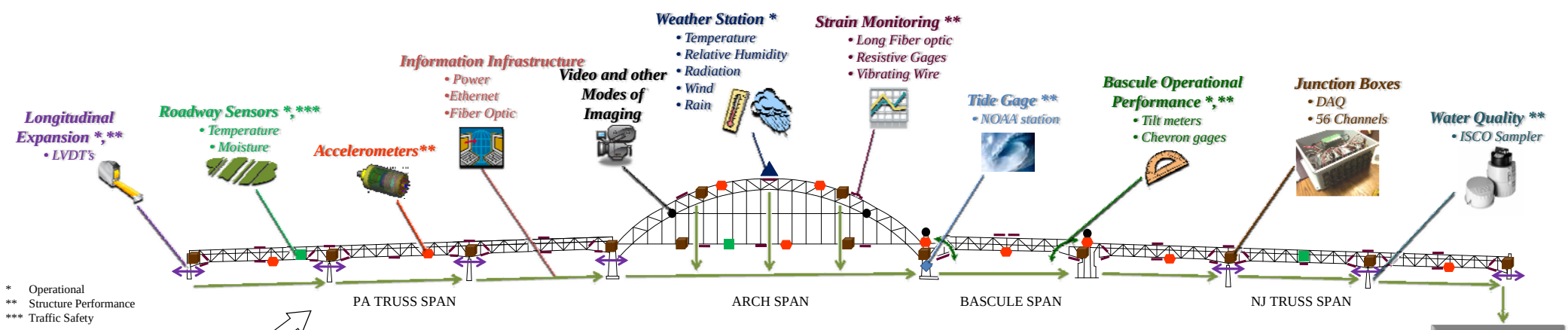
Professional

16. Communication
17. Public policy
18. Business and public administration
19. Globalization
20. Leadership
21. Teamwork
22. Attitudes
23. Lifelong learning
24. Professional and ethical responsibility

Technical

5. Materials science
6. Mechanics
7. Experiments
8. Problem recognition and solving
9. Design
10. Sustainability
11. Contemp. issues & hist. perspectives
12. Risk and uncertainty
13. Project management
14. Breadth in civil engineering areas
15. Technical specialization

Health Monitoring Systems Diagram for the Tacony-Palmyra Learning Bridge



MONITORING THE HEALTH OF THE MONITORING SYSTEM

Bridge Safety and Security Command Center

DATA and INFORMATION WAREHOUSE

FEM Calibration & SCENARIO Analyses

ASSET MANAGEMENT SYSTEM

DATA WORTH ARCHIVING & TRIGGERS AND ALERTS

DATA QUALITY MONITORING

DATA FIREWALL

Unlimited Access (Owners, Engineers, and Staff)

Limited Access (Bridge Staff and Learning Bridge Managers)

Basic Access (Learning Bridge Students and Users)

RISKS

- Operational Deficiencies
- Local and Member Deficiencies
- Global Structural System Deficiencies
- Durability, Maintenance and Cost Issues

Hazards	Vulnerabilities	Exposure
▪ Ship impact	▪ Global instability	▪ Loss of life
▪ Flood debris / ice	▪ Local buckling	▪ Repair costs
▪Truck overloads	▪ Yielding	▪ Bridge shut-down (loss of tolls)
▪ Vehicle impact	▪ Bascule jamming	▪ Accidents
▪ Fire	▪ Corrosion	▪ Vehicular traffic backups
▪ Wind	▪ Concrete spalling	▪ Marine traffic backups
▪ Climate change	▪ Fatigue / Fracture	
▪ Scour	▪ Unseating	
▪ Settlement		
▪ Operator error		
▪ De-icing chems		

Bridge Commission Organization

- Commissioners
- Senior Administrative Staff
- Freeholders
- Police Department
- Engineering Staff
- Bridge Operators
- Maintenance Staff
- Toll Collectors

Other Stakeholders

- Bridge users
- Burlington County
- Philadelphia County
- NJ and PA DOT's and FHWA