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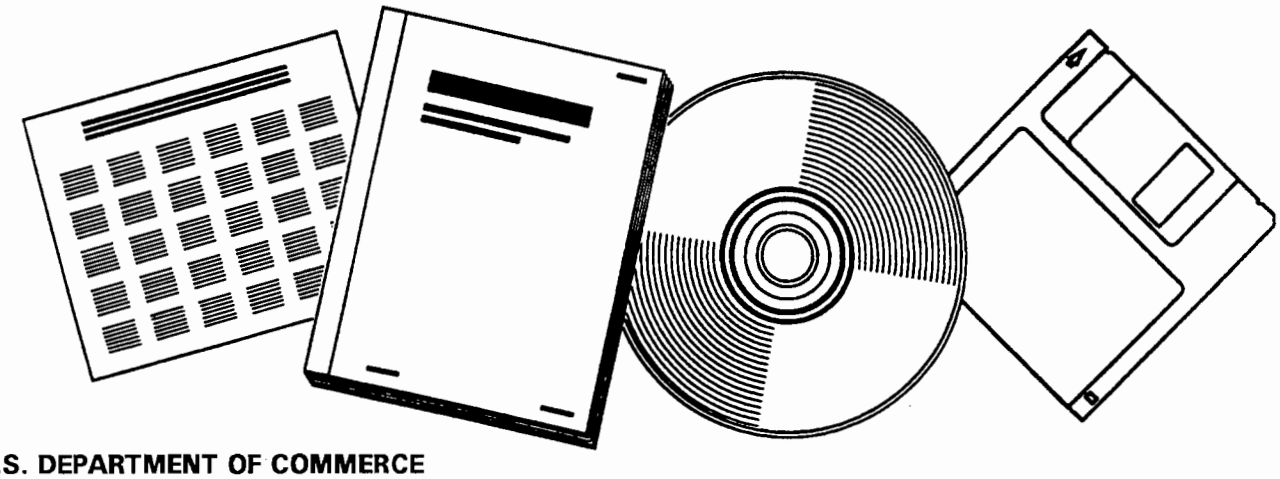
ADVANCEMENTS IN TEL8 TEACHING AND COMMUNICATION VIA WEB-BASED TECHNOLOGY

OCT 97



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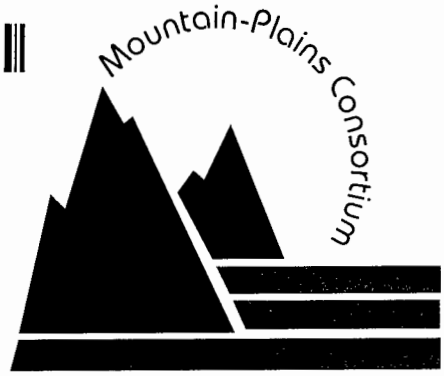

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Advancements in TEL8 Teaching and Communication via Web-Based Technology

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October 1997

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Advancements in TEL8 Teaching and Communication via Web-based Technology

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October 1997

EXECUTIVE SUMMARY

The principal investigators addressed many aspects of distance learning in a recently taught TEL8 course on bridge engineering. Their efforts are outlined in this report with respect to this course. The fruit of their effort is a better and more technologically advanced method of coupling TEL8 courses with the use of world-web technology. Instructor evaluations indicate that the on-line forum was particularly effective and should be used in the future. The development of on-line courses in the manner described requires a significant effort — much more than a traditional course. Appropriate compensation, teaching schedules, and recognition should be considered in the long term for the TEL8 system to remain a viable education media for college classes. Otherwise, it will be difficult to find instructors willing to dedicate the time necessary to make online courses the best that they can be.

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Disclaimer

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INTRODUCTION

This report presents results and issues associated with teaching graduate level courses on the TEL8 system. The TEL8 system supports research involving communication using two-way interactive audio and video among 10 sites in the six states of FHWA Region 8. The specifics about one course presented from the University of Wyoming in the Spring 1997 semester are reported. Seven sites received the course titled "Bridge Engineering — An LRFD Approach," using the MPC satellite network. It was attended by 55 graduate students and practitioners at CSU(9), USU(9), NDSU(2), UW(10), NDDOT(6), WYDOT(1), and MTDOT(18). The mix of practitioners and students was nearly even. A course description is attached for more information.

INNOVATION

To teach a distance-learning course at the advanced level, significant preparation involving issues in instructional design, presentation, communication, and software is required. For this course, the instructor implemented and employed new technologies in the area of presentation and communication. Presentation materials were distributed weekly prior to class so each student had all handout materials during class. The students were then able to make notes, computations, etc., on the prepared materials. The class involved advanced concepts in analysis, statistics, and design. The theoretical and background portion of the lecture was presented with use of Microsoft PowerPoint slides. Forty to 80 slides per lecture were typical for this course, which was offered once a week in a three-hour time block. Duplicated slides often were necessary to illustrate points in a dynamic fashion. Software also was demonstrated online with the student viewing output results on hardcopy handouts. Advanced software, such as finite

element analysis programs, was used to graphically illustrate structural behavior that often is difficult to describe in the nongraphical manner. Animation also was helpful here. Examples were illustrated with hand computations via the overhead imager. Again, the students had all materials apriori.

Remote and multifaced communications are critical in designing and conducting distance learning courses. Students were widely dispersed in both distance, educational background, and practical experience. The diversity was helpful and problematic. The diversity supported good interaction and commentary on professional practice but tailoring lecture material suitable for students and practitioner was challenging. To foster good off-line communication and make personal interaction with the students possible and beneficial for all, the instructor developed several web pages specifically for this course. The web-page development was facilititate by the computing staff at UW.

The web page contained the following components:

- Introduction
- Site purpose
- Instructor information
- Syllabus
- Presentations
- Software descriptions
- Communications issues
- Homework solutions
- Old tests
- Bulletin board

- Discussion forum
- Anonymous mail
- Student database
- Web feedback
- Posting and download area
- Other bridge-related web sites

All pages proved to be useful but some were *critical* to the success of the course. Only the later pages are described here, however, for more detail please see the following web pages: *http://wwweng.uwyo.edu/classes/ce5270/.* (Also please see the attached Appendix.)

KEY WEB PAGES

Homework Solutions

The homework solutions were posted soon after the homework due date. The students were encouraged to submit copies of their solutions and to make copies for their records of the instructor's homework solutions. All students could download the posted homework from the web pages. These pages were designed for printing. This approach fostered good turnaround and helped the students' learning. The assignments for this class were lengthy and detailed. At best, the turnaround for grading a class of this size was two weeks.

Bulletin Board

Messages from the instructor were posted directly to a course bulletin board. By mid semester 25 messages had been posted. This helped to foster communication between classes, assignment updates, notification of new software, etc. Assignments also were posted. This

bulletin board was a valuable interactive device and is highly recommended for distance learning classes.

Discussion Forum

The discussion forum was the most useful tool in the website and was developed specifically for this course. This form provided the student with an opportunity to post questions and anyone in the class had an opportunity to respond. Typically, the instructor answered most of the questions and the student or practitioner often had other responses. The discussion forum designed for the class was a simple outline format.

A typical example follows:

> *Student #1: This is a two-part question so I hope you give me credit for two questions. In Homework #3 you said the btbeam output gives critical truck position. Which axle is this for? I assumed it was the front but sometimes it didn't line up for max/min on the influence diagram. The second part asked if the output has forward/backward position. Which direction is forward?*
>
> *Instructor: There may be a modest error in the report, but I'm not sure where at this point. The position for the computation should be fine, it just may be reported incorrectly in a few cases. The truck train is for the front axle on the front truck.*
>
> *Student #2: Is the front axle the 145 KN axle if the truck is moving backwards?*
>
> *Instructor: yes*

There were about 200 postings in the forum for the class. The forum takes a lot of instructor time and is the functional equivalent of office hours with the advantage that all students benefit from the query and response. This is critical in distance learning. Enhancing this part of the web page and tailoring it for specific applications is an option that other distance learning instructors should consider. However, the web page is readily adapted for use by others in its present form.

Anonymous Mail

Anonymous mail was for students to post suggestions to the instructor without a posting address or name. The upside was that evaluations by students could be made at any time and the instructor was able to take advantage of their comments in a timely fashion. The downside was that specific issues could not be addressed with the individual because all record of the mailer address is stripped.

Posting and Download Area

Computer software was distributed to the students via the download area. This greatly simplified distribution to the remote sites and to all students at a particular site.

Other Web-Based Sites

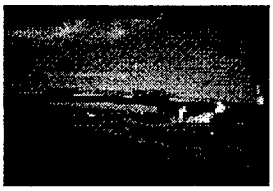
Here FHWA, TRB, NAS, etc. pages were linked. The web page approach developed for the class essentially is a linking of the class page to a set of other action pages. The web page took a tremendous effort to develop and maintain with current information. However, given the number of sites and students this approach worked effectively. The web page can readily be used by other MPC instructors with minor modifications. The page can be further improved as time and funding permit. The value of off-line interaction using the web should be integrated into distance learning courses.

GENERAL CONSIDERATIONS

The motto of the Boy Scouts is alive and well for distance learning — **BE PREPARED.** This report has highlighted tools helpful in that regard. Developing instruction and materials — logistics associated with these materials and contingency planning for system partial failure and for students that are unable to attend class — must be considered in advance. Considering the mixture of the class participants and backgrounds is equally important. Assessing this early was helpful in fine-tuning course materials and presentations. Integrating the remote sites and the on-site students must be constantly considered.

Being prepared takes time. For the "Highway Bridge Engineering - An LFRD Approach," approximately 40 hours per week were required. It should be noted that the instructor is a recognized expert in the area of bridges, published a 1997 text book on the subject, specializes in software development and shares development of several programs that are appropriate for class. In short, teaching distance learning classes requires an extraordinary amount of work. Due to this critical characteristic of teaching distance learning classes, the appropriate compensation, teaching schedules, and recognition must be considered in the long term in order to keep the TEL8 system viable. Otherwise, it will be difficult to find instructors willing to dedicate the time necessary to make online courses the best that they can be. It is hopeful that the process and tools associated with the bridge engineering course will be used by other MPC instructors to make the process more efficient. Graduate education using the distance learning system of TEL8 worked effectively and can be further improved from both instructor and student perpectives by expanding the concepts and tools outlined.

APPENDIX



CE 5270
Highway Bridge Engineering - An LRFD Approach

Use your browser's back function to return here. A frames test page is available. (Needs javascript.)

Non-frames design concept by just jenine (jenine@lamar.ColoState.EDU).

Welcome to the Highway Bridge Engineering Web.

Non-frames, non-JavaScript version available.

Site purpose

- This web site was created to aid students enrolled in CE 5270: Highway Bridge Engineering. It is intended to complement lecture attendance, not replace it.

Using this site

- Make sure that the appropriate selection is made in the lower pull-down menu as you navigate this site. You can return here at any time by clicking on the bridge picture at the top.
- If you're using frames:
  - Use the top frame to navigate this site. This frame contains the following items:
    - *Bridge picture.* If you have images turned on, you can click on the Bridge picture to return to this page at any time.
    - *Page selector.* The top pop-up menu selects the page. Changing your selection will update the contents of the main frame.
    - *Load button.* Although changing either the load selector or the selection should cause the contents of the main frame to change, some browsers won't show the update unless you click here. If the content of the main frame doesn't change, click here to tell the browser it needs to redraw.
  - The main frame (the big one) is were most of the information will be displayed.

If you experience problems...

- If you experience any difficulties with this site, try using the bug report form. If that doesn't work, send email to Jin Wang (wwinston@plains.uwyo.edu). Try to be as thorough as possible when describing the error. Include what web browser (Netscape, Internet Explorer, etc.) you were using and the version number if you know them.

Highway Bridge Engineering - An LRFD Approach

Site Purpose

This site is an instructional aid for students taking Highway Bridge Engineering. The Highway Bridge Engineering Web provides easy access to the instructor via e-mail. Students interested in forming study groups around different class topics can post their interests in the Student Data Base. A bulletin board has been provided for the instructor to post announcements. Traditional class information such as the class syllabus, policies, hints for doing homework problems and example tests have been provided.

Web Tools Required

To properly view and navigate this site, you will need a recent version of Netscape Navigator, Microsoft's Internet Explorer, or any browser capable of forms and frames.

Acrobat Reader is required to read and print many of the homework solutions and the old tests. These files are distributed in PDF (Portable Document Format) format and can be read using Adobe Acrobat Reader©. A copy of the reader can be downloaded for free from Adobe Systems.

Note on web browser versions:

These pages were created and tested using the following versions and platforms:

- Netscape Navigator Gold Version 3.01 Gold (Windows NT 4.0, Windows 95, PowerPC)
- Netscape Navigator Version 3.0 (Windows 95, UNIX (OSF/1), UNIX (HP-UX))
- Netscape Navigator Version 2.02 (Windows 3.1, PowerPC, Macintosh)
- Microsoft Internet Explorer 3.0 (Windows NT 4.0, PowerPC (beta))

Class Description from the (UW) General Bulletin

A study of the analysis, design and rating of highway bridges, including consideration of dead and vehicular loads, analysis of typical systems, service and ultimate strength behavior, rating of existing bridges, bridge design, and bridge operations. Composite and non composite steel and concrete bridges are considered. This course may include investigations that will require field trips outside of the scheduled class times.

Prerequisites: CE 4260 (concrete design) and CE 4250 (steel design) or equivalent, or consent of the instructor.

Credit: 3 hours.

These pages were prepared for Dr. Jay A. Puckett by Jin Wang, University of Wyoming College of Engineering.
Last Modified: 16 Jan 1997

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Education: B.S. Civil Engineering, University of Missouri, 1978
M.S. Civil Engineering, Colorado State University, 1980
Ph.D. Civil Engineering, Colorado State University, 1983

Specialization: Structural design and analysis, finite element methods, semi-analytical techniques in structural analysis, CADD for bridge design.

Areas of Academic Expertise: Bridge engineering, software engineering, structural analysis, and concrete design.

Current Research Interests: Bridge engineering, software engineering, composites materials in timber engineering, bridge joint design, maintanance, serviceability, and asphalt plug joints (bridges).

Current Projects: "Use of Fiber Reinforced Composites in Wood Bridges," Forests Products Laboratory, United States Department of Agriculture, Madison, WI.

"Analysis, Design, Rating, and Drafting of Wood Bridge Superstructures," Forests Products Laboratory, United States Department of Agriculture, Madison, WI.

"Investigation of Bridge Joint Behavior and Design Recommendations," Wyoming Department of Transportation.

Multidisciplinary Collaborations: Computer science work in databases for bridge rating and design

Professional Memberships: ASCE and ACI

About the Instructor.

View Dr. Puckett's Academic Resume.

Topics

1. Loads

a. Dead

b. Standard live

c. Permit vehicles

d. Other considerations

2. Analysis of beam and slab systems

a. Influence lines

b. Truck positioning for critical effects

c. Transverse load distribution

d. Dynamic effects

3. Bridge Types

4. Aesthetic considerations

5. System analysis

a. Load distribution

b. Actual behavior

6. Bridge rating

a. Rating/design review of steel non-composite plate girder bridge

b. Rating/design review of steel composite plate girder bridge

c. Rating/design review of concrete T-beam bridge

7. Bridge design

a. Design of a steel three-span composite plate girder

b. Pier analysis and design (time permitting)

c. Abutment analysis and design (time permitting)

8. Introduction to bridge operations (limited coverage)

a. Inspection, Management

b. Permits, Routing

9. Specific Computational Examples

a. One-span steel bridge

b. Three-span steel bridge

c. Concrete T-Girder Rating

d. Design of three-span bridge (assigned)

e. Prestress concrete design review (time permitting)

10. Possible Supplementary Topics

- AASHTO Software Development
- Status of the Nation's Bridge Data for Rating
- Load Distribution Analysis
- Asphalt Plug Joint Research
- Bridge Management with PONTIS
- Crash Testing Bridge Rail
- Overview of Timber Bridges Prototype Routing System in Wyoming
- Testing of Lightly Reinforced Bridge Decks
- Questions to ask about rating
- Load Testing Bridges
- DOT Permit Policies (DOTs)
- Automating CAD
- CADD Practices in the Region
- CADD Practices in the US
- Other topics per student suggestions and interests

CE 5270

Course Policy

Jay A. Puckett, Ph.D., P.E.

Professor

University of Wyoming

The following course policies will be enforced:

1. All homework must be mailed the day that it is due. Each site should submit one envelop containing homework. Make photocopies or submit good photocopies for review. Do not trust the US mail not to loose your work.

2. All tests should be monitored as outlined on the instructions. Your site coordinator will help in this regard.

3. Students are expected to work independently but may confer with other students. Submission of workhome that is identical is not acceptable. You may certain ask other questions, discuss problems, etc. This enhances learning.

4. Homework will be reviewed and not corrected in detail. The solution will be posted on the web page and students can closely review and correct their own work. This enhances learning.

5. The course transmission may be video taped but all video tapes must be destroyed within three weeks of the time of transmission.

6. The course will be evaluated on the basis of the homework and projects and exams. The relative weights of each are listed below:

Homework: 30

Project: 30

Exams: 40

Total: 100

Tentative Schedule

la. Review of course outline, course policies,expectations, and evaluation. Review the mechanics of the course schedule and mechanics for interactive communications. Each student will introduce themselves outlining their location, employment status, engineering experience, and course expectations.

1b. Review the organization of the AASHTO LRFD specification and outline the chapters that will be used in this course.

1c. Review dead loads and vehicular live load requirements. The discussion will introduce unfactored loads. Introduce limit states. No load distribution, combinations, or dynamic effects will be considered at this time.

1d. Introduction to influence lines. Definition of ILD. Example for simple beam reaction, shear, and moment. Example for a double cantilever beam.

1e. Development of ILD for a continous beam for the actions of moment, shear, and deflection.

1f. Review of Mueller Breslua principle and application to statically determinate and indeterminate structures.

1g. Review of bridge types with photographs. Discussion of bridge terminology. Engineering activities discussion: analysis, design, rating, inspection, management.Assignment: simply-supported beam ILDs.

2a. Review of last session.

2b. Review definition of ILD. Work more complex example problem. Using ILD for concentrated and uniform loads. Illustrate use with static loads. Illustrate design truck, design tandem, and design lane load analysis for several actions and points of interest. Use a real simplespan bridge. Compute dead load effects as well.

2c. Introduce Muller-Breslau approach. Repeat a previous example with Muller-Breslau. Outline Muller-Breslau for continuous systems and systems with hinges.

2d. Introduce AISC ILD for continuous spans.

2e. Work example of design truck and lane for three-span girder.

2f. Introduce live load distribution concepts for girder bridges and slabs.

Assignment: Determine actions for simple beam and for continuous beam.

3a. Review last session

3b. Review live load distribution concepts for girder bridges and slabs. Discussion NCHRP 1226 work. Illustrate parameteric studies. Discuss previous AASHTO live load distribution model. Illustrate bridge types with AASHTO tables.

3c. Illustrate example to determine one-lane, multiple-lanes for interior and exterior girders for simple span bridge.

3d. Dynamic load effects, specification requirements.

3e. Review limit states. Introduce load combinations.

3f. Example of load combination using previous work.Assignment: Determine the combined load effects

for several actions and locations on previous simple beam.

4a. Review previous session.

4b. Determining load distribution factors for multi-span bridge.

4c. Background on load combinations, reliability approach. NCHRP 12-33 report.

4d. Background on dynamic load effects.Assignment: Perform load combinations on the multispan bridge for one-lane, multiple-lanes, and interior/exterior girders.

5a. Review previous session.

5b. Introduction to BT Beam.

5c. Examples with BT Beam.

5d. System analysis, ultimate strength considerations, load redistribution, specificationconsiderations.

5e. Examples of plastic analysis and shakedown.

Assignment:

6a. Introduction to bridge rating. Load factor rating, working stress rating, LRFD rating. Limit states. Permitting, posting.

6b. Review of LRFD specification for reinforced concrete.

6c. LRFD rating/design review example for reinforced concrete. Likely use the BRASS short course notes.

6d. Permitting and posting practice among represented DOTs.

6e. Review of software for analysis and load rating. Status of the nation's data.

7a. Review of previous session.

7b. Review BRASSLRFD for the previous example. Discuss capability, input example, and output.

8a. Review of previous session.

8b. Overview of LRFD steel specification, limit states, etc.

8c. Simplespan steel bridge rating/design review example. Hand computations for one analysis point.

8d. Overview of BRASSLRFD input for steel. Input example and review output for other analysis points.

9a. Review previous session.

9b. Continuous steel bridge rating/design review example.

9c. BRASSLRFD input and output. Discussion of results and details of computations.

10a. Review of previous session.

10b. Advanced analysis methods.

lOc. Grillage, finite element, and finite strip examples. Comparison with AASHTO distribution factors.

10d. BRUFEM --Florida's 3-D rating code.

11a. Introduction to design for a threespan composite plate girder

11b. Commentaries from represented DOTs on design practices for steel.

11c. Design business process model.

11d. Introduction to the design example.

11e Design example.

12a. Review of previous session

12b. Design example continued.

Possibe Practice-Oriented Presentations

Introduction to bridge management and AASHTO PONTIS.
Introduction to AASHTOWare and recent AASHTO developments.
Current software practices in DOTs and current directions.
Bridge types and current design practice.
Organization and development of AASHTO BridgeWare Database.
Comparisons of AASHTO load distribution methods with finite strip methods.
Literature review of the empirical design method for concrete bridge decks.
Asphalt plug joints -- applications, DOT experience, and current research.
Temperature effects on bridges.
LRFD specification -- state bridge engineers experience.
Load testing.
Prototype permit truck routing system.

Software

- BT Beam will be used for LRFD beam analysis
- BRASS-LRFD will be used for concrete and steel analysis and design review
- Madero will be introduced for LRFD timber analysis and design review
- Excel spreadsheets will be used for cross section analysis

Communications

- In-Class Interactive Video
- Telephone
- E-mail
- Course information and software will be distributed via an Internet Web Page

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Post A Message!

Name:
E-Mail:

Subject:

Message:

Optional Link URL:
Link Title:
Optional Image URL:

Post Message | Reset

Scripts and WWWBoard created by Matt Wright and can be found at Matt's Script Archive

Homework solutions can be downloaded from the downloading area. It can also be viewed (you need Adobe Acrobat Reader) from here by clicking on the respective homework solution below. The printed quailty is better than that shown on your montior. It is recommended to download it to your computer and print. Please be patient, we are trying to improve the presentation quailty.

For web site tools and file reader, see Site Purpose.

Homework solution 1. #9 Mc min. was revised 2/17/97.

Homework solution 2a. Pages 7 & 9 revised 2/10/97.

Homework solution 2b..

Homework solution 3. .

Homework solution 5. .

Web Site Feedback and Bug Reporting

Use this form to send email to the people responsible for maintaining and improving this web site. The fields for your name and email address are not required, but we ask that you please fill them out so we can get in touch with you if needed.

Your name:

Your email address:

◉ Web Feedback ○ Bug Report

Please enter your comments below. These comments will be sent to the people in charge of maintaining this website. Use this form to submit suggestions on how to improve this website.

Send Mail Clear Form Nevermind

Anonymous Comments to Instructor

Use this form to send anonymous comments to Dr. Puckett. Your name will not be included with what the instructor receives.

Send Mail | Clear Form | Nevermind

Student Data Base

The Student Data Base is provided to encourage students to form study groups.
Posting contact information here is purely voluntary.

Please enter your first & last name in lower case w/o space	
View Data Base	Add your name

Bridge-Related Sites

Below are other sites which deal with bridge-related issues. To suggest a site for this list, send email to Dr. Puckett.

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http://nisee.ce.berkeley.edu/

http://iti.acns.nwu.edu/clear/bridge/index.html

http://www.best.com/~solvers/bridge.html

http://www.ce.vt.edu/evd/

http://www.wsdot.wa.gov/eesc/bridge/software/software.htm

http://WWW.ENR.COM/

http://william-king.www.drexel.edu/top/bridge/CBChes.html

http://www.iti.nwu.edu/library/virtual.html

http://coveredbridges.com/zred_rt.htm

http://www.dot.gov/dotinfo/fhwa/hta/hta-bdc.html

http://www.dot.gov/dotinfo/fhwa/hta/fhwahta.html

http://tresc.dot.ca.gov/

http://www2.nas.edu/trbbooks/

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