SESSION 3.4
Covered Bridge Manual Update

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Synopsis:
A Covered Bridge Manual has been prepared and recently released by the Federal Highway Administration (it’s available for FREE!). It was specifically developed to address the preservation of historic covered bridges and contains a thorough discussion of issues relevant to all involved with these efforts. It will be of most interest to engineers and contractors, but offers good guidance to owners as well. Phillip Pierce, principle author of the manual, will discuss key aspects of the work.

About the Presenters:

Phil Pierce has 32+ years of diverse involvement with bridge engineering and is identified as one with a special passion for covered bridges. He is currently the Deputy Commissioner of the Delaware County Department of Public Works, but also began a part-time consulting practice in 2000. It was as a consultant that FHWA selected him to develop a Manual on Covered Bridges.

Earl Dubin has his Bachelor of Science in Civil Engineering from the University of Buffalo. During his career he has served as Traffic Engineer for Erie County and the City of Buffalo, as well as being the Bridge Engineer for the City of Buffalo. Currently, Mr. Dubin is a Structural Engineer with the New York Division of the Federal Highway Administration. Mr. Dubin is a Licensed Professional Engineer in New York State.
Twelfth Statewide Conference on Local Bridges, October 2005

FHWA’s Covered Bridge Manual

by
Phillip C. Pierce, P.E.,

Introduction by Earl Dubin, P.E., FHWA
NHCBP Program

- TEA-21
- SAFETEA-LU
  - Apply through NYSDOT Regional office
New York State

- 24 bridges in the State
- TEA-21
  - Funds of nearly $1M
  - Rehabilitate 7 Bridges
What is it?

- Funded by the Historic Covered Bridge Preservation Program, part of TEA-21
- One of several “research” efforts related thereto
- Finally in print after several years of development and “refinement”
- Hardcopy available for free – downloadable is supposedly coming
Why was it needed?

- Very little technical information was/is available about the engineering and construction of covered bridges
- Covered bridges present unusual challenges to those involved with them
- Some of those challenges are not addressed by current specifications
Who prepared it?

- Phillip C. Pierce, P.E., Consulting Engineer, assisted by:
  - Ben Brungraber, P.E. – well known and highly respected timber engineer
  - Abba Lichtenstein, P.E. – yes, still active and offering insightful critiques
  - Scott Sabol, P.E. – VT Technical College professor; formerly at NCHRP
Who is it for?

- Anyone involved with covered bridges
- Primarily meant for engineers and contractors
- Hopefully educational for owners
What’s in it?

- The answers to ALL questions and conundrums involving CBs!
- No, alas, not really – but as much guidance and insight as could be offered
What’s NOT in it?

- The definitive answer to where the strength of some covered bridges is hidden
Contents

- Background
- Description Of Bridge Components
- Technical Engineering Issues
- Care Of Existing Bridges
- References
- Appendices
Contents Continued

- Background
  1. Introduction
  2. Covered Bridges: Form, Use, and Terminology
  3. Historical Development of Covered Bridges
Contents Continued

- Description Of Bridge Components
- 4. Types of Longitudinal Supporting Trusses
- 5. Floor Systems
- 6. Ancillary Features
- 7. Foundations
Contents Continued

- Technical Engineering Issues
  8. The Engineering Challenge
  9. Design and Analysis Specifications
  10. Issues Related to Wood
  11. Loads
  12. Force and Stress Analysis Issues
  13. Design Issues
  14. Connections
Contents Continued

- Care Of Existing Bridges
- Evaluating Existing Bridges
- Repairing and Strengthening Existing Bridges
- Preserving Existing Covered Bridges
- Historic Considerations
- Guide to Initial Preservative Treatment of Wood in Covered Bridges
Contents Continued

- Appendices
  A. An article about Town-lattice trusses
  B. Three case studies on repairing and strengthening
  C. Three case studies on new construction
  D. Three case studies on replicas
Especially important topics

- Technical approach
- Loads
- Specifications
- Timber connections
- Bracing
- Respect for performance
- Practical considerations
(Phil’s) Technical Approach

- Use of “Sophisticated” software (including finite elements) is not necessarily a good approach, nor often necessary
- Load and Resistance Factor Design is unwarranted
Loads

- bridge weight
- live load
- snow load
- wind load
Specifications

- Allowable stress!
- What benefit can LRFD offer a simple span timber truss?
Timber connections

- Traditional timber joinery is NOT like steel
- Ignoring joinery in the analysis is not proper, nor safe
- They can be COMPLEX!
- And contentious
Bracing

- Again – this is NOT steel,
- Rely on proven traditions,
- Don’t expect to be able to easily prove strength with calculations
Respect for performance

- Extant “historic” covered bridges have withstood the test of time
- One should not ignore performance when numerical evaluations indicate a problem
Practical Considerations

- There are limitations to the capabilities of field evaluations (e.g., careful of promises to use technology to identify all rot)
- There are limitations of repair or rehabilitation – an originally weak bridge cannot support modern loads
- Relaxed codes (e.g., guiderails)
Key to Success

- PROVEN EXPERIENCE - both for the Engineer and the Contractor
- Patient and understanding regulators and owner
- Flexible budget
What would I like to have included, but didn’t?

- More information about the nuances of bridges across the states
- A recent presentation in Oregon about the manual enabled me to visit CBs there and I observed significant differences from east coast bridges
What would I like to see done for the benefit of CBs?

- Research into the topic of allowable stresses for historic material and elements - carefully consider the 95% Exclusion Rule
- Consider a national Blue Ribbon review panel prior to destruction or major alteration of historic CBs
What’s Next?

- More funding for additional research is included in the new Highway Reauthorization bill (the “Safe, Accountable, Flexible and Efficient Transportation Equity Act – A Legacy for Users” (SAFETEA-LU))
Closing thought

- Having been involved in virtually any type of bridge that one can identify, including quite a bit of work on metal trusses and other timber structures, I characterize them as presenting more challenge than most bridges.
- I consider our remaining historic covered bridges as treasures.
- They should not be entrusted to amateurs.
How get a free copy?

Send an e-mail request to:
John O’Fallon at FHWA Turner-Fairbank

john.o’fallon@fhwa.dot.gov

Or call him at (202) 493-3051
(Anyone have a CB assignment for me?)

No, Seriously – Questions/Comments?