Whites Covered Bridge Replacement

Whites Bridge Road over the Flat River, Ionia County

Tom Byle and Greg Garrett

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**Project Team**

- Ionia County Road Commission (Paul Spitzley)
- Whites Covered Bridge Historical Society (Tom Byle)
- AECOM (Doug Parmerlee, Greg Garrett, Jen Byle, Tru Doan)
  - Superstructure Design, Construction Support, Load Rating
- Cogent Civil Engineering, LLC (Jennifer Dougherty)
  - Shop Drawing Detailing
- Davis Construction Company (Scott Miller)
  - Superstructure Construction
- Building Restoration Inc (Blair Bates)
  - Abutment Rehabilitation
- Strain Electric
  - Electrical, Lighting, & Security Cameras
Funding Sources

- Private Donations (Meijer Foundation, Devos, King Milling)
- Whites Bridge Historical Society
- Keene Township Fund
- Michigan Local Bridge Funds (grant)
- Michigan Economic Development Corporation (grant)

Project Construction Costs

- Abutment Rehabilitation $28,200
- Superstructure $638,800 ($760,000 Eng. Estimate)
- Electrical & Security $18,000
- Name & Height Signs $5,060
My First Introduction to Covered Bridges

- 1976
- Inspected Ada Covered Bridge and Fallaburg Covered Bridges
- Both are Brown Trusses as is the Whites Covered Bridge
What is a Brown Truss?

The floor and roof are also trusses but are horizontal and serve to give the truss rigidity. The bottoms of the diagonals tend to protrude below the sheathing.

The Brown truss is noted for economy of materials as it can be built with very little metal.

Brown's patent claims did not actually address the economy afforded by lack of vertical members ("braces"). Instead, he focused on the improved strength over previous trusses that had members ("braces" in his terminology) come to the horizontal chord near to each other but not exactly together (at "gains" in his terminology), by having several members come together in the same place.

Only 4 were know to have been built
- Ada
- Fallasburg
- Whites
- One in Greenville area
Key Items of a Brown Truss

- 1) Constructed of sawn lumber, not hewn timber, cutting gains or notches in the ends. Lighter timber could be used yet stronger.
- 2) Iron bolts and rods as connectors – not wooden pegs. Allowed for faster assembly. Whites Bridge was done in 84 days. Apr. 22, 1869 – July 15, 1869. Only horses and / or oxen - no power tools 🌿

I do not claim broadly furnishing the main or counter braces with gains and passing them between the timbers of the chords;

What I do claim as my invention, and desire to secure by letters Patent, is—Providing each of the main and counter braces with two gains at top and bottom, and each of the timbers of the chord with a gain at the point where the braces are applied corresponding with the gains in the braces, and the braces thus formed up between the timber, with the gains of the braces in such relation to the gains of the timbers that when the timbers of the chords are brought together they are combined and become, as it were, only one piece, no part of which can be operated upon or affected independently of the other by the downward and upward thrusts common to truss bridges, even if the bolt which passes laterally through and intersects each set of braces and the timbers of the chord were removed."

Who was Josiah Brown Jr?

- An inventor born in Buffalo NY. That’s all we know.

- Another question?

- How did a builder in West Michigan get the Brown patent and turn it into 3 possibly 4 covered bridges? It’s another question without an answer.
Who was Jared Bresee?

- Built both White’s Bridge and Fallasburg Bridge
- There’s evidence he helped J. H. Walker of Grand Rapids with the Ada Bridge

He was listed as a builder and resident of Ada in the 1860 census
Also, there was evidence he was the Treasurer of Vergennes Township which would indicate he was a resident of the township at that time.

Ada Bridge

- Roof Collapse – February 1979
Ada Bridge

Looking east.

Placing rafters.
My first “covered bridge project”
September 9, 1979
**Rebuild of the Ada Covered Bridge**

Pretty much a duplicate – future use was as a pedestrian bridge.
Ada’s Bridge is Dropped into Place

At 1:15 on Dec. 1 the township of Ada got back something which was missing for over one year — its historical covered bridge. The 36-ton structure was reinstalled over the Thornapple River exactly where it had been before it was destroyed.

Correction

The Grand Rapids Children’s Ballet Co. will be performing 6:30 p.m. Friday, Dec. 19 and noon Saturday, Dec. 20 at Woodland Mall. The troop’s premiere performance tells the story of naugthy elves at Santa’s workshop where the toys come to life when everyone is gone.

by fire late last summer.

The installation was accomplished by two cranes operated by the Galloway Heavy Moving Company. The cranes were located on opposite sides of the river. One crane lifted the bridge halfway over the river, then the other crane took over when the bridge’s weight was transferred in midstream. A diesel was behind the structure, pushing the bridge over the water.

Close to 100 people witnessed the event, enduring cold temperatures, thick mud, and long delays. After the bridge was finally set, they broke out in applause. The bridge still needs a roof and a walkway before it is ready for use. Completion date is Dec. 18. Then the 100-foot structure will be safe for pedestrian and bicyclists.

The new Ada Covered Bridge was set across the Thornapple River last Monday while nearly 100 people watched. The new structure replaces the historic 112-year-old covered bridge which spanned the river until fire claimed it last year.

Not at this time
Whites Bridge - July 7, 2013
My Second Covered Bridge Project

- My daughter is watching a person named Paul Phenix on Facebook and tells me “dad you need to help him”. He’s talking about cutting trees at an Amish sawmill and he’s hoping to be done by Christmas.
- He was born in Belding and wanted to rebuild the bridge in memory of his grandmother. He was the driving force that kept the Society moving forward.
- I go to a couple meetings and end up as Vice President of the Whites bridge Historical Society.
  - Road Commission had no funds to rebuild. New modern bridge was out of the question
  - Greg and I estimated a replacement cost using 2 different methodology’s and arrived at $400,000
  - WBHS members do fund raising
  - MDOT advertised the project
  - Contractor call – you’re $400,000 short 😞
  - Pulled the project from the letting

Now What?
More Fundraising!

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1869 to July 7, 2013
Project Goals:

- Replace with a replica
- Improve live load capacity
- Reuse existing abutments (fit geometry)
- Limit budget
1938 Repair Plan Sheet

Design Resources:

- 2017 AASHTO Standard Specifications (ASD)
- 2015 AWC National Design Specification (NDS) for Wood Construction
- 2015 AWC NDS Supplement Design Values for Wood Construction
- FHWA Covered Bridge Manual (FHWA-HRT-04-098)
- ASCE 7, Minimum Design Loads for Buildings and Other Structures
Brown Truss Patent 17,722

Proposed Truss
**Structural Model**

- Dead Load
- Live Load (H 15-44, County Maintenance Vehicle(27 Tons))
- Wind
- Snow
  - Drifting
- Load Combinations
  - DL+LL
  - DL+(LL+S)0.75
  - DL+(LL+S+W)0.75
  - DL+(LL+W)0.75

**STAAD Model**
Wind Frame

Complete Interior View

Proposed Truss Improvements
**Truss Chord Members**

- **Exist Top**
  - 4” x 10”

- **Exist Bott**
  - 4” x 12”

**Truss Chord Members**

- **Prop Top**
  - 4” x 12”

- **Exist Top**
  - 4” x 10”

- **Exist Bott**
  - 4” x 12”
Truss Chord Members

Prop Top
4" x 12"

Prop Bott
4" x 13"
Glulam

Exist Top
4" x 10"

Exist Bott
4" x 12"

Proposed Truss Improvements

Single 6” x 8”
W/ 1 1/4” ROD
Double 6” x 6”
Proposed Truss Improvements

All Single 6” x 8” W/ Steel hanger connections
Proposed Truss Improvements

Steel splice Pl’s
Proposed Truss Improvements

Proposed Floor System
Proposed Floor System
Construction

Construction
Construction

[Images of construction sites with cranes and workers]

Construction

[More images of construction sites]
Construction

Construction
Construction

Construction
Completed Structure
Any questions?