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THE OFFICIAL MAGAZINE OF
SAIA SCAFFOLD & ACCESS INDUSTRY ASSOCIATION

PROJECT OF THE YEAR AWARDS

Industrial
Collaborative
Shoring

SAIA EVENT GUIDE
Committee Week

COUNCILS
Suspended Shoring

MEMBERSHIP
Association benefits

REINFORCING HISTORY

D.H. Charles Engineering, Inc. was presented with two SAIA Project of the Year awards for its work on the nation's largest covered, wood bridge. ***SA*** reports with the details.

The Bridgeport Covered Bridge at South Yuba River State Park in Nevada County, CA is the only remaining single-span Howe Truss, Burr Arch covered timber bridge in the U.S. Originally built in 1862, the bridge was in dire need of repairs, causing it to be closed for vehicle use in 1972, followed by pedestrian access in 2011.

To get the bridge repaired and able to be accessed safely, a number of innovative engineering tasks would need to be completed, and it would take a handful of experts to get it all done.

THE PLAYERS AND THE PLAN

The objective of the bridge rehabilitation was to replace the deteriorated wood and existing abutments while removing the piers that supported the bridge. To achieve this, a significant amount of coordination would be needed between general contractor Spectra Company, Sunbelt Rentals, which designed and supplied a new steel bridge, Skyline Scaffolding and D.H. Charles Engineering, Inc. (DHC,) which was awarded the scaffolding engineering contract by Skyline Scaffolding.

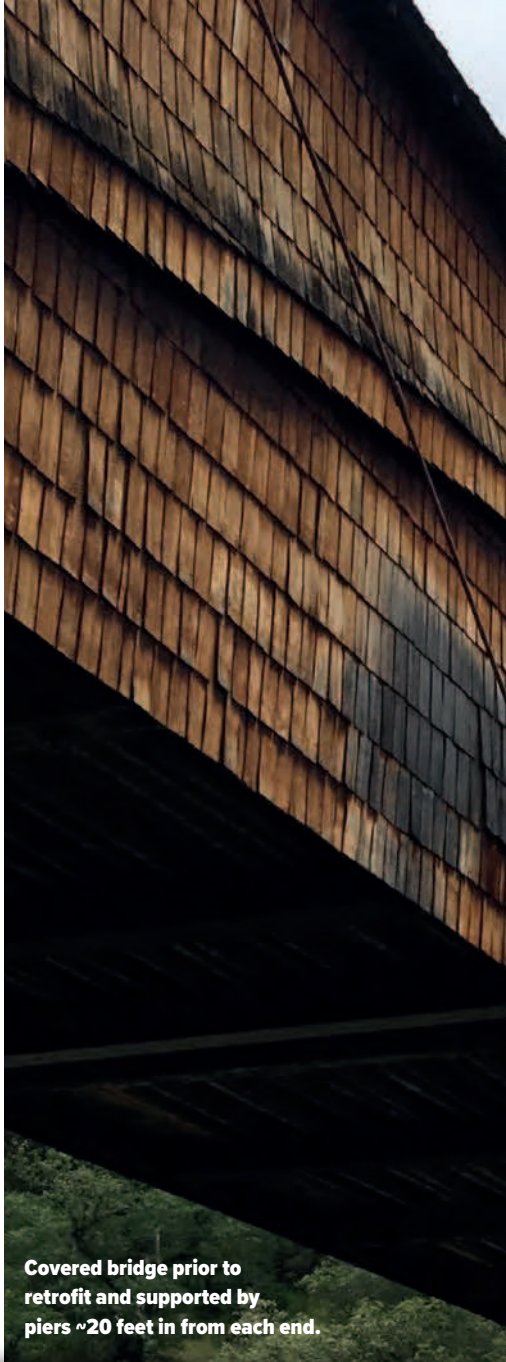
DHC was called upon to perform the following structural engineering aspects of the project:

1. Design shoring towers to set on bridge foundations which support vertical loading from Sunbelt Rentals and lateral loading from 18-feet of flowing water;
2. Review existing foundations and design additional foundation, to support the design loading while limiting the bearing pressure to the allowable bearing pressure set by the project Geotechnical Engineer;
3. Design beams to support the bottom chords of the wooden bridge and supported by the Sunbelt truss at 8 to 9 feet oc;
4. Prepare a hydraulic jacking plan to raise the bridge up to 18 inches while being supported by the beams outlined in item three, and lift bridge fully off abutments;
5. Design access scaffold system to outside of bridge to allow for re-cladding;
6. Design a lateral bracing system to support the top chord of the truss during construction while its existing bracing were removed;
7. Review the adequacy of the existing truss to be supported by the beams outlined in item to ensure bridge stability is maintained throughout the project duration.

GETTING CREATIVE

At the beginning of the project, the bridge was supported by an abutment at each >

ALL PHOTOS: D.H. CHARLES ENGINEERING, INC.



Covered bridge prior to retrofit and supported by piers ~20 feet in from each end.

South shoring tower prior to installing Sunbelt bridge and supported by existing pier foundation.

Photos looking north with shoring towers, Sunbelt bridge and PERI RCS beams fully installed.

The D.H. Charles team accepts one of its awards from the SAIA.

AWARD-WINNING PROJECT

D.H. Charles Engineering, Inc. was the recipient of the Scaffold & Access Industry Association's Shoring Project of the Year award and the Industrial Collaborative Project of the Year award for its work on the Bridgeport Covered Bridge at South Yuba River State Park in Nevada County, CA.

This project provided structural shoring for the Bridgeport Covered Bridge which spans the South Yuba River in the Yuba River Park in Nevada County, CA.

The primary companies involved in the project included:

- **California Parks Department** (owner)
- **Spectra Company** (Spectra) (General Contractor)
- **Skyline Scaffolding** (Skyline) (scaffold subcontractor)
- **Sunbelt Rentals** (Sunbelt) (Steel bridge designer & supplier)
- **D.H. Charles Engineering, Inc.** (DHC) (scaffold engineer)
- **Applied Engineering Consultants, Inc.** (Applied) (General Contractor's engineer)

North shoring tower supported by existing pier foundation.

Photo of top of south shoring tower, beam stack, showing connection between Sunbelt truss and shoring tower.

Photo detailing blocking between PERI RCS beams and covered bridge bottom chord.

end, plus a pier approximately 20 feet in from each end.

The new shoring design would need to consider several unique challenges. First and foremost, the bridge's existing deteriorating conditions were a major factor to consider. In addition, there was limited space beyond the bridge on one side of the river, and, lastly, it was critical to ensure the shoring towers were not set in the river.

Photo showing double steel plates where hydraulic jacks were installed to lift the bridge.

DHC's final solution involved shoring towers that were set on the existing foundations. This not only supported the vertical and lateral loading from the bridge while supporting the covered bridge, but also ensured the 18-feet of flowing water surrounding them. When supporting the load, additional bearing area was needed to ensure the foundation's bearing pressure was not overloaded.

The phases the shoring towers were designed to support and the associated load conditions included:

1. Lateral north/south loading due to supporting friction from launching the Sunbelt bridge off the south tower
2. Vertical gravity and lateral wind and water loading once the Sunbelt bridge was fully installed, Dwidwag bars and PERI RCS beam installed and bridge lifted off its abutments
3. Lateral north/south loading due to pulling the Sunbelt bridge back through the covered bridge

Photo of north shoring tower with Sunbelt bridge and PERI RCS beams fully installed.

Following DHC's shoring towers being set in place, the Sunbelt bridge was launched off the south shoring tower through the enclosed bridge and landed on the north shoring tower 165 feet, 3 inches away.

Once the Sunbelt bridge was fully extended through the existing bridge and supported by the DHC shoring towers, Dywidag rods were dropped through each of the two Sunbelt trusses at approximately 8 feet oc, which extended down through the covered bridge and through PERI RCS rails.

The PERI RCS rails then extended laterally to both support the bottom chord of the covered bridge and create a walkway on both sides of the covered bridge. That Dywidag rod which extended through the truss was used to move the covered bridge up in 0.25-inch increments by using a hydraulic jack to move the rod upwards, which in turn raised the bridge off the abutments and transferred its loading to the Sunbelt Bridge.

The jacking occurred in two phases, the first to raise the bridge straight up 10 inches, then the second to raise the center 8 inches up with each bridge end staying in place. This camber applied into the bridge was the bridges intended shape throughout the bridge's reconstruction.

GOING ALL IN

What started as DHC only designing the shoring towers and jacking plan ended up with the company designing the shoring towers, the jacking plan, the foundation design (to increase bearing pressure area,) the PERI RCS beam design to support bridge bottom chord and a truss bracing design which tied the covered bridge trusses back to the Sunbelt bridge truss to allow for the removal of the covered bridge.

It took five revisions to complete the shoring tower design to accommodate the needs of the contractor, structural engineer of record and the California Parks Department.

The 26-month-long project, which was completed in November 2021, amounted to a total of $6.9 million. sa

Photo of PERI double channel stack allowing for Dwyidag rods to be offset from Sunbelt truss node.