Bypass Bridge Reduces Repair Time, Keeps Traffic Moving, and Ensures the Safety of Construction Workers

A 390-foot, three-span steel Acrow bridge installed as a bypass over the Umauma Stream along the Mamalahoa Highway during repairs to a historically significant steel girder and trestle bridge.

Built in 1911, the Umauma Stream Bridge is a steel girder and trestle bridge over the Umauma Stream along the Hamakua Coast of the Island of Hawaii. The superstructure is composed of a concrete deck on steel girders, and the substructure is composed of steel railroad trestle supports with masonry (lava-rock) abutments. The Umauma Stream Bridge was built over 100 years ago for the Hilo Railroad Company which played a major role in the development of the Hamakua sugar plantations.

The bridge was classified as structurally deficient in 2007 and received funding for repair in 2011.

The initial plans called for "phasing" where traffic is alternated on one half of the bridge while the other half is repaired. This method is not only inconvenient to the public but it also takes longer and puts workers at risk as they are exposed to moving traffic. A detour route was not an option because it would have to go through a neighborhood causing noise and disruption to homeowners. Additionally, the roads were not designed to take that volume of traffic and heavy trucks.

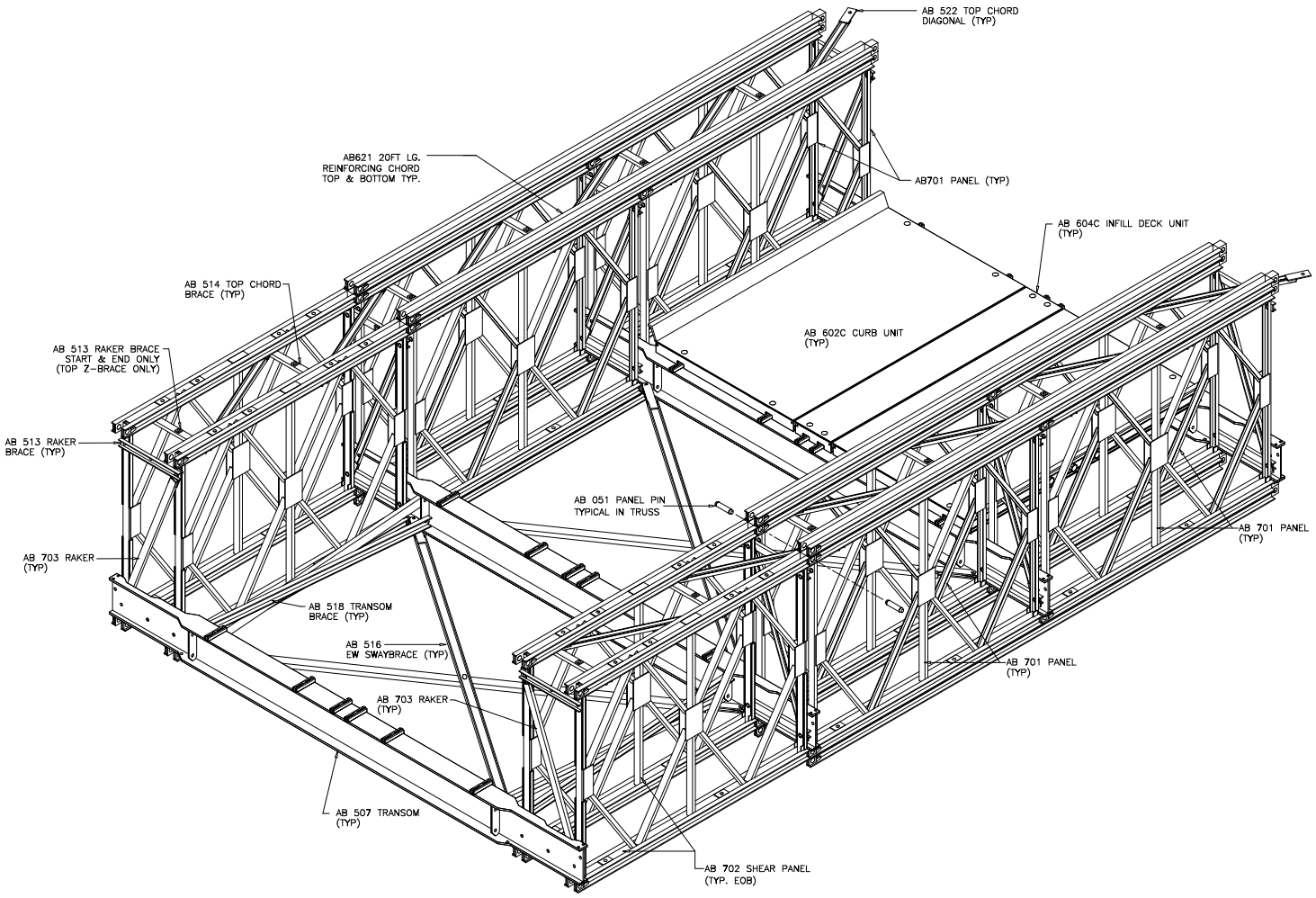
The contractor recommended the option of a temporary bypass Acrow bridge to the Hawaii DOT as a more efficient and safer alternative to "phasing," allowing for better repair and replacement of the existing bridge. Once this plan was agreed to, Acrow Bridge was called in and the project was started in August 2013.

The installation of the 390-foot, three-span bridge by Acrow engineers and field staff along with contractor, Hawaiian Dredging Construction Company, presented special challenges. The tower heights of 80 feet (24.4M) and 65 feet (19.8M) along with the seismic design requirements necessitated working with KSF Engineering in Honolulu on special footers and stabilization guy wiring as well as detailing out the reinforced tower design through finite element analysis. Additionally, the footprint allowed at the bottom where the tower footers were placed was very restrictive and the set distance between the towers for each side was eccentric, and not centered for the bridge support as they normally would be.

The first step of the project was to prepare the right of way where the Acrow bridge would sit next to the original bridge. Some excavation was required to widen the hillside to accommodate the bypass bridge. This took a few weeks. At the same time, towers were installed to hold the Acrow bridge. Once complete, the bridge was rolled out across the 390ft gap and lowered on to the abutments and towers. The bridge decking used has an epoxy-aggregate, non-skid coating making it ready to drive on immediately after the final inspection prior to opening it to the public. Total time for the preparation and installation was 3-4 weeks, including delays due to torrential rains that slowed the work.

Replacement work is ongoing for the new Umauma Stream Bridge. The original trestle that held up the old bridge will be left in place and refurbished underneath the new bridge for both aesthetics and historic preservation.

Acrow's bridge is expected to be in operation until summer 2016 when the repair of the Umauma Stream Bridge is scheduled to be completed.



ISOMETRIC VIEW OF DSR2 TRUSS – FEMALE END OF BRIDGE

Specifications

Bridge length:

Acrow supplied 390 linear feet (118.9M) of bridging, 3 spans

- 110 feet (33.5M)
- 160 feet (48.8M)
- 120 feet (36.6M)

Bridge width:

The Acrow bridge has a 13 foot 7 inch (4.14M) clear travel way between the guide rails

Two sets of tall towers were provided:

- Bent #1 80 feet (24.4M) tall 4 panel towers
- Bent #2 65 feet (19.8M) tall 4 panel towers

Both with special reinforcement due to high seismic design considerations

Guide rails:

W rail guide rail system attached to Arrow Panels

Deck surface:

Epoxy Coated Deck

Bridge erection:

Full cantilevered launch

Live load:

The bridge was designed in accordance with the latest edition of the AASHTO LRFD bridge design specifications to HL93 vehicular

Bridge design:

(A) Panel chords, diagonals & verticals, panel reinforcing chords, Rakers to AASHTO M223 GD 65

(B) Decking, raker brace, transom, top chord brace, swaybrace, transom brace, diagonal chord brace to AASHTO GD 50

(C) Panel pins to ASTM A 193 GD b7

(D) Bolts to AASHTO M164M – A325

Bridge finish:

- All major components galvanized to AASHTO M111-ASTM A 123
- All bolts are hot dipped galvanized
- All pins are electro galvanized

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