

August 7, 2014

Jennifer M.V. Fitch, P.E.
Project Manager
Vermont Agency of Transportation
1 National Life Drive
Montpelier, VT 05633

Project Name: Brookfield BRF FLBR(2)
Structure Identification: VT 65 Bridge #2 over Sunset Lake

RE: Item 900.645, “Special Provision (Fiber Reinforced Polymer pontoons)”
NCR 2-1 – Inclined web line, timber bracing, pontoon length
NCR 4 – Fabric Placement on Vertical Wall

Ms. Fitch –

T. Y. Lin International has reviewed Project Non-conformance Report (NCR) 2-1 and is summarizing our observations, opinions, and recommendations on the issues herein. From reading the report prepared by Kenway Corporation dated August 6 and discussions held during an onsite meeting between Kenway and VTrans on August 4, it’s apparent that the issues presented in NCR 2-1 are resulting from the same underlying behavior: shrinkage of the FRP material as it cures.

NCR 2-1, Items 1 and 3 – Vertical Wall Alignment:

Kenway is proposing changes to the fabrication process (tighter corner fillet and increased cure time under vacuum) to prevent or reduce wall movement after curing. In addition, Kenway is rescinding a proposal to add FRP stiffeners to maintain wall alignment and is requesting Pontoons 1 and 2 be accepted as-is, without previously discussed transom putty added between the faces.

The changes to the Fabrication process, as well as intended foaming and temporary bracing practices noted later in this letter, are all positive changes that should better achieve the targeted product. However, it should be reiterated that approval of this changed fabrication process in no way shifts responsibility of meeting fabrication requirements from Kenway to VTrans or TYLI. It is recommended that the fabrication process be allowed to proceed and measurements of the wall be provided to VTrans prior to moving forward with infusion of the hull of Pontoon 4.

Acceptance of Pontoons 1 and 2 without a closure pour to take up the separation of walls is yet to be determined. A definition of match-casting or tolerances between adjoining surfaces is being investigated and will aid in the decision of acceptance of these pontoons at a later date.

NCR 2-1, Item 2 – Permanent Timber Bracing:

To correct the bending (out-of-plumb) web line of Pontoon 2, Kenway installed timber bracing in each of the pontoon cells. This bracing helped reduce the severity of the distortion of the web lines, but was also left in place during foaming operations. Timber bracing is not shown in the approved Fabrication Drawings and likely would not have been accepted. However, the contract requirements do not specifically prohibit its use and the bracing appears to only be necessary for a temporary duration until the spray applied foam cures.

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The timber will be enclosed by foam in a watertight pontoon and is therefore unlikely to rot. If the timber does rot, the foam is present to resist any potential wall movement and distortion of the FRP is not anticipated. It is recommended that the use of timber within Pontoon 2 as a fabrication process be accepted. However, this recommendation should not be taken as an allowance to continue placing permanent timber bracing within the pontoons nor an overall acceptance of Pontoon 2 in its completed form.

NCR 2-1, Item 4 – Pontoon Length:

The overall lengths of Pontoons 1 and 2 are slightly lower than that allowed by Project tolerance limits and Kenway is proposing modifications to field splice and stainless steel shelf installation locations by utilizing all allowable bolt hole tolerances.

While Kenway's proposal meets project requirements, it is not preferable. If bolt holes are lined up 1/8" different than project dimensions, there is a chance that the holes can still be drilled further off from target and the hole could be placed beyond tolerance limits. If this were to occur, the pontoons could potentially be rejected. An alternate suggestion is to simply increase future pontoon lengths by an additional 1/8" each and maintain the bolt configuration noted in the plans.

It is recommended that the deficient lengths of Pontoons 1 and 2 be accepted, pending changes to future dimensions as Kenway proposes or as suggested herein.

NCR 4 – Fabric Placement on Vertical Wall:

Kenway has identified a nonconformance in their fabrication process in that excess material is placed beyond the final limits of the top edge of the vertical wall during infusion, and subsequently cut. The contract documents prohibit cutting of material after infusion. Kenway has noted the need to fabricate in this manner to better control straightness of the wall and avoid fabric wrinkles.

The fabrication method is deemed acceptable in an effort to achieve project tolerance requirements and an overall better product. Furthermore, the contract documents do not directly prohibit cutting excess fabric after infusion, only cutting FRP laminates. Kenway should continue fabricating the pontoons as requested in NCR 4 with both layers of the 4008 material run past the edge of the hull and clamped with a removable flange.

Interior Foam Fabrication Modification:

The subject NCR also proposes modifications to the foaming process. Kenway is proposing the use of polyisocyanurate foam blocks slightly smaller than the pontoon cell openings and then filling the voids with spray applied polyurethane.

While this method is generally acceptable, the gap between the top of the foam and bottom of top flange needs to be reduced from what is currently proposed. The project requires a maximum of 1/8" gap between FRP and foam. This requirement amounts to approximately 56 in² of void space in any given pontoon cross section (interior cell perimeter multiplied by 1/8"). The proposed foaming method will result in a nominal 1" gap between the foam and FRP along the top surface, for a total void volume of approximately 123 in². The method should be adjusted to better target the overall void space allowed by the contract documents.

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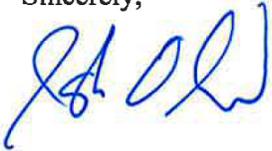
Recommendations

The rejection of pontoons 1 and 2 should remain and determination potential of acceptance will need to occur at a later time once a match-cast surface tolerance can be defined and agreed upon. In the meantime, Kenway should look in to the items identified above and provide clarification where necessary.

At this time, it is recommended that the Stop Work Order be lifted to allow Kenway to continue infusion of the hull and top flanges with proposed changes outlined in NCR 2-1 and NCR 4 incorporated. As previously noted, approval of the changes to the fabrication process does not transfer responsibility of meeting project requirements from Kenway to VTrans or TYLI. It is recommended that the fabrication process be allowed to proceed and measurements of the vertical wall be provided to VTrans prior to moving forward with infusion of the hull of Pontoon 4. Final assembly of the pontoons will need to wait until the foaming operation is refined as noted above.

Please feel free to contact me with any additional questions or clarifications.

Sincerely,

A handwritten signature in blue ink, appearing to read 'J. Olund', is positioned above the typed name.

Josh Olund, P.E.
Design Engineer

Attachments

cc: Resident Engineer – Sandra Schmitt
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