

Rigidified FRP Tubular Arches & Hybrid Composite Beams July 19, 2012

Questions and Answers not covered during the webinar

Q1. Cannot beams be treated as commodities and specified by strength and moments of inertia? You should be able to sell based on that?

Some State DOT's have allowed for the HCB to be bid as a pre-approved alternate. This is similar to using a performance specification as suggested. Some DOT's have even gone to small scale Design/Build or Design/Detail, where the contractor provides the design and installation based on pre-approved alternates. (John Hillman)

The just-approved AASHTO Guide Specification on concrete-filled FRP tubes is quite general, and allows for any manufacturer to meet the requirements for the concrete-filled FRP tubes. Strength and stiffness are important properties, and the tube must be able to carry wet concrete in addition to soil dead load, dead load of structural components and nonstructural attachments, dead load of wearing surfaces and utilities, and live loads that occur after curing of the concrete. Design of the structure must consider all of these conditions. An essential element of behavior is composite action between the concrete and tube, and maintaining composite action over the life of the structure. The Guide Specification will allow an engineer to design the concrete-filled FRP tube given the properties of the FRP (longitudinal and hoop strength as well as moduli). A performance specification could then be written around the required properties of the FRP, and for the concrete, and the project bid. However, it is again important to be sure that the tube will be composite with the concrete long-term, and be sufficiently durable. The specification provides guidance and requirements on testing to verify composite action. (Bill Davids)

Q2. Can you discuss deflection issues compare to other type beam?

Live Load deflections of the HCB have to meet the same criteria as steel or concrete bridges. Based on the sequence of loading and installation, the camber for the HCB's have to take into account; self weight of the shell, arch concrete deflections on the shell and deflection of the complete HCB under deck dead loads.

All of these deflections are summed up and the camber built into the mold prior to fabrication of the HCB shell. (John Hillman)

Q3. What other material do you use besides the concrete arch and the steel reinforcement to fill out the rest of the FRP box?

The remaining portion of the interior volume of the HCB not filled with concrete or steel is filled with a low-density closed cell foam known as Polyisocyanurate. (John Hillman)

Q4. Can the HCB beams be used with integral abutments?

To date we have built five HCB bridges that incorporate integral abutments and a sixth bridge that uses integral pier caps for longitudinal continuity of the beams. (John Hillman)