November 2018 ABC-UTC Webinar Featured Presentation: Tight Construction Windows for BNSF Railway Bridge 24.8 Replacement in Camas, Washington		
#	**Questions**	**Responses**
	Design	
1	What type of coordination was done with BNSF in the preliminary engineering stage of the project for this type of construction?	Coordination was continually being done during all phases of design (preliminary, 30%, 60%, 90% and final).
2	What were the railroad design criteria?	Design criteria includes E80 live load with alternate live load including diesel impact. Design criteria also included stream flow of 4.3 ft/sec, wind loads of 50 psf on unloaded structure and 30 psf on loaded structure, scour for 100 and 500 year flows and seismic design.
3	What were the specifications regarding live load for RR bridge design? Do the RR bridge specifications use LRFD or LFD design?	Specification of E80 live load for this project. This project used ASD design for steel superstructure and LFD design for substructure.
4	How does ABC differ between road and RR bridges?	ABC is different for railroads due to the higher design loads, the bridge elements are significantly larger. In addition, the track windows are much smaller than used for some roadway projects.
5	Are there any special items related to design and construction of railroads?	Yes, railroad design uses the AREMA Manual which is developed and maintained by groups of volunteers within the railroad design community. For construction, there are obvious differences with the added dangers working around live railroad tracks. In addition, roadways can detour traffic sometimes around construction sites but to detour trains around can be hundreds of miles so construction like ABC is utilized to minimize the disruption but allow for replacement of bridges.
6	Are the bridge members fracture critical?	Yes, the lower chord of the truss, other tension diagonal and floorbeams are fracture critical. For the through plate girder, the bottom flange and web are fracture critical.

7	Did you provide a suggested design or guidance on the details of the slide design? Is this only considered as means and methods?	No specific method of installation was provided, although the method of sliding was believed to be the preferred method assumed during design and permitting. The design of the slide is the responsibility of the contractor and reviewed by the construction manager and railroad. The contractor is required to provide details of the installation method with their bids since it is part of the criteria for selection.
8	Could you discuss some of the rail restrictions that made this project difficult, and your recommended and implement solutions?	The biggest rail restriction is the track windows both for the pile driving but also the main track window for bridge removal and replacement. For the project to be successful, all parties need to understand in detail what is going to take place during each of the track windows. By understanding it thoroughly, discussion of contingency planning can take place if things do not go as planned.
	Construction	
9	How did you mitigate disturbances on existing track during construction?	As part of the contract, the existing bridge is electronically monitored to ensure the bridge is not moving during either temporary construction or permanent construction.
	Maintenance	
10	Any consideration for inspections?	Yes, there are access ladders to get down to the pier caps as well as access ladders on the truss to get to the top chord. In addition, the truss has an inspection platform that hangs under the bridge for inspection of the underside of the truss span.
	Cost	
11	What was the cost of the bridge / construction project?	Approximately $20M.
	Questions during Webinar	
12	Why was a Warren truss (with verticals) selected instead of Pratt (like old 1911 span)?	Warren truss is a typical that we have used for design of railroad structures that allows for easier construction, inspection and maintenance.

13	If this was an historic bridge, and you went from 2 thru-truss spans to 1 thru-truss span? That's a pretty big change. With such a big change in configuration, why do a new truss span at all?	The new truss span was required to span over the main channel and closely match the existing highway bridge span arrangement. We also wanted to place the new piers outside the main channel if possible. The 200-ft span is too long for a through plate girder so the next alternative is a through truss which was utilized.
14	Why were two temporary work bridges required?	Two temporary work bridges were used for two main reasons. First, a platform was required to construction all of the drilled shafts on both sides of the bridge. Second, one bridge was used for assembly of the new spans and the other bridge was used for the removal and disassembly of the old spans since we had to have a place to put the old spans out of the way during the short track window.
15	How long were the piles? How much time was required to drive them?	The piles ended up about 100 ft into the ground. Since they were this long, they required at least one pile splice to be completed. The pile spices were also completed during the four-hour track windows that we were given for installation. We could typically get about one pile completed during a four-hour track window. This was not always the case since each pile splice was about an hour.
16	Please talk a little more about the temporary jump span. What were the dimensions? Was it designed to carry the Cooper E80 loading?	The jump span was a 25-ft-long span that consisted of four wide flange beams that sit on short bents that sit on top of the existing pier cap and new pier cap. It was designed to carry E80 loading and was an open deck design.
17	What happened to the old truss bridge?	The old truss was disassembled and sold for scrap metal.
18	Were the trusses moved by sliding or rolling? Were rollers installed on the temporary beams between the angles or teflon plates/ sliding surfaces used for the skid shoe beam?	The trusses were moved by sliding. No rollers were used with this system. There was graphite paint as part of the slide surface along with other lubricant to reduce the friction during sliding of the skid shoe.
19	Do you have to paint the steel truss to protect it from corrosion?	The truss utilized weathering steel and was not painted. This is typical for railroad structures unless in a coastal climate.

20	What was Transystems estimate for track outage versus the contractor's estimate?	Our track outage estimate nearly matched the contractor's so we were satisfied when we received bids.
21	How was the longitudinal force distributed through the substructure, with such small abutments to transfer the forces to the soil?	The longitudinal force was distributed to all of the substructure. The piers are so much larger in size and take a lot of the longitudinal force.
22	Was cost saving the main reason for not painting the bridge and using weathering steel?	No, the railroad standard is the use of weathering steel to reduce maintenance cost of repainting the bridge.
23	Could you explain more on how the jacks worked for the sliding of the new bridge sections?	The jacks for sliding are just like any other jack except they have a hole in the middle of the ram so the rod can pass through it. As the ram is extended this then pulls on the rods and moves the span. Once at the full ram stroke, the ram is retracted and the nut and washer are tightened back down to the top of the ram and then the next stroke is begun.
24	In the initial slide (aerial), I noted a couple of jagged diagonal lines going from one side of the R/W to the other side. Were these delineating river requirements or etc.?	These lines were delineating the edge of the river for the permitting.
25	Was a cost-benefit analysis done to justify the $20 million cost of the project?	This bridge was a part of the railroad's capital replacement program. Every bridge the railroad owns is inspected annually and evaluated for condition. Bridges are then prioritized based on their condition and once a bridge has been determined to be near the end of its useful life, planning for replacement begins. At this point an estimated cost is determined and budgets are updated. The impact the bridge has to the railroad's system is taken into account in the prioritization stage.
26	Did you use rollers, or did you use Teflon and soap for the slide?	There were no rollers. The skid shoes were sliding on graphite paint and other lubricants to reduce the friction during sliding.
27	Since paint is not used, are the elements thickened to account for future corrosion? 100-year design?	No, since the structural steel is weathering steel that has its own method of protection once the steel initially weathers as long as water is allowed to drain, no additional corrosion should take place.

28	How did your estimate of outage time compare to the contractor's 32 hours? Was there a scoring element to the contractor's proposal outage time in the bid?	There was not a scoring system for the contractor's proposal outage time. We evaluated each on their method of changeout, duration and studied the detailed schedule of their changeout to make sure they understand and have captured all the required tasks and that we believe their outage time is accurate. Our estimate time was pretty close to all of the contractors.
29	Was there busing for passenger service?	For the two 32-hour outages, Amtrak moved the end of their service from Portland, OR to Pasco, WA. They then bussed passengers from Pasco to Portland. At all other times, Amtrak ran their regular schedule.
30	Were there incentives / liquidated damages for long closure work windows?	Yes, there were liquidated damages within the contract for the track windows. Incentives were not part of the contract since we are wanting the contractor to complete the work safely and on time.