ABC-UTC February 2023 Monthly Webinar: Precast Substructure Connection Details – AASHTO and PCINE Guidance		
#	**Webinar Questions**	**Responses**
	General Questions	
1	Are there any surprising recommendations in this guidance document that you would like to discuss and the reasons why?	Several new connection details are presented that are new to the industry. These connections are faster, easier, and less costly.
2	Can you provide a comparison of precast versus poured-in-place, specific to environmental impact, carbon reduction, and cost?	Environmental impact is an important subject, but not the focus of this presentation.
3	Does PCI guidance vary greatly between regions?	The information presented is a regional document, but the details are applicable to the entire United States, including seismic regions. PCI is looking to make this information a national document.
4	Is this system approved for use on Florida DOT projects?	Not to our knowledge as this is a new document.
5	Can you comment on the importance of redundancy in bridge structures?	Redundancy is a topic that is not covered in this presentation.
6	What are the PBU (Prefabricated Bridge Unit) life cycle expectations? How does this compare to a cast-in-place concrete deck with potentially less porosity?	PBUs (Prefabricated Bridge Units) are typically built with standard deck concrete; therefore, the durability should be the same. Closure joint concrete is often less porous than the PBUs. PBUs that have been in place for over 10 years are performing equal or better than cast-in-place concrete decks.
	Specific Questions	
7	Can you comment on prestressed prefabricated bridges in seismic zones and design of connections in seismic zones?	Seismic connections are covered in the presentation and are included in the AASHTO LRFD Guide Specifications for ABC.

8	What are the latest guidelines for designing pipe pin connections between column and superstructure in high seismic areas?	The AASHTO LRFD Guide Specifications for ABC do not cover this connection; therefore, it is not included in the PCINE document. We are aware of this connection. It may be included in the AASHTO Specifications in the future.
9	What are the difficulties in subgrade requirement preparation for precast concrete spread footings?	The recommendation is to prepare the subgrade as you would with any spread footing. To facilitate the installation, we recommend that the footing be installed 3 inches to 4 inches high and the void beneath the footing filled with flowable fill. This has proven to be very practical. Non-shrink grout is not necessary, as footing bearing pressures are normally less than 100 psi. Flowable fill has strength in the range of 1000 psi.
10	What is the proper foundation preparation for precast concrete footings?	The recommendation is to prepare the subgrade as you would with any spread footing. To facilitate the installation, we recommend that the footing be installed 3 inches to 4 inches high and the void beneath the footing filled with flowable fill. This has proven to be very practical. Non-shrink grout is not necessary, as footing bearing pressures are normally less than 100 psi. Flowable fill has strength in the range of 1000 psi.
11	Do you need to take any additional requirements for precast substructure connection details underwater?	There are no known connections that can be made in the wet. The area needs to be de-watered. Once connected, these connections can be submerged, as they emulate standard construction joints.
12	How and or is there an inspection process to verify that the precast member connections are 100% successful?	There are several means of verifying the success of blind connections. These include pre-construction mock-ups that can be disassembled to verify that the contractor is using successful processes. Many of the connections do not include blind work and are easily inspected.
13	Is there any dry connection to connect prefabricated columns to precast footings?	There has not been any research on "dry" connections; therefore, the AASHTO LRFD Guide Specifications for ABC do not include them.

14	What type of mechanical connectors have worked better in construction?	There are many new connections available. The only mechanical connector shown in the guide details is a grouted coupler. There has been much research on these couplers, which is why they are included in the AASHTO LRFD Guide Specifications for ABC. Grouted couplers have been in use in the industry for over 40 years. They have proven to work very well. The designer should confer with the owner on any choices for connections.
15	What are some rules of thumb for precast substructure connection details?	We present certain rules of thumb for the size of members, but not connections.
16	Were there any adjustments made to the connection details to reflect the differences in UHPC mixes in the Northeast versus elsewhere?	The details presented are based on the AASHTO LRFD Guide Specifications for ABC, which is a national document. The Guide Specs cover generic UHPC connections. If the mix meets the performance criteria of the Guide Specs, then the connections will function satisfactorily.
17	What are the major design differences between precast and cast-in-place connections?	All of the details presented emulate cast-in-place concrete; therefore, the design of many of these connections is similar or the same as cast-in-place concrete connections. Resources for design guidance for many of the connections are covered in the presentation.
18	What assumptions were made regarding lateral loading during development of connection details?	Most of the connections emulate cast-in-place concrete construction; therefore, the connections can be designed for all loads including lateral loads.
	Cost	
19	Transportation costs are high for precast concrete. To what extent is the industry constrained by geographic markets?	Many options are shown in the presentation for various elements. One of the heaviest elements is the footings. We present options to use cast-in-place concrete for footings, thereby saving on transportation costs. We also cover means to reduce the weight of other substructure elements through the use of voids that can be filled with concrete on site.

20	What is the cost difference of cast-in-place concrete substructures compared to precast concrete substructures?	Many elements can have similar costs. Pier cap elements have been shown to be less costly by eliminating costly high-level forming.
	Questions during Webinar	
21	Are there any issues with precast fabricators developing forms that can be re-used on other projects without getting into too many custom forms for just one project?	To date, most substructures have been formed with wood forms. The details have been developed to keep the shapes simple to make the forming less expensive. There are opportunities for standardization for certain shapes, which may be the case as precast substructures become more common.
22	Are there any successful examples of use of a precast concrete pier cap with a secant pile wall, to allow for accelerated top down construction? The secant pile wall would act as the abutment wall.	We do not know of any use of a precast cap on a secant wall. We do see the potential to use the precast abutment cap shown on a secant wall.
23	Which states use precast concrete the most? Which states are not so open to it?	The use of precast substructures varies across the country. The adoption of the 2018 AASHTO LRFD Guide Specifications for ABC and the 2022 PCINE substructure guide shown in the webinar should help to expand the use of precast substructures.
24	Is there a rough cost multiplier for precast construction versus conventional construction for substructures?	The cost of ABC is affected by many factors including speed of construction, site access, and the complexity of the details. The multiplier can range from 1.0 to 2.0 depending on these factors. The NCHRP Project 12-102A training modules cited in the presentation contain a module on ABC costs. With respect to substructures, the cost differential is not that great. In fact, precast pier caps have been found to be less expensive than cast-in-place pier caps.
25	For the socket connection shown, how is the plastic hinge developed at the footing/column connection, as the required confinement reinforcement is not provided?	The x-ray view of the column did not show the confinement reinforcement. You would place confinement steel in the lower portion of the column as you would for a cast-in-place column. The nice aspect of this detail is that all the confinement reinforcing can be placed in the precast column element.

26	As time has passed, have there been any durability issues with the use of grouts and particular details as they have entered working life?	Grouted joints have been used for many years. One of the first precast substructure bridges was built in Florida (Edison Bridge in Fort Meyers, built in 1993). This bridge was built with grouted couplers and grouted joints. To our knowledge, this bridge has performed very well in a very harsh environment. We have also inspected bridges in Utah that are approximately 20 years old. The precast substructures are performing flawlessly.
27	Are there any issues with key joints between precast cantilever abutments regarding temperature variations (especially in nordic regions)?	The design of joints should follow AASHTO or local standards. The details shown are essentially contraction joints. The guideline has text regarding expansion joints which are similar, but filled with expanded foam material.
28	Why is the diamond-like shape necessary for key joints? Won't a circular (semi-circle portion chipped off from each adjacent wall stem) be more efficient / have less stress concentrations?	The shape of the key can be changed. The joints shown have been confirmed by our fabricator members to be easy to build. There has been no known problem with stress concentrations of failures in these joints.
29	Where can I find "NCHRP Project 12-102a training module 2 for sample calculations"? I cannot find it based on a google search.	It takes a little digging to find it. You can go to www.trb.org and search in the projects tab. If you do not want to do this, we included the actual web link in the presentation. The link is: https://apps.trb.org/cmsfeed/TRBNetProjectDisplay.asp?ProjectID=5433
30	Is it more economical to have a battered abutment stem (variable width) versus maximum width full height (rectangular constant width) as shown in the presentation?	It is possible to build a battered wall; however, it is easier to form and pour a vertical face stem.
31	How would the precast concrete connections be repaired / retrofitted, say after a seismic event?	The details emulate cast-in-place concrete. The repair of a precast element would be the same as a cast-in-place element in most cases. If couplers are used, the designer can detail the couplers in the footing or cap to avoid damage.
32	Do you have any comments regarding precast approach slabs?	Our committee has developed precast approach slab guide details (www.pcine.org). The key to success is to use flowable fill and shims to set the panels to grade. Attempting to set the panels on compacted fill has proven to be difficult.

33	Would you recommend with gravity or against gravity grouted coupler connections for these ABC elements?	We are not certain what is being asked here. The couplers shown can be installed vertical, inverted, and horizontally. The construction specifications in the 2018 AASHTO LRFD Guide Specifications for ABC require that the contractor follow the recommendations of the coupler manufacturer for installation procedures. If there is concern, you can specify that the contractor make a mock-up coupler connection that can be tested to verify that the grout is being placed properly.