| ABC-UTC 2023 In-Depth Web Training: Precast Substructures | | |
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| **#** | **Questions** | **Responses** |
| | **Module 2: Washington State's I-5 / US 12 Bridge at Grand Mound Precast Substructure** | |
| 1 | What is the proposed height limit for precast concrete piers? How do you design precast concrete piers for seismic events (construction stage, final stage)? | The HFL (Highways for LIFE) project was a demonstration project without any column height limits. The height limit is often controlled by shipping and handling requirements. The HFL precast concrete piers are CIP (cast-in-place) emulative, and seismic design was similar to CIP piers at final stages. Seismic design was not considered during construction stages. |
| | **Questions during Module 2** | |
| 2 | Is the shear friction in the socket connection sufficient to develop the fixed moment connection at the base of the column? | Yes, it is. The saw-tooth connection surface was sufficient for full interface shear transfer and fixed moment connection without any transverse reinforcement through the column. |
| 3 | Does the column have to be in a SSD (saturated surface-dry) condition prior to casting the surrounding concrete for the column / footing connection? | Yes, the column needs to be in a SSD condition prior to casting the concrete for the column / footing connection. |
| 4 | At what stage is grout applied to the column segments? Slide 45 shows the top cap being placed before grouting the connections. Is this correct? | Yes, grouting was applied after erection of all segments. Segments were relatively small, and grouting after each segment erection could have results in uplift due to the grouting pressure. |
| 5 | What was the reason for using columns with three segments? It seems like the weight could be managed with a column having one or two segments? | This was a demonstration project, and the purpose of segmental columns was to demonstrate the feasibility of grouted duct connections between column segments. This type of segmental columns was subsequently used for flyover ramps with very tall columns. |

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| 6 | On Slide 50, how are the pier diaphragms cast after the deck slab is cast? | This was a deck-bulb-tee girder bridge where the slab is prefabricated as the top flange of the girder. All intermediate and end diaphragms were precast except for the upper portion of the pier diaphragm that was CIP (cast-in-place). The concrete topping was placed after completion of the superstructure to meet the profile grade requirements. |
| 7 | Was the grout pressure sufficient to get rid of the air pockets under the column sections? Is some amount of suction required to make sure there are no air pockets at this location? | Yes, the grout pressure was sufficient to eliminate any air pockets under the columns. The contract required a mockup of column section erection with grouted ducts.There were no air pockets in the mockup, nor in the actual column sections. |
| 8 | Is there a reason not to use a bonding agent under the column segments? | The specimen testing showed that a bonding agent is not required. Grout was adequate for bonding between column segments. |
| 9 | Does the precast column in socket connections need to be octagonal? | Yes, in seismic regions the precast column socket connection needs to be octagonal to provide uniform lateral resistance under seismic ground motion. The HFL bridge rectangular column was built with a circular bar cage that allows the octagonal shape. Rectangular or circular columns in non-seismic regions do not need to be changed to an octagonal shape. |
| 10 | The cap closure joint was large and seemed to have congestion issues. Might WSDOT consider using UHPC closure joints in the future? | UHPC for the closure joint is a great idea but wasn't considered at the time of the HFL project. Future bridges of this kind will certainly consider UHPC for closure joint connections. |
| 11 | Were there any seismic-related concerns that would affect the splice locations in the vulnerable zones of the column? | No. Column splice locations were at 1/3 points of the column height and away from plastic hinging zones and away from the point of maximum moment and shear. |