**Need for Innovation**

Prefabricated bridge bents, also known as piers, have not been used in seismic regions because accepted methods of making connections that are both structurally robust and quick to assemble were not known and were not addressed in design specifications. This new technology allows the main elements of bridge bents to be prefabricated off site. Then the segments are moved into place and assembled to form the bents, greatly reducing construction time and traffic delays.

**Project Overview**

The BergerABAM project team has demonstrated, on a bridge in Washington State, a totally precast concrete bridge bent system, including prefabricated columns and beams, that can be used in seismic regions. To construct precast elements in high seismic zones requires ductile detailing, which permits the structure to deform rather than to experience sudden unexpected brittle failure. The connections are made with a small number of large-diameter reinforcing bars that are grouted into larger-diameter ducts. This is the first project in the U.S. to use such precast, segmental construction for bridge bents in high seismic regions.

**Critical Components of System: Two Connections**

1. **Large-Bar Connection to Cap-Beam**
   - Use few, large bars in grouted ducts to connect column to cap-beam. Erection is easy and rapid.
   - Bars extend into cap-beam for moment continuity with superstructure in longitudinal and transverse directions.
   - Column can be made in segments to limit weights of precast element for handling.

2. **Socket Connection to Footing**
   - Socket connection can be constructed rapidly.
   - Aggressive roughness provides shear friction interface.
   - Heads on bottom of column bars provide direct load path and positive bar development in foundation.
   - Both spread footing and drilled shaft foundations are being considered and tested.

**Project Status**

Laboratory testing of both column-to-spread footing connections and column-to-drilled shaft connections have been completed. The demonstration project, a new bridge over Interstate 5 in Washington state is now complete and open to traffic. The final reports, draft design specifications and design examples are currently being completed.

**Contact Information**

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**Additional Information**

- Video on project at http://www.fhwa.dot.gov/hfl/partnerships/bergerabam/index.cfm
- Webinar: Initial testing and early construction, recorded November 18, 2010 at www.fhwa.dot.gov/hfl/commtool.cfm
- Webinar: Final testing and completed structure, recorded on August 22, 2013 at https://connectdot.connectsolutions.com/n134083201308/

**Previous Test Results**

- Large-Bar Pullout Tests
- Pullout Tests Tests on individual bars proved anchorage capacity. (Fracture with $l_d = 10a_d$).
- Beam-Column Connection Tests Demonstrated that the precast system has the same strength and ductility as a comparable cast-in-place connection.

**Socket Footing Testing**

Both spread footing and drilled shaft connections have been validated by testing in the laboratory. Both types were able to restrict seismic damage to the column.

**Project Team**

BergerABAM
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Washington DOT
Concrete Technology Corporation
Tri-State Construction