New Jersey Turnpike Authority
PO Box 5042, Woodbridge, NJ 07095

Document Change Announcement

2007 Design Manual

DCA2012-DM-02

DATE: April 4, 2012

Subject: Revisions to Section 2.2.4.3.2 of the Design Manual

Description of Change

Changes have been made regarding the specification and design of anchor bolts and horizontal forces.

Instructions to Designers and Consultants

Effective immediately, the revisions contained in this announcement shall be applied to all projects that have not reached Phase C of design. Contact your NJTA Project Manager for instructions. Attached revision is noted in italics.

Designers may access these revisions in the NJTA Design Manual, which is available on the Authority's Web Page: http://www.state.nj.us/turnpike/professional-services.html.

Information for In-House Staff

The revisions have been incorporated into the Design Manual, which is available on the S drive @ S:\Project Files\Design-Procedure Manual. Please distribute the information to your respective Project Managers and have them direct their consultants appropriately.

Recommended By:

Robert J. Fischer, P.E.
Assistant Chief Engineer, Design

Approved By:

4/4/12

Richard J. Raczynski, P.E.
Chief Engineer

cc: Senior Staff Engineering, Operations & Maintenance Departments, All Prequalified Consultant Firms, File

New Jersey Turnpike Authority

DOCUMENT UPDATE REQUEST

Forward to Assistant Chief Engineer, Design

Initiator	Rich Schaefer	**Submittal Date**	03/28/12
Firm	HNTB Corporation	**Telephone**	973-237-1650

Document (check one)

- ☐ Procedures Manual
- ☒ Design Manual
- ☐ Sample Plans
- ☐ Standard Drawings
- ☐ Standard Specifications

Description of Change

Add the following to the end of Section 2.2.4.3.2

5. **Provisions for Anchor Bolts:**
Anchor bolts shall be fully designed for elastomeric bearings. Force effects on anchor bolts to be designed by the bearing fabricator shall be considered where specifying HLMR or Seismic Isolation bearings for use. Where large horizontal or longitudinal forces are anticipated due to multiple lines of fixed bearings at a singles superstructure unit and/or where impact/thrust against guided expansion bearing guides or keeper plates is likely, these forces shall be accounted for in the design of the anchor bolts for elastomeric bearings, or included in the Bearing Design Tables provided for HLMR/Seismic Isolation bearings.

   Where pedestal are used to support bearings, the designer shall consider extending the 1'-6" depth of embedment of the anchor bolt rod as required by design to ensure sufficient embedment of the bolt into adequately sized and reinforced concrete. Additional pedestal reinforcement in addition to or in lieu of extending the anchor bolt embedment may also be considered where appropriate or required by design.

   Anchor bolts may be installed by the contractor via direct casting into the substructure unit concrete, drilling and grouting the bolts in place, or by casting-in oversize holes or preformed holes in the substructure concrete. Drilling and grouting of bars must be explicitly eliminated from use in the contract documents if the possibility of damaging the structural integrity of the substructure elements is anticipated. If net uplift or tension is anticipated at the anchor bolts, the casting of oversize holes or use of preformed holes in the substructure concrete should be explicitly eliminated from use in the contract Plans.

Reason for Change

Discusses specification and design of anchor bolts and horizontal forces

Design. Performance metrics for the bearings shall be presented on the Contract Plans.

Regardless of bearing type chosen, the designer shall evaluate the anticipated construction sequence and alert the Contractor if temporary bracing, preload jacking for thermal displacement, or other special procedures are required to install the bearings without overstress.

3. Provisions for Substructure Movement:
Settlement of fill under and behind abutments is frequently accompanied by horizontal movement of the abutment top, and small rotations of tall piers will result in appreciable displacement of the bearings. In these circumstances, and others where movements or settlements may take place, provisions shall be made in the design for resetting the bearings. The end diaphragm shall be positioned and designed to provide for jacking the end of the span. Sufficient expansion capacity shall be provided in the bearings to accommodate the substructure movement, and so minimize the need to reset them.

4. Provisions for Bearing Replacement:
All bearing designs and details shall provide a means for ready removal of the bearing for the purpose of inspection, maintenance and replacement. As an example, the bearing may be placed between steel plates so that removal does not entail the demolition of reinforced concrete substructures. Substructures shall be designed to furnish space for jacks or other devices for temporarily supporting the superstructure. Superstructures shall be designed to accommodate the loads imposed by these devices.

5. Provisions for Anchor Bolts:
Anchor bolts shall be fully designed for elastomeric bearings. Force effects on anchor bolts to be designed by the bearing fabricator shall be considered where specifying HLMR or Seismic Isolation bearings for use. Where large horizontal or longitudinal forces are anticipated due to multiple lines of fixed bearings at a singles superstructure unit and/or where impact/thrust against guided expansion bearing guides or keeper plates is likely, these forces shall be accounted for in the design of the anchor bolts for elastomeric bearings, or included in the Bearing Design Tables provided for HLMR/Seismic Isolation bearings.

Where pedestals are used to support bearings, the designer shall consider extending the 1'-6" depth of embedment of the anchor bolt rod as required by design to ensure sufficient embedment of the bolt into adequately sized and reinforced concrete. Additional pedestal reinforcement in addition to, or in lieu of, extending the anchor bolt embedment may also be considered where appropriate or required by design.

Anchor bolts may be installed by the contractor via direct casting into the substructure unit concrete, drilling and grouting the bolts in place, or by casting-in oversize holes or preformed holes in the substructure concrete. Drilling and grouting of bars must be explicitly eliminated from use in the contract documents if the possibility of damaging the structural integrity of the substructure elements is anticipated. If net uplift or tension is anticipated at the anchor bolts, the casting of oversize holes or use of preformed holes in the substructure concrete should be explicitly eliminated from use in the contract Plans.

2.2.5 Substructure Design

2.2.5.1 Piers

1. See Exhibit 2-214 for general guidelines on Turnpike pier details. Details for new bridges are provided for both piers without cantilevers and piers with cantilevers. In an effort to maintain the originally intended and present appearance of the Turnpike, Engineers shall determine which of the two pier types are already predominant in the vicinity of the Turnpike upon which the new bridge is located and submit the proposed pier type to the Authority for review and approval. In the absence of any available information to aid in choosing the correct pier type to be used, piers without cantilevers shall be used wherever possible and practical. For existing bridges requiring rehabilitation, reconstruction or widening, Engineers shall utilize the pier type that matches that of the existing bridge.

2. Restrictions on the use of frame piers
   These restrictions apply to all piers adjacent to the Turnpike / Parkway or Turnpike / Parkway ramps unless they are positioned more than 30 feet clear from the outer edge of shoulder.
   a. Single shaft piers shall have a minimum horizontal cross-section area of 30 square feet.
   b. Frame piers shall have a minimum of three columns.

3. Footings
   Frame piers shall generally be designed with a continuous footing supporting all the shafts, except that piers founded on rock or piles may have individual footings for each shaft. The footing width of piers founded on soil shall be at least one-third of the height (from bottom of footing to top of cap beam) and for piers founded on rock or unyielding soil shall be at least one-fourth the height. Soils with a bearing capacity of at least three tons per square foot may be considered unyielding. If piles are used, the distance between the outer rows shall be not less than one-fourth the height of the pier.

4. Temperature and Shrinkage
   Frame piers shall be designed for the combined effects of temperature change and concrete shrinkage, unless a placing sequence is specified for the cap beam that will reduce or