DESIGN DIRECTIVE

To: Distribution

From: Erik Stoothoff, P.E.
Chief Engineer

Date: October 8, 2019

RE: Guidance for the Use of Adhesive Anchors

This design directive is intended to consolidate, reiterate, supplement, and clarify the MBTA's approach, preferences, and requirements for the use of adhesive anchors on the MBTA system.

In the event that conditions warrant deviation from this directive, a design waiver signed by the Chief Engineer and the department owning the scope of work will be required of the project.

Design Consultants shall design to standards as prescribed by Code. MBTA Standards shall apply only where Code does not address a topic or the MBTA requires a standard above and beyond Code. The more stringent shall always apply.

Guidance for the Use of Adhesive Anchors

The MBTA maintains strict controls regarding the use of adhesive anchors in all applications. This Directive provides guidance and procedures to be followed for each potential use of adhesive anchors on MBTA facilities or on MBTA. The MBTA shall not permit the use of adhesive anchors in any application if the procedures in this Directive are not followed.

Potentially Acceptable Adhesive Anchors

- The Massachusetts Department of Transportation (MassDOT) Research and Materials Unit will maintain a list of products that have been tested in accordance with International Code Council Evaluation Service Acceptance Criteria 308 (AC 308) for creep susceptibility.
- The list of potentially acceptable adhesive anchors will be included on the

Qualified Construction Materials List, which is available on the MassDOT website.

- Only those adhesive anchors that have been tested in accordance with AC 308 will be accepted.
- Use of "Fast Set" adhesive anchors is prohibited for ALL applications.

Guidance to Designers

- Designers shall always specify non-adhesive methods of anchoring dowels and other anchors into existing concrete, such as the use of cementitious grout in cored holes, except as provided below.
- Designers shall provide necessary dimensions for coring or drilling holes for the installation of dowels or anchors, including hole diameter and depth, spacing between dowels or anchors and edge distance.

Approval Process for Using Adhesive Anchors for Designers

The Engineer of Record may propose using adhesive anchoring material in lieu of coring and grouting by following the approval process outlined below:

Step 1 – The Engineer of Record shall prepare a written request to use adhesive anchors instead of coring and grouting. The request should address the following:

1. Is the use of adhesive anchors in lieu of cored and grouted anchors in the public interest?
2. Does the use of adhesive anchors provide improved long-term performance, resiliency or durability compared to cored and grouted anchors?
3. Does it provide an equal or better material or product than cored and grouted anchors?
4. Does it provide a better method of construction than cored and grouted anchors?
5. If the Contractor benefits from the use of adhesive anchors in lieu of coring and grouting, is there a corresponding benefit to the MBTA?

The request must identify the adhesive anchor material to be used and the exact application, including a detailed sketch or a copy from the Construction Drawings showing the exact location where the requested adhesive anchor is to be used, the spacing, edge distance, hole diameter and depth. In cases where multiple applications of adhesive anchors are proposed, each location will require a separate, use-specific request. The request shall be submitted to the MBTA through the Capital Delivery Project Manager. The Engineer of Record shall certify in writing as part of the request that each unique installation of an adhesive anchor will not fail in tension.

Step 2 – The Capital Delivery Project Manager will forward the request to the Office of the Chief Engineer (OCE) for a structural suitability review and approval.

Step 3 – The OCE will review the request in the following manner and in consultation

with the Engineer of Record to obtain input into the design loads that the anchors or dowels must carry.

Material Check

1. Is this a "Fast Set" adhesive? If yes, reject.
2. Is the adhesive on R&M's approved list? If not, reject.

Prohibited Structural Applications: Reject

1. Overhead application – anchor is to be installed vertically upwards to suspend an object, such as a utility, directly from the anchor which will create a direct pull out tensile force.
2. Anywhere application in which the adhesive anchor based on structural behavior will be subjected to a constant tension load. This includes adhesive anchors that may carry intermittent but frequent tensile loads. Examples of intermittent but frequent tensile loads include:
    a) Reinforcing bars that need to develop the tensile component of moment from a beam or a column shaft or will always be subjected to a pull out tensile load from the member that they are anchoring to the existing concrete.
    b) Anchor bolts, such as anchor bolts for sign supports, strain poles, and luminaires that transmit moment to the concrete foundation.
    c) Anchor bolts attaching brackets supporting utilities, where the bracket depth will create a moment couple between the anchor bolts so that the top bolt(s) will see a constant pull out load.

Permitted Structural Applications: Approve

1. Any application where, based on a structural evaluation, the anchor or reinforcing bar will be subjected only to shear forces without any tensile load component. These include:
    a) Anchors used to attach utility brackets or supports that will carry the load in shear.
    b) Reinforcing bars that act as dowels to transmit shear between concrete surfaces, such as across construction joints and between substructure elements.
2. Reinforcing bars that primarily act in shear but may be subjected to intermittent but infrequent tensile loads.

Installation of the Proposed Adhesive

1. Does the edge distance and spacing of the anchors and the hole diameter and depth to be drilled meet or exceed the minimums as specified by the manufacturer? If not, reject.

2. According to the manufacturer's specifications, will the depth of the hole develop the required pull out and/or shear of the anchor given the strength of concrete into which it is being installed? If not, reject.

Step 4 – Once the OCE determines whether a proposed adhesive anchor installation can be approved or must be rejected, he or she will notify the Capital Delivery Project Manager of the determination by memo (including all documentation included in the request) with a copy to the Senior Director of Infrastructure, Engineering and Planning and the Capital Delivery Manager of Structural Design. The Capital Delivery Project Manager will initial the memo, stamp it REVIEWED and send for distribution. If any of the application parameters are violated during construction in the field, the approval is null and void and a full reassessment is required.

Note: A contractor may initiate the use of adhesive anchoring in lieu of coring and grouting. The contractor shall initiate the request through the Capital Delivery Resident Engineer. The Resident Engineer shall submit the request to the Capital Delivery Project Manager. The Capital Delivery Project Manager shall work with the Engineer of Record to satisfy the requirements of approval outlined within this document. The Engineer of Record shall provide the necessary design for the use of adhesive anchors as outlined above.