



INDIANA DEPARTMENT OF TRANSPORTATION

Driving Indiana's Economic Growth

Design Memorandum No. 22-18

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TO: All Design, Operations, and District Personnel, and Consultants

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SUBJECT: Chemical Anchors for Post-Installed Reinforcement

REVISES: *Indiana Design Manual (IDM) Chapter 412-3.01(08), 412-3.03(02), Figure 412-3B (deleted)*

EFFECTIVE: Immediately

IDM Chapter 412, Bridge Preservation, has been revised to reflect the design requirements for the use of post-installed concrete anchors specified in *AASHTO LRFD Bridge Design Specifications*, 8th Edition with interim revisions through May 2018, and the Department's policy on the use of such anchors. The design of concrete anchors first appeared in AASHTO with the publication of the 8th Edition, and previous designs were often based on guidance from chemical anchor system manufacturers. Current design should be based on the AASHTO code requirements, and the guidance provided in IDM Chapter 412.

For questions related to this design memo, please contact the Bridge Engineering Division at Bridgedesignoffice@indot.in.gov.

IDM Revisions

412-3.01(08) Anchor Systems for Reinforcement [Rev. Sep. 2022]

When extending existing primary reinforcement, it is preferred to lap new reinforcement to existing reinforcement. Examples of primary reinforcing would include, but not be limited to, transverse reinforcing in decks on beams, longitudinal reinforcing in decks on beams within negative moment regions, longitudinal reinforcing in slab superstructures, and reinforcing in pier caps. However, it may not always be possible or cost-effective to expose sufficient existing reinforcement to lap with new reinforcement. When lap splices are not economical or feasible, the new reinforcement may be mechanically spliced to the existing reinforcement by means of a reinforcing bar splicing system, as shown on the INDOT Qualified Products List.

When extending existing secondary reinforcement or anchoring new reinforcement that isn't intended to provide continuity with existing reinforcement, it is preferred to use field drilled holes in concrete in conjunction with a chemical anchor system. The INDOT Qualified Products List provides a list of approved products, and specific product names should not be shown on the plans. Other types of post-installed anchors such as undercut, expansion, stud, or drop-in type anchor systems should not be used for permanent installations. The design of the chemical anchor system should be in accordance with LRFD 5.13, which refers to ACI 318. At a minimum, the following information should be shown on the plans:

1. Reinforcing bar size,
2. Minimum required embedment depth,
3. Minimum spacing, and
4. Minimum edge distance.

The plans should not indicate a minimum pullout strength, since the minimum characteristic bond strength stresses recommended by ACI should be assumed when evaluating bond failure, and the other failure modes should be evaluated during design.

Where vertical holes are to be drilled into the top of a concrete bridge deck, a minimum clearance of 2 in. should be maintained between the bottoms of the holes and the bottom of the slab. Where vertical holes are to be drilled over a concrete- or steel-beam flange, the holes may be extended to the top of the flange.

412-3.03(02) Longitudinal Joints [Rev. Sep. 2022]

Past performance indicates longitudinal expansion joints in a bridge deck between a widened portion and the existing portion have been a continuous source of bridge maintenance problems. Therefore, longitudinal expansion joints should not be used to separate existing and widened bridge decks.

When widening between adjacent structures, provide a minimum 1” open joint between the copings. An example would be the addition of travel lanes to twin structures separated by concrete barriers.

Experience has shown a positive attachment of the widened and original decks provides a better riding surface, usually presents a better appearance, and reduces maintenance problems. A positive attachment of old and new decks should be made for the entire length of the structure. The preferred method for attachment is to lap reinforcement. The following recommendations should be considered when widening existing decks.

1. A structure should be widened by removing concrete for a distance sufficient to allow adequate length for lapping the original transverse deck reinforcing to that of the widening.
2. Where removal will not provide sufficient lap length, reinforcing should be exposed and extended by means of a mechanical lap splice. The design should be in accordance with *LRFD* 5.13.
3. A structure with no overhangs, such as a longitudinally reinforced concrete slab, may be attached by doweling the existing structure to the widening. Double-row patterns for the dowels are preferred over a single row.
4. Removal of the deck past the outside beam line will result in a cantilever slab condition. The design should ensure that the deck can resist the loadings anticipated during construction.
5. A longitudinal construction joint located over a beam flange should be avoided when possible. Longitudinal construction joints should preferably be aligned with permanent lane lines. These joints tend to be more visible than the pavement markings during adverse weather conditions.

Figures

412-3B Design Data for Anchor Systems [Figure Deleted]