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5.8.5 Reinforcement ~~protection~~

5.8.5.1 General

5.8.5.1.1 Policy overview

Reserved.

5.8.5.1.2 Design information

Reserved.

5.8.5.1.3 Definitions

Black reinforcement refers to uncoated or otherwise unprotected steel reinforcement.
Primary Highway System: "Primary roads" or "primary road system" means those roads and streets both inside and outside the boundaries of municipalities which are under department (defined as state department of transportation) jurisdiction [Iowa Code 306.3.6].

5.8.5.1.4 Abbreviations and notation

CMB IM, Construction and Materials Bureau Instructional Memorandum

5.8.5.1.5 References

Reserved.

5.8.5.2 Reinforcement Protection

Unless otherwise specified, steel reinforcement shall be uncoated and meet the Standard Specifications and Materials IMs [IDOT SS 4151.03; CMB IM 451].

~~All components of H24 and J24 s~~Standard county bridges (e.g. H24, J24) may use only uncoated (black) reinforcement because those bridges will be used ~~only by counties for bridges~~ on roads not treated with deicing chemicals.

For the Primary Highway System, reinforcement in all railings, superstructure components, and substructure components exposed to deicing chemicals shall be protected unless otherwise noted. The typical method of protection is epoxy coating, however, stainless steel dowels are specified for approach slab to abutment connections in some cases, and alternate methods of protection may be specified on a case-by-case basis.

Epoxy coated reinforcement [IDOT SS 4151.03.C; CMB IM451.03B] is required specifically for the following:

- Standard bridges ~~H40, H44,~~ J40~~,~~ and J44~~, and RS40~~ (with exceptions for some substructure components)
- Railings [BDM 5.2.4.1.2, 5.4.1.4.2, 5.5.2.4.2, 5.6.2.4.2, BSB SS 1017-10281~~018, 1018A-1018D, 1019A-1019B, 1020A-1020F, 1028A~~]
- Bridge decks [BDM 5.2.1.1, 5.2.4.1.1.2, 5.2.4.1.2]
- Prestressed concrete deck panels [BDM 5.2.4.3, 5.2.4.3.2]
- CCS superstructures (except pile spirals) [BDM 5.6.1.4.2]
- PPCB superstructures including shear steel and haunch reinforcement that extends into the deck (except pile spirals) [BDM 5.4.1.4.2, 5.3.2.1]
- CWPG superstructures (except pile spirals) [BDM 5.5.1.4.2]
- Integral abutments (except pile spirals) [BDM 6.5.4.1.2]
- Stub abutments [BDM 6.5.4.2.2]
- Wings, abutment wing extensions, abutment diaphragm wing extensions, and wing extensions [6.5.4.3.2]
- Pier caps under expansion joints [BDM 6.6.4.1.1.2]
- Pier columns under expansion joints or within 25 feet of the edge of the traveled roadway [BDM 6.6.4.1.2.2]
- Reinforced approach sidewalk slabs [BSB SS 1029E-1029F]
- Bridge lighting pole bases [BSB SS 1030A]
- Box culvert slabs, corbels, and wall reinforcement that extends into the slab when the roadway is on the slab [BDM 8.2.3.3, 8.2.4.5.1]

~~Epoxy coated reinforcement may be used for the following:~~

- ~~Standard bridges H30, H30SI, and J30 (with exceptions for some substructure components)~~

Stainless steel dowels or bars [CMB IM 452] are required for the following:

- Barrier rail to bridge deck/wing connections for all state-owned bridges including bridges over the Interstate and Primary Highway System even if the connecting road is unpaved~~interstate and primary bridges~~
- ~~Barrier rail to bridge deck/wing connections for bridges on paved roads exposed to deicing chemicals over the Interstate and Primary Highway System~~
- Stub abutment to approach slab connection [BDM 6.5.1.1.2]
- Integral abutment to approach slab connection for CCS ~~interstate and primary~~ bridges [BDM 5.6.1.1.1, 5.6.1.4.2]
- Culvert to approach slab connection when the roadway is on the culvert slab [BDM 8.2.4.5.1, E634/M634 in BDM 13.7.2]
- Approach sidewalk to bridge abutment connection [BSB SS 1029E, 1029F]
- Exposed reinforcement during staged construction [BDM 5.2.4.1.2]

Stainless steel reinforcement bar weights for quantities shall be calculated based on uncoated/epoxy-coated steel reinforcement weights since the difference in weight is minimal.

Galvanized steel reinforcement [IDOT SS 4151.03.B; CMB IM 451.02] currently is not specified for any bridge components but may be specified on the plans with approval of the Chief Structural Engineer.

5.8.5.3 Reinforcement Type and Grade

Unless otherwise specified, black and epoxy coated steel reinforcement shall be grade 60 ksi as specified in CADD Note E50E. Specifically, reinforcement shall be deformed bars meeting the requirements of ASTM A 615 grade 60, ASTM A 706 grade 60, or ASTM A 996 grade 60 [IDOT SS 4151.03.A.3].

Black or epoxy coated steel reinforcement may be 80 ksi when needed to reduce congestion. Rebar congestion is reduced by decreasing bar size or increasing bar spacing or both. Cases where 80 ksi may be used to reduce congestion typically include.

- Drilled shafts, pier columns, and pier caps.

- Longitudinal negative moment deck reinforcement (b2 bars) over piers for PPCB bridges. Substitutions shall ordinarily be limited to cases where 60 ksi 9b2 bars are required in the top and bottom of the deck. Those bars may be replaced one-for-one with 80 ksi 8b2 bars in the top and bottom of the deck. [Note: 60 ksi No. 9s with As*fy = (1.00 in^2)*(60 ksi) = 60.0 k is equivalent to 80 ksi No. 8s with As*fy = (0.79 in^2)*(80 ksi) = 63.2 k] See also BDM 5.2.4.1.1.8 and 5.4.1.4.1.7.
- J-bar deck overhang bars where TL-5 single slope rails are used that also require end region j-bar spacing. The 60 ksi 6j1 bars at 3.00-inch spacing in BDM Table 5.2.4.1.2-2 may be replaced by 80 ksi 6j1 bars at 4.00-inch spacing. [Note: 60 ksi No. 6s at 3 inches has As*fy = (0.44 in^2)*((12 in)/(3 in))*(60 ksi) = 105.6 k is equivalent to 80 ksi No. 6s with As*fy = (0.44 in^2)*((12 in)/(4 in))*(80 ksi) = 105.6 k]

A 2599 bid item should be used with a bid item description like “Reinforcing Steel, Epoxy Coated, 80 ksi”. CADD Note E50E shall be modified as needed, but like the following.

> Reinforcing steel in accordance with AASHTO LRFD Section 5, Grade 60 for all epoxy coated and non-coated, except ASTM A615 Grade 80 or ASTM A706 Grade 80 for epoxy coated 8b2 deck bars, and Grade 60 or 75 for stainless.

Per IDOT SS 4151.03.A.2, spirals of No. 5 bars or smaller and any bars No. 3 or smaller for stirrups or hoops of a specified shape may, at the Contractor's option, be steel meeting the requirements of ASTM A 1064 or ASTM A 615 grade 40 unless prohibited in the project plans. Overriding IDOT SS 4151.03.A.2 in the project plans using CADD Note E713 shall be done when using grade 60 continuously wound No. 5 tie bars in frame pier columns to meet the vehicle collision requirements in BDM 6.6.2.6.

Unless otherwise specified, stainless steel reinforcement shall be grade 60 or 75 ksi as indicated in CADD Note E50E. Specifically, stainless steel reinforcement shall be deformed bars and meet the requirements of ASTM 955 and be UNS S31653 (316LN), S31803, S32304 (2304).