



2017

LRFD Bridge Construction Specifications

4th Edition



AMERICAN ASSOCIATION
OF STATE HIGHWAY AND
TRANSPORTATION OFFICIALS

AASHTO

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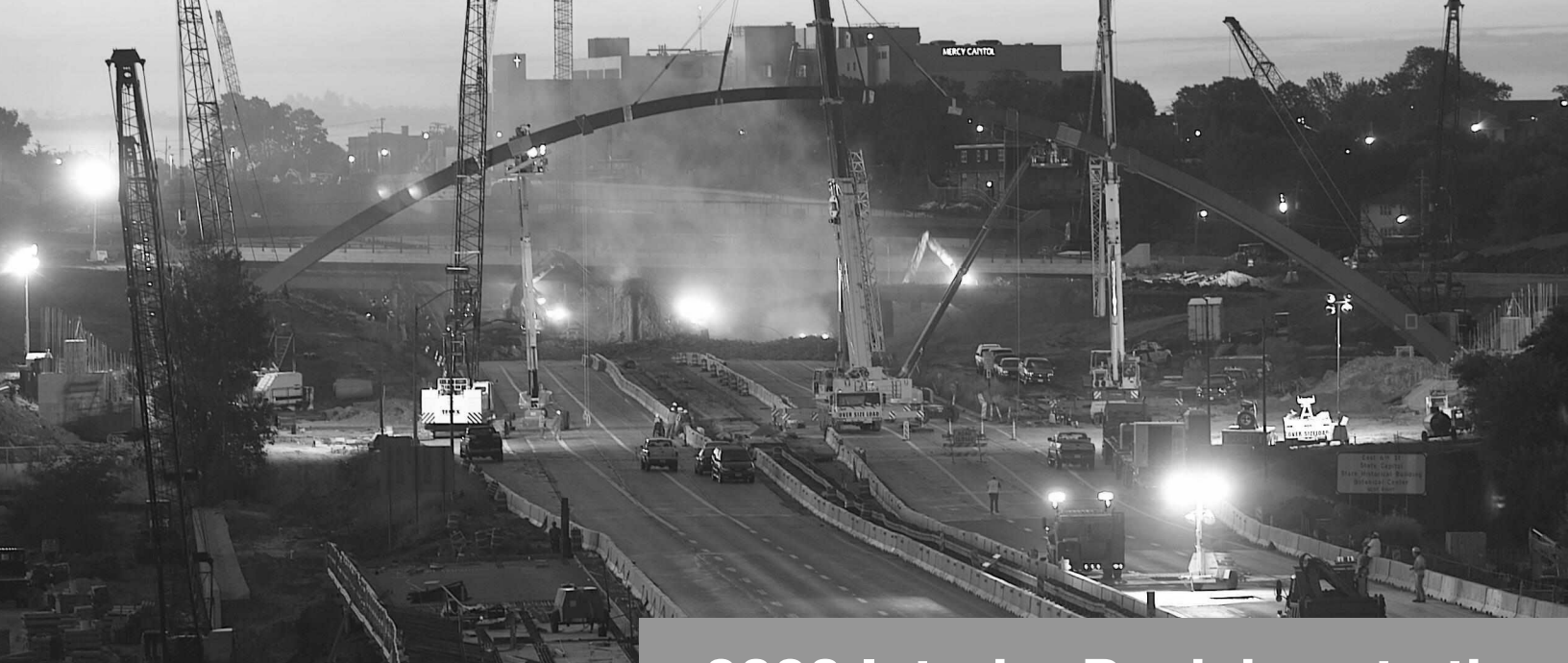


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2020 INTERIM REVISIONS INSTRUCTIONS AND INFORMATION

General

AASHTO has issued proposed interim revisions to the AASHTO *LRFD Bridge Construction Specifications*, Fourth Edition (2017). This packet contains the revised pages. They are designed to replace the corresponding pages in the book.

Affected Articles

Underlined text indicates revisions that were approved in 2019 by the AASHTO Committee on Bridges and Structures. ~~Strikethrough text~~ indicates any deletions that were likewise approved by the Committee. A list of affected articles is included below.

All interim pages are displayed on a pink background to make the changes stand out when inserted in the edition's binder. They also have a page header displaying the interim publication year. Please note that these pages may also contain nontechnical (i.e., editorial) changes made by AASHTO publications staff; any changes of this type will not be marked in any way so as not to distract the reader from the technical changes.

2020 Changed Articles

SECTION 7: EARTH-RETAINING SYSTEMS

7.8

SECTION 10: PRESTRESSING

10.3.2

C10.3.2

10.3.2.1

10.3.2.2

SECTION 11: STEEL STRUCTURES

C11.9.1

11.10

SECTION 27: CONCRETE CULVERTS

C27.6.1

2020 New Articles

SECTION 7: EARTH-RETAINING SYSTEMS

7.5.5

7.6.5

C7.6.5

7.6.5.1

7.6.5.2

7.6.5.3

7.6.5.4

SECTION 34: SOIL NAILS (Entire Section)

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7.5.5—Horizontal Drains

Horizontal or sub-horizontal drains consisting of a PolyVinyl Chloride (PVC) pipe with slotted perforations in section that will intercept water shall be constructed as specified in the contract documents or on the approved working drawings.

7.6—CONSTRUCTION

The construction of earth-retaining systems shall conform to the lines and grades indicated in the contract documents, on the working drawings, or as directed by the Engineer.

7.6.1—Concrete and Masonry Gravity Walls, Reinforced Concrete Retaining Walls

Stone masonry construction shall conform to the requirements of Section 14, “Stone Masonry.” Concrete construction shall conform to the requirements of Section 8, “Concrete Structures.” Reinforced concrete block masonry shall conform to the requirements of Section 15, “Concrete Block and Brick Masonry.”

Vertical precast concrete wall elements with cast-in-place concrete footing support shall be adequately supported and braced to prevent settlement or lateral displacement until the footing concrete has been placed and has achieved sufficient strength to support the wall elements.

The exposed face of concrete walls shall receive a Class 1 finish as specified in Section 8, “Concrete Structures,” unless a special architectural treatment is specified in the contract documents, or on the approved working drawings.

7.6.2—Sheet Pile and Soldier Pile Walls

This work shall consist of constructing continuous walls of timber, steel, or concrete sheet piles, and the constructing of soldier pile walls with horizontal facing elements of timber, steel, or concrete.

7.6.2.1—Sheet Pile Walls

Steel sheet piles shall be of the type and weight (mass) specified in the contract documents. Steel sheet piles shall conform to the requirements of AASHTO M 202M/M 202 (ASTM A328/A328M), AASHTO M 270M/M 270 (ASTM A709/A709M) Grade 50 (Grade 345), or to the specifications for “Piling for Use in Marine Environments” in ASTM A690/A690M. Painting of steel sheet piles, when required, shall conform to Article 13.2, “Painting Metal Structures.”

Timber sheet piles, unless otherwise specified or permitted in the contract documents, shall be treated in accordance with Section 17, “Preservative Treatment of Wood.” The piles shall be of the dimensions, species, and grade of timber specified in the contract documents. The piles may be either cut from solid material or made by building up with three planks securely fastened together. The piles shall be drift sharpened at their lower ends so as to wedge adjacent piles tightly together during driving.

Concrete sheet piles shall conform to the details specified in the contract documents or the approved working drawings. The manufacture and installation shall conform, in general, to the requirements for precast concrete bearing piles in Section 4, “Driven Foundation Piles.” Concrete sheet piles detailed to have a tongue and groove joint on the portion below ground and a double-grooved joint on the exposed portion shall, after installation, have the upper grooves cleaned of all sand, mud, or debris and grouted full. Unless otherwise provided in the contract documents or approved in writing by the Engineer, grout shall be composed of one part cement and two parts sand. The grout shall be deposited through a grout pipe placed within a watertight plastic sheath extending the full depth of the grout slot formed by the grooves in two adjacent pilings and which, when filled, completely fills the slot.

Sheet piles shall be driven to the specified penetration or bearing capacity in accordance with the requirements of Section 4, “Driven Foundation Piles.”

After driving, the tops of sheet piles shall be neatly cut off to a straight line at the elevation specified in the contract documents or as directed by the Engineer.

Sheet pile walls shall be braced by wales or other bracing system, as shown in the contract documents or directed by the Engineer.

Timber waling strips shall be properly lapped and joined at all splices and corners. The wales shall preferably be in one length between corners and shall be bolted near the tops of the piles.

When specified in the contract documents or on the approved working drawings, reinforced concrete caps shall be constructed in accordance with Section 8, “Concrete Structures.”

7.6.2.2—Soldier Pile Walls

Soldier piles shall be either driven piles or piles constructed in a drilled shaft excavation to the specified penetration or bearing capacity indicated in the contract documents.

Driven piles shall be furnished and installed in accordance with the requirements of Section 4, “Driven Foundation Piles.” The piles shall be of the type indicated in the contract documents.

7.6.4—Mechanically Stabilized Earth Walls

The construction of mechanically stabilized earthwalls shall consist of constructing a facing system to which steel or polymeric soil reinforcement is connected and the placing of structure backfill material surrounding the soil reinforcement.

7.6.4.1—Facing

Facing consisting of either precast concrete panels, cast-in-place concrete, or welded wire fabric shall conform to the details and materials specified in the contract documents or on the approved working drawings.

Precast concrete panels shall be cast in conformance with the requirements set forth for precast members in Section 8, “Concrete Structures.” The concrete compressive strength shall be that specified in the concrete documents or 4.0 ksi, whichever is greater. The exposed face shall have a Class 1 finish, or the architectural treatment specified in the contract documents or on the approved working drawings. The face not exposed to view shall have a uniform surface finish free of open pockets of aggregate or surface distortions in excess of 0.25 in. Soil reinforcement connection hardware shall be accurately located and secured during concrete placement and shall not contact the panel reinforcing steel. Joint filler, bearing pads, and joint cover material shall be as specified in the contract documents.

Cast-in-place concrete facing shall be constructed in conformance with the requirements in Section 8, “Concrete Structures.” Soil reinforcement extending beyond the temporary facing shall be embedded in the facing concrete the minimum dimensions specified in the contract documents or on the approved working drawings.

Welded wire facing, either temporary or permanent, shall be formed by a 90-degree bend of the horizontal soil reinforcement. The vertical portion of the soil reinforcement forming the face shall be connected to the succeeding upper level of soil reinforcement. A separate backing mat and hardware cloth shall be placed immediately behind the vertical portion of soil reinforcement. Its wire size and spacing shall be as specified in the contract documents.

7.6.4.2—Soil Reinforcement

All steel soil reinforcement and any steel connection hardware shall be galvanized in accordance with AASHTO M 111M/M 111 (ASTM A123/A123M).

Steel strip reinforcement shall be hot-rolled to the required shape and dimensions. The steel shall conform to ASTM A572/A572M, Grade 65 (Grade 450), unless otherwise specified in the contract documents.

Welded wire fabric reinforcement shall be shop fabricated from cold-drawn wire of the sizes and spacings specified in the contract documents or on the approved working drawings. The wire shall conform to the requirements of AASHTO M 32M/M 32 (ASTM A82); fabricated fabric shall conform to the requirements of AASHTO M 55M/M 55 (ASTM A185).

Polymeric reinforcement shall be of the type and size specified in the contract documents or on the approved working drawings and shall conform to the specified material and manufacturing requirements.

Connection hardware shall conform to the contract documents or the approved working drawings.

The installation of instrumentation for monitoring corrosion shall conform to the requirements specified.

7.6.4.3—Construction

When required, a precast reinforced or a cast-in-place concrete leveling pad shall be provided at each panel foundation level. Prior to placing the leveling pads, the foundation material shall conform to the requirements of Article 7.4.2.

Precast concrete panels and welded wire fabric facing shall be placed and supported as necessary so that their final position is vertical or battered as shown in the contract documents or on the approved working drawings within a tolerance acceptable to the Engineer.

Joint filler, bearing pads, and joint covering material shall be installed concurrent with face panel placement.

Backfill material conforming to the requirement in Article 7.3.6 shall be placed and compacted simultaneously with the placement of facing and soil reinforcement. Placement and compaction shall be accomplished without distortion or displacement of the facing or soil reinforcement. Sheeps foot or grid-type rollers shall not be used for compacting backfill within the limits of the soil reinforcement. At each level of soil reinforcement the backfill material shall be roughly leveled to an elevation approximately 0.1 ft above the level of connection at the facing before placing the soil reinforcement. All soil reinforcement shall be uniformly tensioned to remove any slack in the connection or material.

7.6.5—Soil Nail Walls

Soil nail walls shall consist of a combination of a permanent facing and shotcrete facing, or only shotcrete facing, connected to soil nails.

7.6.5.1—Excavation

The ground contour above the wall shall be established to its final configuration and slope as shown in the Plans prior to beginning excavation of the soil for the first row of soil nails.

C7.6.5

See Lazarte, et al. (2015) for additional information on the components of soil nail walls. While cast-in-place concrete facing is commonly used for soil nail walls, other facings have been used.

Soil nail walls shall be constructed by excavating from the top down in staged horizontal lifts. The excavation shall be limited to no more than 3.0 ft below the elevation at which the soil nails will be installed for the current lift. The reinforced shotcrete facing shall be placed prior to the vertical cut becoming unstable but no more than 24 hours. A lift shall not be excavated until the nail installation and reinforced shotcrete placement for the preceding lift has been completed and accepted.

After a lift is excavated, the cut surface shall be cleaned of all loose materials, mud, rebound, and other foreign matter that could prevent or reduce shotcrete bond. The accuracy of the ground cut shall be such that the required thickness of shotcrete can be placed within a tolerance of plus or minus 2.0 in. from the defined face of the wall, and over excavation does not damage overlying shotcrete sections by undermining or other causes.

If an excavation becomes unstable at any time, soil nail wall construction shall be suspended and the excavation shall be temporarily stabilized by immediately placing an earth berm up against the unstable excavation face.

7.6.5.2—Soil Nails

Soil nails shall be constructed in conformance with the requirements of Section 34, “Soil Nails.”

7.6.5.3—Drainage Components

Geocomposite drainage systems and horizontal or subhorizontal drains shall conform to the requirements of Articles 7.5.4 and 7.5.5, respectively.

7.6.5.4—Shotcrete and Concrete Facing

Shotcrete for stabilizing lifts and permanent shotcrete facing shall be constructed in conformance with the requirements of Section 24, “Pneumatically Applied Mortar.” Cast-in-place concrete for permanent concrete facing shall be constructed in conformance with the requirements of Section 8, “Concrete Structures.”

7.7—MEASUREMENT AND PAYMENT

Unless otherwise designated in the contract documents, earth-retaining systems shall be measured and paid for by the square foot. The square foot area for payment shall be based on the vertical height and length of each section built, except in the case when alternative earth-retaining systems are permitted in the contract documents. When alternative earth-retaining systems are permitted, the square foot area for payment will be based on the vertical height and length of each section of the system type designated as the basis of payment whether or not it is actually constructed. The vertical height of each section shall be taken as the difference in elevation on the outer face, from

The height and length of an excavation will depend on how long the soils can vertically stand unsupported as well as the requirements shown on the approved working drawings or contract documents.

See Lazarte, et al. (2015) for further details about excavating for soil nail walls and construction methods for soils that do not have sufficient stand up time.

the bottom of the lowermost face element for systems without footings, and from the top of footing for systems with footings, to the top of the wall, excluding any barrier.

The contract price paid per square foot for earth-retaining systems shall include full compensation for furnishing all labor, materials, tools, equipment, and incidentals, and for doing all the work involved in constructing the earth-retaining systems including, but not limited to, earthwork, piles, footings, and drainage systems, complete in place, as specified in the contract documents, in these Specifications and as directed by the Engineer.

Full compensation for revisions to drainage system or other facilities made necessary by the use of an alternative earth-retaining system shall be considered as included in the contract price paid per square foot for earth-retaining system and no adjustment in compensation will be made therefore.

7.8—REFERENCES

AASHTO. *AASHTO Guide Specifications for Highway Construction*. Ninth Edition. GSH-9. American Association of State Highway and Transportation Officials, Washington, DC, 2008.

AASHTO. *Standard Specifications for Transportation Materials and Methods of Sampling and Testing*. HM-WB. American Association of State Highway and Transportation Officials, Washington, DC, 2017.

GSA. *Adhesive, Bonding Vulcanized Rubber to Steel*. Federal Specification MMM-A-121. U.S. General Services Administration, 1966.

Lazarte, C. A., H. Robinson, J. E. Gómez, A. Baxter, A. Cadden, and R. Berg. *GEC 7 Soil Nail Walls Reference Manual*, Publication No. FHWA-NHI-14-007. Federal Highway Administration, U.S. Department of Transportation, Washington, DC, 2015.

tendon elongations, type of ducts, and all other data pertaining to the prestressing operation, including the proposed arrangement of the prestressing steel in the members.

Working drawings shall be submitted sufficiently in advance of the start of the affected work to allow time for review by the Engineer and correction by the Contractor of the drawings without delaying the work.

Where required on the contract drawings or in the contract documents, the Contractor shall prepare integrated drawings for all items embedded in the concrete. If this provision includes a requirement for additional engineering or design detailing, that requirement shall be clearly stated, as noted in Article 10.1.2.

Shop drawings for post-tensioning and other embedments, such as expansion joints, bearings, and anchor bolts submitted by suppliers shall be reviewed and approved by the Engineer for conformance with the design concept and compliance with the design drawings and Specifications. Where contract-document information on post-tensioning systems is modified by the Contractor, or where contract drawings do not provide detailed dimensional information on the post-tensioning system, it is the Contractor's responsibility to coordinate the placement of the post-tensioning system with other embedments, and to correct any interferences created by the Contractor-supplied PT (post-tensioning) system or other substitutions. The post-tensioning layout shall govern the layout of the secondary nonprestressed reinforcement. Where necessary, location of nonprestressed reinforcement should be adjusted to clear tendons, subject to the approval of the Engineer.

10.2.2—Integrated Drawings

Where required by the contract documents, in addition to all required working drawings, the Contractor shall prepare composite placing drawings to scale and in sufficient detail to show the relative positions of all items that are to be embedded in the concrete, and their embedment depth, for the portions of the structure that are to be prestressed. Such embedded items shall include the prestressing ducts, vents, anchorage reinforcement and hardware, reinforcing steel, anchor bolts, earthquake restrainers, deck joint seal assemblies, drainage systems, utility conduits, and other such items. Such drawings shall be in sufficient detail to confirm that there will be no conflict between the planned positions of any embedded items and that concrete cover will be adequate. Where the contract calls for the Contractor to develop drawings for post-tensioning systems, or where the Contractor makes modifications to the post-tensioning system(s) shown on the plans, the Contractor shall prepare working drawings for embedded items or propose changes in the dimensions of the work as necessary to eliminate conflicts and provide proper cover wherever conflicts arise with or due to the post-tensioning system. Resolution of conflicts should follow the provisions of Article 10.1.2. Any such revisions shall be approved by the Engineer before work on any affected item

is started. All costs involved with the preparation of such drawings and with making the necessary modifications to the work resulting there from shall be borne by the Contractor. This will require integrated drawings to be detailed to a scale and quality sufficient to show double-line reinforcement and post-tensioning tendon details in either two-dimensional or in complete three-dimensional drawings.

10.3—MATERIALS

10.3.1—Prestressing Steel and Anchorages

Prestressing reinforcement shall be high-strength seven-wire strand, high-strength steel wire, or high-strength alloy bars of the grade and type called for in the contract documents and shall conform to the requirements of the following Specifications.

10.3.1.1—Strand

Uncoated seven-wire strand shall conform to the requirements of AASHTO M 203M/M 203 (ASTM A416/A416M). Supplement S1 (Low-relaxation) shall apply when specified.

10.3.1.2—Wire

Uncoated low-relaxation steel wire shall conform to the requirements of AASHTO M 204M/M 204 (ASTM A421/A421M).

10.3.1.3—Bars

Uncoated high-strength bars shall conform to the requirements of AASHTO M 275M/M 275 (ASTM A722/A722M). Bars with greater minimum ultimate strength, but otherwise produced and tested in accordance with AASHTO M 275M/M 275 (ASTM A722/A722M), may be used provided they have no properties that make them less satisfactory than the specified material.

10.3.2—Post-Tensioning Anchorages and Couplers

All anchorages and couplers shall develop at least ~~96~~ 95 percent of the actual ultimate strength of the prestressing steel, when tested in an unbonded state, without exceeding anticipated set. The coupling of tendons shall not reduce the elongation at rupture below the requirements of the tendon itself. Couplers and/or coupler components shall be enclosed in housings long enough to permit the necessary movements. Couplers for tendons shall be used only at locations specifically indicated in the contract documents and/or approved by the Engineer. Couplers shall not be used at points of sharp tendon curvature.

The static strand-wedge performance test shall be in accordance with PTI M50.1, Acceptance Standards for Post-Tensioning Systems. This test is applicable to both bonded and unbonded systems.

C10.3.2

~~The anchorage efficiency test requirement that devices develop 96 percent of the ultimate strength of the prestressing steel has been expressed as actual ultimate strength rather than guaranteed ultimate strength. The reason for this is that the test requirement is to make sure that effects from the hardware used for gripping do not reduce the capacity of the tendons more than four percent. This can only be measured in reference to the actual strength of the particular prestressing steel used in the test.~~

The static strand-wedge performance test is a test of force transfer from the strand to the other anchorage components and is achieved through the wedges and wedge plate. This performance test is a requirement for both bonded and unbonded systems. The test requirements that devices develop 95 percent of the ultimate strength of the prestressing steel is expressed as the actual ultimate tensile