South Carolina
Department of Transportation

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PRECONSTRUCTION DESIGN MEMORANDUM

MEMO: PCDM-11

SUBJECT: Supplemental Design Criteria for Low Impact Bridge Replacement Projects

SUPERCEDES: 2024 Supplemental Design Criteria for Low Volume Bridge Replacement Projects

The attached document has been adopted by the department and is applicable to all state and federally funded bridge replacement projects.

Samuel M. Pridgen
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Samuel M. Pridgen, P.E.
Director – Office of Engineering Support

Immediately

Effective Date

SMP:
Attachment
ec:

Rob Perry, Deputy Secretary for Engineering
John Boylston, Chief Engineer for Project Delivery
Robbie Isgett, Chief Engineer for Alternative Delivery and Construction
Chris Lacy, Director of Bridge Management
Julie Barker, Director of Preconstruction
Chris Gaskins, Director of Alternative Delivery
Mike Barbee, Director of Right of Way
Chad Long, Director of Environmental Services
Clay Richter, Director of Construction
Jeff Terry, Director of Maintenance
Casey Lucas, RP Engineer – Lowcountry
Stacey Johnson, RP Engineer – Pee Dee
Adam Humphries, RP Engineer - Midlands
Berry Mattox, RP Engineer - Upstate
Aaron Dawson, FHWA

U.S. Department of Transportation
Federal Highway Administration

SCDOT
South Carolina Department of Transportation

Supplemental Design Criteria
For
Low Impact Bridge Replacement

January 2026

RECOMMENDED

Samuel M. Pridgen
2026.01.05 10:50:15 -05'00'

Date: _____

Samuel M. Pridgen, P.E.
Director of Engineering Support, SCDOT

Chris R. Lacy
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Chris R. Lacy, P.E.
Director of Bridge Management, SCDOT

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John D. Boylston, P.E.
Chief Engineer for Project Delivery, SCDOT

APPROVED

Rob E. Perry
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Date: _____

Rob Perry, P.E.
Deputy Secretary for Engineering, SCDOT

PURPOSE

Many secondary bridges in South Carolina are rapidly approaching or have exceeded their design life. Recognizing the impact to mobility of closed and load restricted bridges SCDOT strives to improve the maximum number of bridges with the limited amount of funding available. It is the position of SCDOT that the threat of deteriorating bridges exceeds the threat of extreme events. In accordance with SC Code of Law 57-5-720, SCDOT is relaxing design criteria for bridge replacement projects on the secondary highway system.

While the design criteria below are of utmost importance, the guiding principle of the SCDOT for replacing low impact bridges on the secondary system is to replace the bridge while minimizing costs, impacts to the environment and utilities, and the need for new right of way.

No design exception/variance documentation is required if the design criteria within this document are applied to the project. Approved design exceptions/variances will be required when the design criteria set forth in this document are not met.

SELECTION CHARACTERISTICS

The project must meet all of the following characteristics to apply the design criteria found within this document:

Route Designation

- The bridge must be on a secondary route off of the National Highway System.

Traffic Volumes

- Traffic volumes must be less than or equal to 3,000 AADT measured at initial PE obligation year.

Bridge Crossing Type

- Bridge site must not cross existing roadways or railroads.

SURVEY REQUESTS

The level of survey may be limited, but shall be commensurate with the amount of detail necessary to satisfy the design criteria in this document. All design disciplines shall be consulted prior to establishing the survey request.

STRUCTURAL DESIGN CRITERIA

The requirements of the SCDOT Bridge Design Manual (BDM), Bridge Design Memos, the SCDOT Seismic Design Specifications for Highway Bridges, and the SCDOT Bridge Drawings and Details apply with the amendments noted below.

Seismic Design Requirements

- The bridges qualified for use under this document will not have an Operational Classification (OC) assigned. Therefore, the requirements of Table 3.1, Bridge Operational Classification (OC), in the SCDOT Seismic Design Specifications for Highway Bridges will not apply.
- The bridges qualified for use under this document shall meet the seismic design and detailing requirements of Seismic Design Category (SDC) A.
- An acceleration design response spectrum curve will not be developed for these projects. Therefore, an SD1-SEE of 0.25 g shall be used for all projects west of US Highway 1 and an SD1-SEE of 0.45 g shall be used east of US Highway 1.

Structure Types

- Structure types other than those identified in the BDM may be substituted after coordination and acceptance between the Project Development Team (PDT) and the Office of Engineering Support (OES).
- Culverts may be substituted only after coordination between the PDT and the OES.

GEOTECHNICAL DESIGN CRITERIA

The requirements of the SCDOT Geotechnical Design Manual (GDM), the Geotechnical Design Bulletins (GDBs) and the SCDOT Geotechnical Drawings and Details apply with the amendments noted below.

Geotechnical Exploration

- **Office**

  The office portion of the geotechnical exploration consists of reviewing available documentation. This documentation may include, but is not limited to, previous soil borings in the general vicinity of the project, pile logs from the existing bridge, USDA soils maps, USGS topographic maps, aerial photographs, and wetland inventory maps. In addition, the backup documentation should include information pertaining to the existence or extent of geological hazards that may be present at the project site or in the immediate vicinity of the site. Ensure geological hazards are noted in accordance with the GDM.

  Geotechnical Summary Report (GSR) – The GSR shall include a brief discussion of the project information and encountered subsurface conditions. Following this brief discussion, the next section of the GSR shall contain the project recommendations. Please note that neither a Preliminary Geotechnical Engineering Report nor a Final Geotechnical Engineering Report are required, the only report that should be submitted is a GSR. An outline of the GSR is available on the SCDOT website by searching SCDOT.org for “geotechnical summary report”.

- **Field Exploration**

  Use a single-phase geotechnical exploration for these bridge projects. For these projects, the use of all cone penetration tests is allowed. No correlation boring is required. Table 1 provides the minimum testing location requirements.

  All bridge foundations (deep and shallow) bearing on rock should have a minimum of 5 feet of rock coring.

  Roadway embankment borings are not required for these projects.

Table 1, Foundation Exploration Requirements

Foundation Type	Geotechnical Site Investigation
Pile Foundation	Minimum one testing per bent location[(1)]
Drilled Pile Foundation	Minimum two testing locations per bent location[(1),(2)]
Single Foundation - Drilled Shaft (hammerhead)	Minimum one testing location per foundation location
Multiple Foundation – Drilled Shaft	Minimum two testing locations per bent location[(3)]
Shallow Foundation – Founded on Soil	Minimum two testing locations per bent location
Shallow Foundation – Founded on Rock	Minimum one testing locations per bent location

[(1)]Spacing may exceed 70 feet longitudinally if site subsurface is laterally homogeneous.

[(2)]Drilled piles are only allowed at end bents. The use of drilled piles at interior bents requires coordination between the PDT and OES.

[(3)]Minimum one testing location per bent allowed in Aiken, Allendale, Bamberg, Barnwell, Beaufort, Berkeley, Calhoun, Charleston, Chesterfield, Clarendon, Colleton, Darlington, Dillon, Dorchester, Florence, Georgetown, Hampton, Horry, Jasper, Kershaw, Lee, Marion, Marlboro, Orangeburg, Sumter, and Williamsburg Counties.

Geotechnical Analysis

- **LRFD**

  - **EE I Analysis**

    For an SDC A, no soil shear strength loss (SSL) or pseudo-static slope stability analyses will be required for slopes or earth retaining structures (ERSs). Therefore, since SSL analysis is not to be performed, none of the laboratory testing required in the GDM associated with this analysis shall be performed. However, a limited number of classification tests may be performed as necessary to confirm soil classifications. In addition, the corrosion testing series is still required.

  - **Design**

    Considerations used in selecting the appropriate foundation system should follow the approach outlined in Chapter 3 of Design and Construction of Driven Pile Foundations – Volume I, September 2016, FHWA-NHI-16-009, GEC 12 – Volume I.

Earth Retaining Structures (ERS)

For ERSs with wall heights less than or equal to 7-1/2 feet, no global slope stability analysis will be required. If the ERS is part of a larger slope (i.e. the ground slopes up behind the wall or down in front of the wall) a detailed design will be required. However, if the ground both in front of and behind the wall has a slope of 10H:1V or flatter it is not considered to be part of a larger slope. In addition, no external loads shall be allowed (i.e. no vehicular traffic or parked vehicles) on the ERSs. All ERSs shall have a positive batter of 1 inch in 60 inches (1:60). All walls shall have appropriate drainage.

Use of modular gravity walls (e.g. gabion or prefabricated concrete) is permitted. Flexible gravity walls shall be constructed using modular blocks. Use a B-3 geogrid as the reinforcement for these walls (see SC-M-203-2 – *Geogrid Soil Reinforcement*). Place the reinforcement at every other level of block vertically not to exceed 18 inches. The reinforcement shall have a minimum length of 7-1/2 feet measured from the front face of the wall. The coverage of the reinforcement shall be 100 percent. Granular backfill shall be used for these walls. A template drawing is available on the SCDOT website.

All cantilevered walls should have a minimum of 15 feet of penetration beneath the finished grade in front of the wall. All fascia panels used with H-piles and timber lagging shall be designed to resist lateral earth pressures. This requirement is based on the anticipated life of these structures and the anticipation of the complete deterioration of the timber lagging over the life of the structure.

Embankments/Bridge Embankments

Global slope stability and settlement analyses are not required for these projects.

HYDRAULIC DESIGN CRITERIA

The SCDOT Requirements for Hydraulic Design Studies (RHDS) and Hydraulic Design Bulletins (HDBs) apply with the amendments noted below. All requirements in the RHDS and HDBs not amended below must be followed. Additionally, FEMA requirements must be met.

If the site has an SNBI code B.AP.02 (Overtopping Likelihood) greater than 4, then a more resilient design criteria than that listed below may be appropriate.

Design Flow

- Hydraulic analysis will be performed to confirm that the proposed structure matches the hydraulic performance of the existing structure. Free surface flow should be maintained for all storms that maintain free surface flow in the existing condition. This is the design flow. The proposed bridge will approximate the performance of the existing bridge by maintaining the current recurrence of overtopping and pressure flow. The opening should be sized to convey the same flow as the existing structure without increases in velocity. Minor hydraulic performance improvement may occur as a result of design decisions made by other disciplines.
- It is not the intent of this design criteria to reduce the overall length of the existing bridge. If the bridge length set for the design flow is shorter than the existing bridge, consult with the PDT and OES.
- The roadway embankment may be overtopped for the design flow. This is only allowed at crossings that currently have embankment overtopping for the design flow. To prevent erosion brought on by shear stresses, the segment of the embankment affected by overtopping should be evaluated for stability for the design flow.

Low Chord

- The low chord elevation should be set based in accordance with the design criteria in this document, and should consider the presence of debris and the type of stream. If the 25-year flow has more than 1-foot of freeboard in the existing condition, the finish grade may be adjusted to provide a minimum 1-foot of freeboard for the 25-year flow. Otherwise, the freeboard for the design flow should be maintained. This may allow for a low chord elevation lower than that of the existing bridge.

Backwater

- The hydraulic design shall maintain or improve the existing level of hydraulic performance for the 100-year (1% AEP) flow. Variances will be considered for increases of up to 1 foot after an inundation evaluation has been performed to assess any impacts as a result of the increase.

Abutments, Interior Bents, and Setbacks

- Shall be spill-through on a 2:1 or flatter slope except where naturally occurring rock faces are located at the channel banks which may be retained.
- Interior bents do not require setbacks.
- Ideally, the bridge length should be set such that the projected slopes do not intersect any point on the channel. If the channel projection requires the bridge to be lengthened by more than 5 feet, then provide a 5-foot setback from the top of channel to the abutment toe at rip rap face rather than lengthening the bridge to accommodate the projection. At bends in the channel upstream and/or downstream of the bridge, the 5-foot setback requirement may be reduced provided no fill is placed in the channel. Lengthening the bridge substantially to achieve setback requirements is outside the scope of these projects.

Span Arrangements

- To avoid the risk of debris buildup, the channel should be fully spanned when practical. However, the grade should not be raised for the sole purpose of fully spanning the channel.

Scour

- The scour design flow is the 50-year (2% AEP) flow.
- The scour check flow is the 100-year (1% AEP) flow.
- Scour depths are to be placed on the project plans for these flows.

Report

- A hydraulic design report and scour assessment shall be developed following the guidance in the RHDS and HDBs.

ROADWAY DESIGN CRITERIA

When existing site conditions exceed the design criteria for new construction the designer may use the new construction values from the Roadway Design Manual (RDM) and Roadway Design Bulletins (RDBs). When existing site conditions do not meet new construction criteria the following criteria apply:

Design Speed

- Design speed is not a controlling factor for low impact bridges and should not be shown on the typical section. Therefore, these projects will not use a design speed for setting geometric design criteria; rather, the majority of geometric design elements will use a "retain existing" approach.

Lane Width

- Lane width is 10 feet minimum, retain existing width if existing width is greater.

Shoulder Width

- Retain existing shoulder width along roadway approach to bridge. Bridge shoulder width is 4 feet minimum, retain existing width if existing width is greater. Review for bicycle accommodations if the route is on a SC Designated Bicycle Touring Route. Refer to Departmental Directive 28 (SCDOT's Complete Streets policy) for guidance on the inclusion of multimodal accommodations on low impact bridge projects.

Horizontal Alignment

- Retain existing alignment to the extent practical. Minor shifts to the horizontal alignment will be allowed to accommodate contextual impacts. If staged construction is necessary, consult with OES to determine the appropriate design criteria.
- Right of way block out is not a requirement unless deemed necessary by the District Engineering Administrator.

Vertical Alignment

- Retain or increase existing K values. Ensure that any bridge end drainage can be appropriately placed in accordance with SCDOT standard drawings.

Maximum Grades

- Retain existing or flatter.

Stopping Sight Distance (SSD)

- Retain existing or increase stopping sight distance.

Superelevation

- On low impact bridge replacement projects, constraints of excessive costs often preclude the use of desirable superelevation rates. If improvements to the superelevation can be made within the project limits, they should be made with consideration given to the minimum design speeds for the functional and context classifications listed in the RDM and posted speed. If this cannot be accomplished within project limits, match existing superelevation. Project limits should not be extended to improve superelevation.

Roadside Safety

- Use SCDOT RDM 3R (Non-Freeway) Guidance found in Chapter 18. Calculate length of need considering posted speed limit, horizontal curves and site constraints.