South Carolina
Department of Transportation

June 14, 2023

GEOTECHNICAL DESIGN BULLETIN NO. 2023-2

SUBJECT: Updates to Sections 4.2.1 and 13.6.1 (2022 GDM)

EFFECTIVE DATE: All projects prior to completion of the Final Geotechnical Engineering Report

SUPERSEDES: Existing Portions of Sections 4.2.1 and 13.6.1

RE: 2022 Geotechnical Design Manual

Delete the 2nd Paragraph of Section 4.2.1 in its entirety and replace with the attached paragraph. Delete and replace the first item in Section 13.6.1 and replace with the attached paragraph. These revisions change the compression wave velocity, V_p, from 3,000 feet per second to 1,000 feet per second. This change was necessitated based on additional research, which indicated that no known site underwent liquefaction that had a V_p less than 1,000 feet per second.

Questions, concerns, or recommendations for future revisions should be addressed to the Geotechnical Design Support Section of the Office of Engineering Support.

George R. Bedenbaugh, Jr.

George R. Bedenbaugh, Jr. P.E.
Director, Office of Engineering Support

GRB:neh
Attachment
ec:
John Boylston, Director of Preconstruction
Robbie Isgett, Director of Construction
Jeff Terry, Director of Maintenance
Brent Dillon, Dir. of Traffic Engineering
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Jennifer Necker, RP Engineer - Lowcountry
Leah Quattlebaum, RP Engineer - Pee Dee
Adam Humphries, RP Engineer - Midlands
Julie Barker, RP Engineer - Upstate
Tad Kitowicz, FHWA

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4.2.1 Preliminary Subsurface Investigation

The preliminary subsurface investigation shall include a laboratory testing program that will consist primarily of index testing. For bridge and structure borings, index testing shall be performed on all of the samples collected that have an N_{60} less than or equal to 35 blows per foot (bpf) and having an estimated age of Pleistocene and younger. The exceptions to this are if the compression wave velocity is less than or equal to 1,000 feet per second (i.e. $V_p \leq 1{,}000$ fps) or if the bridge has a Seismic Design Category (SDC) of A, as defined in the Seismic Specs, and the PGA is less than or equal to 0.20g ($PGA \leq 0.20g$), then an SSL analysis will not be required (see Chapter 13). In addition, this testing shall not be required for "Low Volume Bridges". The GEOR shall determine how many index tests will be performed. Index testing shall consist of the following tests:

- Grain-size Distribution with wash No. 200 Sieve
- Moisture-Plasticity Relationship Determination (Atterberg Limits)
  - Performed only on samples with more than 20 percent passing #200 sieve
- Natural Moisture Content

13.6.1 Sand-Like Soil

Sand-Like soils susceptible to cyclic liquefaction must not only be below the water table, but must also be fully saturated. Based on Kokusho (2000) and Hossain, Andrus and Camp (2013) compression wave velocity (V_p) may be used to determine if a Sand-Like soil is fully saturated. If the V_p is greater than or equal to 1,000 feet per second, Sand-Like soils shall be considered to be fully saturated and therefore, susceptible to SSL. Sand-Like soils with a V_p less than 1,000 feet per second shall be considered unsaturated to the point that SSL is unlikely to happen. The water table selection for this evaluation must take into account the seasonal fluctuation of the ground water and the historic and/or possible future rise of the ground water level with respect to the soils being analyzed for liquefaction susceptibility. To determine the depth that soils are adequately saturated for liquefaction to occur, seasonally averaged groundwater elevations shall be used. The Natural Resources Conservation Service (NRCS) website (http://websoilsurvey.nrcs.usda.gov/app/) may be consulted for determining the seasonal fluctuation of groundwater. Groundwater fluctuations caused by tidal action or seasonal variations will cause a portion of the soil to be saturated only during a limited period of time, potentially reducing the risk that liquefaction could occur within the zone.