Chapter 6

Geotechnical Exploration and Report

Engineering Design Standards

CITY OF PIERRE
SOUTH DAKOTA

June 6, 2017

6.1 General

For public improvement including private subdivision projects, a soils report will be required. Submittal shall be no later than with the preliminary plat and plans (see Chapter 13 of these standards).

The geotechnical exploration and report shall address any special geotechnical conditions and make recommendations regarding site conditions, grading, foundations, utility placement, and pavement.

6.2 Soil Exploration

6.2.1 General. When geotechnical explorations are required, all sampling and testing of the soil shall be performed in accordance with the appropriate *AASHTO (American Association of State Highway and Transportation Officials)* and *ASTM (American Society for Testing and Materials)* designations. GPS coordinates of 1 meter or less precision must be submitted to the City Engineer for all soil borings.

6.2.2 Sampling. Representative samples of the soils shall be obtained by drilling hollow penetration soil borings along the route of the existing or proposed public right-of-way.

Borings shall extend to a minimum depth of 5.0 feet below the proposed subgrade foundation, or 5.0 feet below the flow line elevation of any pipe or conduit.

Borings will be performed at sufficient intervals to determine the boundaries of each significant soil type present. Additional borings may be required by the City Engineer if site conditions have not been adequately addressed in the Geotechnical report.

Spacing of the borings will vary with the uniformity of the soil profile and the topography. The maximum interval between soil borings may not exceed 300 feet.

Representative samples from the borings shall be collected for soil laboratory testing.

A boring log shall be maintained for each soil boring performed. The boring log shall contain a complete record of the soil material observed. Boring locations must be submitted on scaled map with GPS coordinates, sub 1 meter precision.

6.2.3 Testing

The tests required are those for identification and classification purposes including: Water Content Tests *(ASTM D2216 and AASHTO T265);* standard sieve and hydrometer analysis *(ASTM D422 of AASHTO T-88),* and Atterburg Limits *(ASTM D423 and 424 or AASHTO T-89 and 90).*

Additional testing may include moisture-density relationship *(AASHTO T-99 or T-180)* and California Bearing Ratio *(MIL STD 621 Method 101 or ASTM D1883).* The CBR test must be performed at 95 percent of the maximum dry density and at the optimum moisture content. A minimum of a three-point curve should be utilized for the CBR testing with a five-point curve

preferred. If the various soil type areas are not large enough to justify separate pavement designs, a single design shall be made on the worst soil type.

6.3 Report

The report shall include an opinion on adequacy or intend end use of the sites to be developed. The report shall identify any geotechnical special conditions found in the exploration and recommendations to remediate the special conditions along with grading, foundations, and subgrade and pavement recommendations. The recommendations may be divided into three parts:

- geotechnical special conditions,
- grading and foundation, and
- subgrade and pavement.

All boring locations must be depicted on a scaled site map utilizing recorded GPS coordinates.

6.3.1 Special Geotechnical Conditions. The special conditions portion of the report shall consider ground water, frost susceptibility, erosion potential, soils creep, landsliding, expansive soils, slope stability, floodplains and other special geotechnical conditions the Geotechnical Engineer becomes aware of.

6.3.2 Grading and Foundation. The grading and foundation portion shall include data regarding the distribution and engineering characteristics of the various soil materials, data about groundwater levels, recommendations about the need for mitigation measures for special geotechnical conditions, grading criteria, foundation design criteria, and other information the Geotechnical Engineer considers pertinent. Recommendations for foundation type and design criteria shall include: bearing capacity of natural or compacted soils; provisions to mitigate the effects of expansive soils; mitigation of the effects of differential settlement and varying soil strength; and the effects of adjacent loads.

6.3.3 Subgrade and Pavement. The subgrade and pavement portion shall include data regarding the distribution of various subgrade materials and design tests (such as CBR, R-value, and/or plate bearing) to be made. Where soils are susceptible to erosion, recommendations shall be made for preventing the undermining of pavements. The pavement design may be included in this report or prepared and submitted separately by the Engineer responsible for preparation of the construction plans and contract documents.

6.3.4 Previous Geotechnical Reports. All previous geotechnical reports relating to a development or improvements that are more than five years old must be updated unless it is determined that conditions have not changed to warrant an update.

Geotechnical reports must be signed and dated by a Professional Engineer licensed by the State of South Dakota.

6.3.5 Further Requirements. *Chapter 18, Soils and Foundations*, of the City's adopted *International Building Code* details additional requirements.