

BUILDING DIVISION – POLICIES AND PROCEDURES

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ENGINEERED FOUNDATIONS & SOILS REPORTS

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ISSUE: When, by whom, and under what conditions shall a foundation soil investigation, an engineered foundation design, and a soils engineering report be required?

ANALYSIS: IBC 2021 Sections 107.1 (Submittal Documents) and 1803 (Geotechnical Investigations) both grant the building official the authority to require the classification of soils and to require such reports be prepared and submitted by an engineer or architect licensed by the state. This Section (Soil Classification) establishes standards for the definition and classification of soil materials. Section 1803 (Investigation) permits the building official to require additional studies to “evaluate soil strength, the effect of moisture variation on soil-bearing capacity, compressibility, liquefaction and expansiveness. Section 1803.6 (Reporting) permits that, when required, the soil classification and design bearing capacity be shown on the plans. This section also permits the requirement of a written report, which shall include, but not be limited to, the following:

1. Plot plan showing the location of all test boring and /or excavations.
2. A complete record of the soil samples. (Description and classification of the materials encountered.)
3. A record of the soil profile.
4. Elevation of the water table, if encountered.
5. Recommendations for foundation type and design criteria, including bearing capacity, provisions to mitigate the effects of expansive soils, provisions to mitigate the effects of liquefaction and soil strength, and the effects of adjacent loads.
6. Expected total and differential settlement.
7. Pile and pier foundation information in accordance with Section 1808.2.2
8. Special design and construction provisions for footings or foundations founded on expansive soils, as necessary.
9. Compacted fill material properties and testing in accordance with Section 1803.5.

Section 1808.7 (Foundations on or Adjacent to Slopes) includes additional requirements when buildings are built on or adjacent to slopes steeper than one unit vertical and three units horizontal (33.3 percent slope). Sections 17.40.050 (Sub Division Design Standards-Hillside Standards) and 18.40.200 (Site Development Standards-Hillside Standards) of the City of Golden’s Municipal Code also include additional requirements where slopes are in excess of 15% on the site.

It is evident that the building official has wide latitude as to when, under what conditions, and by whom he/she may require submittal of soils investigation reports and designed foundation systems. While the prescriptive foundation designs included in the building code generally accommodate standard conditions, the City of Golden’s geographic area includes several soils, site, or geographic conditions that require additional design considerations. These include, but are not limited to:

- (a) Potentially Heaving Bedrock associated with expansive, steeply dipping bedrock
- (b) Potentially Swelling Soil and Rock
- (c) Steep slopes
- (d) Slumping and slipping hillside slopes
- (e) Disturbed or filled soils within the existing developed areas

While it may be appropriate to require a foundation soils investigation, an engineered foundation design, and a soils engineering report for new detached structures, many older existing buildings built under the prescriptive designs contained in the code and have functioned very well. Additions to existing non-engineered structures also require special considerations. It is also questionable as to whether detached uninhabitable structures need these extra design precautions.

Issues have also arisen as to when comprehensive soils engineering analysis and reports should be required. At what point is it appropriate to mandate a full geotectonic investigation and soils report when such a decision might be better left to the judgement and experience of a registered and licensed design professional?

POLICY & PROCEDURE: This policy is to clarify when a foundation soils investigation, an engineered foundation design, and a soils engineering report are required.

- A. Additions to existing non-engineered foundations systems, on slopes of 15 degrees or less, may match the existing design, provided it complies with the minimum prescriptive design requirements of Chapter 18 of the IBC, when all of the following are found to exist:
 1. The area contained within the foundation footprint of the addition is less than or equal to 50% of the existing foundation, up to a maximum of 500 square feet.
 2. There are no signs of settlement, differential movement or other signs of distress or problems attributable to the existing foundation system.
 - B. Single story detached U-1 Occupancies (private garages, carports, and sheds) under 400 square feet shall not require an engineered foundation design. Such structures up to 1000 square feet, on slopes of 15 degrees or less shall also not be required to provide an engineered design when provided with a prescriptive and approved footing and foundation design.
 - C. All foundation systems not addressed in items (a) or (b) above shall require an engineered foundation system per items 1 or 2 below:
 1. Engineered foundation systems for infill projects may be developed based solely on a foundation soils investigation satisfactory to the design engineer provided the plans and specifications are stamped and signed by State of Colorado registered design professional and the structure is:
 - A maximum of 2 stories high, and
 - utilizes shallow foundations system (4 feet or less to at less 36 inches below grade to bottom of footing), and
 - is located where the foundation systems on habitable structures on adjacent lots are constructed with similar footing and foundation and have performed satisfactorily.
 2. All engineered foundation systems associated with new developments and which are not included in item (C-1) above, or where expansive soils are found to be present during the foundation soils investigation shall be based on soils engineering investigation and report pursuant to IBC Section 1803.
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