

# F.5 Infiltration Testing and Soil Assessment

## F.5.1 Soil Characterization

1. Verify that an Infiltration Testing and Soil Characterization Plan is provided with the submitted Geotechnical Report. [Section 3.3.1; Appendix E, Table E-7]
2. Verify that information on the soil stratum and groundwater for each SMP area is obtained and provided. The invert elevation of any infiltration SMP must be at least two feet above any limiting zone, such as groundwater, bedrock, or impermeable soils. [Section 3.3.2; Section 3.3.6; Appendix H]
3. For exploratory test pits, verify the following:
  - a. For projects with 15,000 square feet or more of earth disturbance, verify that a minimum of two test pits are completed for each SMP footprint. For projects with less than 15,000 square feet of earth disturbance, verify that a minimum of one test pit is completed for each SMP footprint. [Section 3.3.2]
  - b. Verify that at least one test pit for each SMP is excavated to a minimum depth of four feet below the proposed infiltration interface of the SMP, which is the lowest elevation where infiltration is proposed (the SMP bottom elevation), or until bedrock or fully saturated conditions are encountered. When conditions prevent the over-excavation of test pits to the minimum required depth, soil borings, in addition to the under-excavated test pits, are used in conjunction with double-ring infiltrometer testing to provide soil classification down to the required depths. [Section 3.3.2]
4. For hollow-stem augered boreholes (soil borings), verify the following:
  - a. Verify that a minimum of one soil boring is conducted for each cased borehole infiltration test. [Section 3.3.2]
  - b. Verify that all soil borings are advanced to a depth of ten feet below the SMP bottom elevation or until auger refusal with continuous split spoon sampling. [Section 3.3.2]
  - c. Verify that the inner tube used is no less than four inches in diameter. [Section 3.3.2]
  - d. Verify that all soil borings are conducted pursuant to the Hollow-Stem Augered Borehole Procedure provided in Section 3.3.4. [Section 3.3.4]
5. For soil sampling, verify the following:
  - a. Verify that three soil samples are taken per acre of SMP footprint area, with a minimum of one soil sample per SMP. [Section 3.3.2]
  - b. Verify that at least one soil sample is taken at an elevation within one vertical foot of the infiltration interface (SMP bottom elevation). [Section 3.3.2]
  - c. Verify that at least one soil sample is taken from the location of an infiltration test and that a sieve analysis of the sample is conducted. [Section 3.3.2]

- d. Verify that the soil samples are classified according to ASTM D2487 (Standard Practice for Classification of Soils for Engineering Purposes [Unified Soil Classification System]) and ASTM D2488 (Standard Practice for Description and Identification of Soils [Visual-Manual Procedure]). [Section 3.3.2]
- e. Verify that the soil samples undergo laboratory particle size analysis according to ASTM D422-63 (Standard Test Method for Particle-Size Analysis of Soils), down to the No. 200 sieve. [Section 3.3.2]
- f. Verify that split spoon sampling, if performed, is completed in accordance with ASTM D1586 (Standard Test Method for SPT and Split-Barrel Sampling of Soils) and that blow count data is collected from the soil samples. [Section 3.3.2]

## **F.5.2 Infiltration Testing**

1. Verify that at least one test is conducted within one vertical foot of the proposed bottom elevation of infiltration for each SMP. [Section 3.3.3]
2. Verify that the infiltration tests are performed within 25 horizontal feet of each proposed infiltration SMP. [Section 3.3.3]
3. Verify that a presoak is performed for one hour immediately prior to infiltration testing. [Section 3.3.3]
  - a. Verify that ten-minute measurement intervals are used between infiltration test readings when the drop in the water level during the last 30 minutes of the presoaking period is two inches or more. [Section 3.3.5]
  - b. Verify that 30-minute measurement intervals are used between infiltration test readings when the drop in the water level during the last 30 minutes of the presoaking period is less than two inches. [Section 3.3.5]
4. Verify that either the double-ring infiltrometer or cased borehole testing method is used. [Section 3.3.3]
5. For the double-ring infiltrometer testing method, verify the following:
  - a. Verify that five infiltration tests are conducted per acre of SMP footprint and a minimum of three tests are conducted. [Section 3.3.3]
  - b. Verify that the diameter of the inner ring is no less than six inches. [Section 3.3.3]
  - c. Verify that test pits are excavated in order to conduct double-ring infiltrometer testing. [Section 3.3.2; Section 3.3.3]
  - d. Verify that no more than two double-ring infiltration tests are conducted within the same test pit. [Section 3.3.3]
  - e. Verify that all tests are conducted pursuant to the Double-Ring Infiltration testing procedure provided in Section 3.3.5. [Section 3.3.5]

6. For the cased borehole testing method, verify the following:
  - a. Verify that eight infiltration tests are conducted per acre of SMP footprint and a minimum of three tests are conducted. [Section 3.3.3]
  - b. Verify that the inner diameter of the casing is no less than four inches. [Section 3.3.3]
  - c. Verify that infiltration tests are not completed within the same borehole as the hollow-stem augered borehole soil characterization studies, but rather are completed no less than five feet, and no more than ten feet, away from the soil characterization borehole locations. [Section 3.3.2; Section 3.3.3]
  - d. Verify that all tests are conducted pursuant to the Cased Borehole testing procedure provided in Section 3.3.5. [Section 3.3.5]
7. Verify that a minimum of eight readings are completed, or a stabilized rate of drop is obtained, whichever occurs first. A stabilized rate of drop means a difference of 0.25 inch or less of drop between the highest and lowest readings of four consecutive readings. [Section 3.3.3, Section 3.3.5]
8. Verify that an Infiltration Testing Log is provided with the submitted Geotechnical Report. Refer to Appendix H for a blank template. [Section 3.3.4; Section 3.3.5]

### **F.5.3 Evaluation of Infiltration Testing Results**

1. Verify that the highest infiltration rate from the test results for any SMP is discarded before calculation of the geometric mean of the tested infiltration rates when more than three tests are conducted for the SMP. [Section 3.3.6]
2. Verify that the geometric mean is used to determine the average of the tested infiltration rates. [Section 3.3.6]
3. Verify that a default value based on one decimal digit less than the smallest detectable reading for that particular test method/equipment is used in calculating the geometric mean when a measured rate of zero inches per hour is obtained through testing. [Section 3.3.6]
4. Verify that the geometric mean of the tested infiltration rates is between 0.4 and ten inches per hour. Infiltration is to be considered infeasible in soils with tested infiltration rates of less than 0.4 inches per hour. Soils with tested infiltration rates in excess of ten inches per hour require soil amendments. [Section 3.3.6]
5. Verify that a factor of safety of two is applied to the geometric mean of the tested infiltration rates to obtain the SMP-specific design infiltration rate to be used for all further design and calculations. [Section 3.3.6]
6. Verify that a Geotechnical Report is submitted that meets all of the Geotechnical Report requirements listed in Appendix E, Table E-7. [Section 3.3.6]
7. When infiltration has been found to be infeasible, verify that a waiver from the infiltration requirement is requested via the Online Technical Worksheet. If the waiver is requested due to unacceptable infiltration rates, verify that a Geotechnical Report is submitted. If the waiver is requested due to contamination, verify that electronic copies of environmental reports for any testing completed, as well as a justification letter from the geotechnical engineer or environmental professional, are submitted. [Section 3.3.6]
8. Verify that a copy of any Phase I or Phase II environmental site assessment prepared for the site is provided. [Section 3.1.1]

## **F.5.4 Soil Amendments**

1. Verify that soil amendments are proposed for any infiltration practice with a tested infiltration rate in excess of ten inches per hour. [Section 3.3.6]
2. Verify that the soil amendments span the entire cross-section of the infiltrating SMP. [Section 3.3.6]
3. Verify that the soil amendments extend a minimum of two feet below the bottom elevation of the infiltrating SMP. [Section 3.3.6]
4. Verify that a conservative infiltration rate is used in the stormwater routing calculations during the design of the SMP. [Section 3.3.6]
5. Verify that a soil amendment sequence of construction is provided on the plans pursuant to Appendix F.3.2, Sequence of Construction. [Section 3.3.6]