

APPENDIX G

OPEN PIT FALLING HEAD INFILTRATION TEST

OPEN PIT FALLING HEAD INFILTRATION TEST

This test is a simplified version of the Open Pit Falling Head Infiltration Test from the City Portland's (Oregon) *Stormwater Management Manual*, which in turn, was based on the Environmental Protection Agency (EPA) Falling Head Percolation Test Procedure (Onsite Wastewater Treatment and Disposal Systems Design Manual, EPA/625/1-80-012, 1980).

TEST PROCEDURE

Prepare Test Hole

1. Excavate an approximately 2-foot by 2-foot wide hole into the native soil to the bottom elevation of the proposed facility.
2. A 2-inch layer of coarse sand or gravel should be placed in the hole to protect the bottom from scour and sloughing.

Soak

3. Fill the hole with a minimum of 1-foot of water. Presoak the soil by maintaining this water depth for at least 4 hours (or overnight if clay soils are present).
 - *Exception* (sandy-gravelly soils): Proceed to Step 6 if after filling the hole twice, the water completely drains in under 10-minutes.

Measure the Percolation Rate

4. To properly account for any soil swelling, percolation rate measurements must be made between 15 and 30 hours after the soaking period begins. Measure from a fixed point (e.g. with a yardstick against a sturdy beam across the top of the pit).
5. Begin measurements with the water level at 6-inches above the gravel. Measure the water level to the nearest $\frac{1}{8}$ inch at 10-minute intervals for a total period of 1 hour (or 20-minute intervals for 2 hours in slower draining soils). Or until all of the water has drained. Any soil that sloughed into the hole during the soaking period must be removed and the water level adjusted to 6 inches above the added gravel (or 8 inches above the bottom of the hole).
6. Successive trials must be run until the measured infiltration rate between two successive trials does not vary by more than 25% (or 10% for well draining soils). At least three trials must be conducted. After each trial, the water level is readjusted to the 6-inch above gravel level.
 - *Option*: The first two trials may be run without measurement, measurements for the other(s) may be at 30-minute intervals, and the test may stop if the lowest two measurements of the third trial vary by not more than 25% (10% if well drained).
7. Upon completion of the testing, the excavation must be backfilled.

Calculation of the Infiltration Rate

8. The slowest percolation rate of the three trials is used for design. The design infiltration rate shall not exceed $\frac{1}{2}$ of the tested percolation rate.

Note: 2"/hr is desirable, but many facilities are built with much lower infiltration rates.
Note: Notify the City 24 hours in advance to allow an inspector to witness the test.

NOTE: The City shall be notified 24 hours in advance of the test to allow an inspector to witness the test.

Simplified Open Pit Falling Head Percolation Test Data Form - EXAMPLE

Location: 123 Main Street, NW corner of parking lot	Date: April 28, 2010	Test Hole Number: 2 of 3
Depth to bottom of hole: 32"	Test Method: Open Pit Percolation	Pre-soak start time: 8:00 pm on 3/27
Tester's Name: C. J. Tester		Tester's Company: ACME Testing, Inc.
Tester's Contact Number: 555-1212		Signature attesting to data accuracy/truthfulness: C. J. Tester

<u>Depth (inches)</u> 0-6 6-12 12-30	<u>Soil Description</u> Dark brown top soil Brown sandy loam Brown loam
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Time	Time Interval (minutes)	Measurement (inches)	Drop in water level (inches)	Percolation rate (in/hour)	Remarks -- TRIAL #1
9:00 a.m.	0	24	-	-	Two inches of gravel in bottom of hole; baseline = 24"
9:20	20	25	1	3	Slow draining soil - use 20 minute intervals Start trial with 6 inches of water above gravel
9:40	20	26	1	3	
10:00	20	27	1	3	
10:20	20	28	1	3	
10:40	20	29	1	3	
11:00	20	29-3/4	3/4	2.25	
11:20	-	-	-	-	Lowest percolation rate = 2.25 inches per hour

Time	Time Interval (minutes)	Measurement (inches)	Drop in water level (inches)	Percolation rate (in/hour)	Remarks -- TRIAL #2
11:30	0	24	-	-	Start trial with 6 inches of water above gravel
11:50	20	24-3/4	3/4	2.25	
12:10	20	25-1/2	3/4	2.25	
12:30	20	26	1/2	1.5	
12:50	20	26-1/2	1/2	1.5	
1:10	20	27	1/2	1.5	
1:30	20	27-1/2	1/2	1.5	
1:50	20	27-3/4	1/4	0.75	

Lowest percolation rate = 0.75 in/hour
Percent difference with previous trial = 67%

Time	Time Interval (minutes)	Measurement (inches)	Drop in water level (inches)	Percolation rate (in/hour)	Remarks -- TRIAL #3
2:00 p.m.	0	24	-	-	Start trial with 6 inches of water above gravel
2:20	20	24-1/4	1/4	0.75	
2:40	20	24-1/2	1/4	0.75	
3:00	20	24-3/4	1/4	0.75	
3:20	20	25	1/4	0.75	
3:40	20	25-1/8	1/8	0.626	
4:00	20	25-1/4	1/8	0.626	
4:20	20	25-3/8	1/8	0.626	

Lowest percolation rate = 0.626 in/hr (use for design)
Percent difference with previous trial = 16.5%
16.5% is less than 25%, so trials can end

Design Infiltration Rate = (Lowest Percolation Rate) / 2

Design Infiltration Rate = 0.626/2 = 0.313 in/hr

Groundwater table = 10 feet below ground surface

Notes: Percolation rate is [Drop in Water Level (inches) / Time Interval (minutes)] * 60 (minutes/hour).
Percent difference is [(larger percolation rate - smaller percolation rate) / larger percolation rate] * 100.

Simplified Open Pit Falling Head Percolation Test Data Form

Location:	Date:	Test Hole Number:
Depth to bottom of hole:	Test Method:	Pre-soak start time:

Tester's Name:	Tester's Company:
Tester's Contact Number:	Signature attesting to data accuracy/truthfulness:

<u>Depth (inches)</u>	<u>Soil Description</u>
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Time	Time Interval (minutes)	Measurement (inches)	Drop in water level (inches)	Percolation rate (in/hour)	Remarks -- TRIAL #1
Lowest percolation rate =					

Time	Time Interval (minutes)	Measurement (inches)	Drop in water level (inches)	Percolation rate (in/hour)	Remarks -- TRIAL #2
Lowest percolation rate =					

Time	Time Interval (minutes)	Measurement (inches)	Drop in water level (inches)	Percolation rate (in/hour)	Remarks -- TRIAL #3
Lowest percolation rate =					

Percent difference from previous trial =

Design Infiltration Rate = (Lowest Percolation Rate) / 2

Design Infiltration Rate = _____

Groundwater table = _____ below ground surface

Notes: Percolation rate is [Drop in Water Level (inches) / Time Interval (minutes)] * 60 (minutes/hour).
 Percent difference is [(larger percolation rate - smaller percolation rate) / larger percolation rate] * 100.