Percolation Tests (Constant Head)

At least one percolation test will normally be required for every soakage device that is constructed.

Boreholes/Test Pits must be deep enough and in the correct location. The ability of the ground to accept stormwater can vary enormously within soakage areas, even within individual properties. Because of this, at least one percolation test will normally be required for every soakage device that is constructed.

If drilling is impossible, then percolation tests can be carried out in test pits.

➢ Boreholes/Test Pits

Percolation tests are normally carried out in boreholes. These may be bores drilled in rock using a drilling rig or bores drilled in soil using a hand auger or post hole auger. If drilling is impossible due to ground conditions, then percolation tests can be carried out in test pits. Boreholes and test pits should be constructed according to the following guidelines:

1. Boreholes of 100 mm to 150 mm diameter should be bored to at least 1 m below the bottom of the intended soakage device.

2. Drilling should be continued until the permeable layer is reached where the soil is silty or has gravel in it. The borehole/test pit base should be below, passing the clay layer to achieve effective drainage.

3. Testpits should only be constructed if drilling is not possible. The pits should be excavated to the level of the proposed soakage device, have a minimum base area of 1 m^2 and be laid back at a suitable angle to prevent caving-in and erosion during the test.

4. Boreholes and test pits should be logged (that is, geological layers and soil types should be recorded).
5. It is advisable to perform the test during wintertime when the ground water level is high.

6. Water-table levels should be recorded at the time of excavation (if observed). If the fieldwork is carried out between October and May (spring – autumn), winter water table levels should be estimated at 1.0 m higher than observed water table levels.

7. The locations of boreholes and test pits should correspond with the position of the proposed soakage devices.

➢ Preparation of Boreholes/Test Pits for Percolation Tests

1. Ground conditions must emulate winter conditions.

2. Boreholes in soil should be prepared for testing by carefully scratching the sides with a sharp-pointed tool to remove any smeared soil surfaces and to provide a natural soil interface through which water may infiltrate.

3. All loose materials should be removed from the hole.

4. If collapse of a drilled borehole seems likely, a PVC pipe should be inserted into the hole to prevent collapse.

If scouring of a test pit seems likely, about 50 mm of sand or fine gravel should be added to the pit to protect the bottom from scouring or sediment blinding.

5. Holes in soil areas must be thoroughly pre-soaked to emulate winter conditions. In spring, summer or autumn (October to May), holes must be kept full for a minimum of 17 hours prior to testing. This will normally provide adequate time for the soils surrounding the hole to become saturated. During wet winter conditions, holes must be kept full for a minimum of 4 hours.

6. Holes in rock areas must be pre-soaked to ensure that any cavities in the rock are filled before testing begins. The hydrant must be open at a high flow rate for a minimum of 10 minutes before testing begins.

➢ Constant-Head Percolation Tests

1. Constant-head tests are most suitable for areas with high permeability.

2. Constant-head percolation tests determine the percolation rate of an area by maintaining a constant head of water in a test pit or borehole. The water that drains out of the test hole is replenished at the same rate from a water source such as a fire hydrant or reservoir. The stabilized flow rate of water entering the hole is measured over time to determine the permeability of the soil. This test method is most suitable for use in rock areas (or areas with high permeability).

3. Equipment required to carry out a constant-head test includes a hose and fire hydrant, flow meter, tape measure or water dipper, stopwatch, a copy of WORKSHEET 2 and pen for recording information.

To carry out a constant head test on a rockbore/test pit:

4. Obtain permission from Council to use water from the hydrant/nearby water supply outlet.
5. Fill the bore using a pipe connected to a flow meter. Observe the water level and adjust the hydrant valve until the bore is maintained close to full. This step must be continued for at least 10 minutes to ensure the hole is adequately pre-soaked.

6. Bores positioned within 10 m of each other must be tested simultaneously.

7. Continue the test for a further 10 to 15 minutes, and ensure a constant rate is achieved.

8. Use WORKSHEET 2 to record the instantaneous flow rate required to maintain a constant head.

9. Apply a factor of safety of 1.4 to account for the likely reduction in future soakage rate due to clogging.

In practice, the use of a fire hydrant will only be appropriate for soakage holes which have capacities below the maximum flow rate able to be provided by the fire hydrant (usually 20 L/s). For holes with excessive soakage capacity, a water truck can be used to provide higher flow rates.

W2

WORKSHEET 2. CONSTANT-HEAD PERCOLATION TEST

Site Address: _____

Completed by: _____

Date of test: _____ Signature: _____

Attach the following:

- ☐ Log of borehole showing depth, geological layers and water table
- ☐ Site-plan showing the location of the hole

(tick when attached)

Ensure the following procedures are followed:

- ☐ Hole is pre-soaked for 10 minutes prior to test
- ☐ Test is continued for 10 to 15 minutes
- ☐ Rockbores are maintained full
- ☐ Testpits are maintained ½ full
- ☐ Bores within 10m of each other are tested simultaneously

1. Test Details

Bore dimensions: (Circular Shape) or, Pit dimensions: (Square Shape)

a) diameter = D =_____m

b) water height from base= h =_____m

c) wall area = **3.142** X **D** X ***h*** = A1

d) base area = **0.78** X **D** X **D** = A2

e) Total area = **A1** + **A2** = AT

a) length = L =_____m **b)** width = W =_____m

c) water height from base= h =_____m

d) wall area1 = **2** X **L** X ***h*** = A1

e) wall area2 = **2** X **W** X ***h*** = A2

f) base area = **L** X **W** = A3

g) Total area = **A1**+ **A2**+**A3** = AT

Time	Flowrate (L/s)

Time	Flowrate (L/s)

Percolation Rate: L/m^2/min

*Use the last flowrate in the test above and write it in the box F1. Then divide it by safety factor 1.4. The result is F2.

(a) Capacity of bore = $\frac{\text{F1}}{\textbf{1.4}}$ = F2 L/s

(e) Percolation rate = $\frac{\text{F2}}{\text{AT}}$ **X 60** **=** P L/m^2/Min