Engineering Appendix Two

Stormwater Disposal to Soakpits

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1. INTRODUCTION TO SOAKPITS

This appendix has been produced to assist for "doing it right" first time and informs you with regard to the use of soak pits.

Council does not provide reticulated stormwater for disposal of stormwater from private property, into a piped or open drain. Council requires you to deal with all "hard" surface water which means all water from building roof areas (including sheds however big) but also water from concrete and other hard surfaces such as patio, driveways, parking areas and swimming pools.

The efficiency of a soak pit depends on the permeability of the ground and the size of the pit.

Typically soak pit designs have been based on the well known compliance document the New Zealand Building Code, Clause E1 Surface Water, Verification Method E1/VM1. This method in principle is detailed and shall form the basis of all minimum requirements for soak pit installations in the District. Any building consent application and any design for rights of way, parking areas or driveway accesses must contain calculations for soak pit sizing.

E1 states that where the collected surface water is to be discharged to a soak pit, the suitability of the natural ground to receive and dispose of the water without causing damage or nuisance to neighbouring property shall be demonstrated to the satisfaction of the territorial authority.

There are other more comprehensive guidelines that are widely available that should also be referred to when investigating, designing and understanding maintenance requirements of soakpits (for example Auckland Council's Soakage Design Manual).

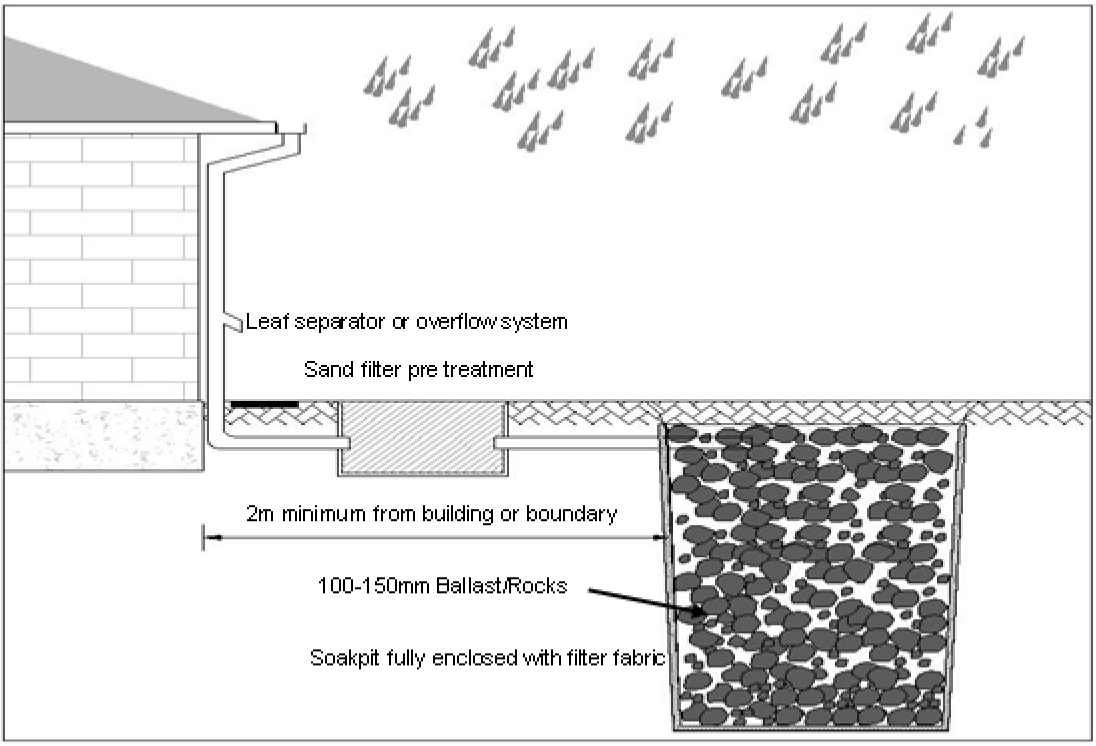
The effectiveness of soak pits may be maximised with the reuse, storage, or detention of stormwater on site through means such as tanks, rain gardens (areas of garden planted in trees and shrubs that soak up water), detention ponds and irrigation areas. In such instances a reduction of soakage capacity may be accepted in conjunction with other low-impact design solutions supported by calculations.

Flood risk analysis and overland flow design will be required to be assessed for all soak pit designs. When assessing flood risk and overland flow, no allowance for soakage capacity shall be assumed.

Continued maintenance is required for soakage systems, as silting up of the soakage media may occur over time.

Disposal of stormwater by soakage on a private rights of way shall require specific design. The right of way shall initially drain via a standard sump and then to a soak pit. The ongoing maintenance of this soakage shall lie with the properties served by the rights of way and Council may require this to be recorded on the title of each property.

Soakage devices must be at least 2m from boundaries, buildings, wastewater pipes or manholes.



Typical Soak Pit Layout

2. WHAT SIZE IS MY SOAK PIT

2.1 Carry out a Percolation test on site

a) Drill a 100mm or 150mm diameter hole to at least the **expected depth** of the soak pit. If groundwater is encountered then this shall be taken as the maximum depth of the soak pit. Testing should be done during periods of high ground water.

b) Fill the hole with water and maintain for at least 4 hours to pre-soak the ground.

c) Refill the hole with water to within 750mm of ground level with a measure rod inside.

d) Record the drop in water level at regular intervals until the water level is around 0.25m from the base of the hole or 4 hours has passed.

e) Plot the readings on a graph.

2.2 Determine the soakage rate

a) Take a selected range of readings over a 10 minute duration period from the graph.

b) These readings need to be taken on the minimum slope of the graph line (not the curved part).

c) Determine how much the water level has dropped during this 10 minute period.

d) Soakage rate = 6*water level drop in mm/10min

e) **SR** = Soakage rate = ___________________________mm/hr

Acceptable soakage rates (without doing a test) in areas other than Tokomaru, Manakau and the Tararua's which shall require specific design are:

- 300 mm/hr District wide
- 600 mm/hr the sandy areas of Waikawa, Waitarere, Hokio subject to being above groundwater

or

- as calculated by this design guide.

2.3 Assess the storm water catchment volume (Rc)

Measure all surface areas which collect rainwater in square metres, and convert to square hectares. Include the roof area and also any decks, patios and paved areas. Calculate the volume per hour.

Rc = runoff discharged from catchment to soak pit in 1 hour (m^3)

Rc = 10*C*I*A

where:

C = runoff coefficient (0.9 for hard surface areas)

I = local rain intensity (mm/hr) = 70mm/hr for Horowhenua towns

A = Catchment area in hectares discharging to the soak pit (to include buildings and hard surfaces)

Rc = 10*0.9*70*Area = ________________________ m^3

Example using an area of 250 m^2 (0.025 ha):

Rc = 10*0.9*70*0.025 = 15.75m^3

2.4 Soak pit sizing

Assume a soak pit size and calculate its volume.

Horowhenua District Council require soak pits to be constructed from a perforated 1050 manhole riser placed in a hole to take the initial flow of water fed from sumps with grip traps for right of way collection or directly discharged into a soak pit from roof collection with gutter leaf traps on all downpipes having leaf guard filters.

The riser shall be punched to allow water to pass through and lined with Bidim or equivalent material to filter out larger materials. The soak hole shall be filled with 100-150mm ballast placed around the riser.

Available storage (Vs) = (Volume of hole minus the volume of manhole times the volume of voids) plus the internal volume of manhole.

The **volume of voids** in a hole shall be taken as **0.38 times the volume of hole.**
Therefore a 4.8m * 3m hole 2.0m deep with 1050 (Nominal ID) riser will give a Volume of storage (**Vs**):

Vs = $((4.8*3*2.0)-(2.0*1.050*1.050*\pi)/4)*.38 + ((2.0*1.050*1.050*\pi)/4)$

Vs = $(28.80-1.73)*.38 + 1.73$

Vs = Vstor = 12.02 m^3

2.5 Calculate soakage allowance in the bottom of hole

(This is not necessary if there was a zero from the percolation test)

Vsoak =Soakage volume = base area x $\dfrac{\text{rate per hour (}\textbf{Soakage District wide}\text{)}}{1000}$

From above, Vsoak = 4.8*3*300 / 1000 = 4.32 m^3

2.6 Check storage volume exceeds catchment volume, less the volume of soakage

Vstor = Rc – Vsoak

Vstor = 15.75-4.32 = 11.43 m^3 ≤ 12.02 m^3 Therefore pit sizing okay.

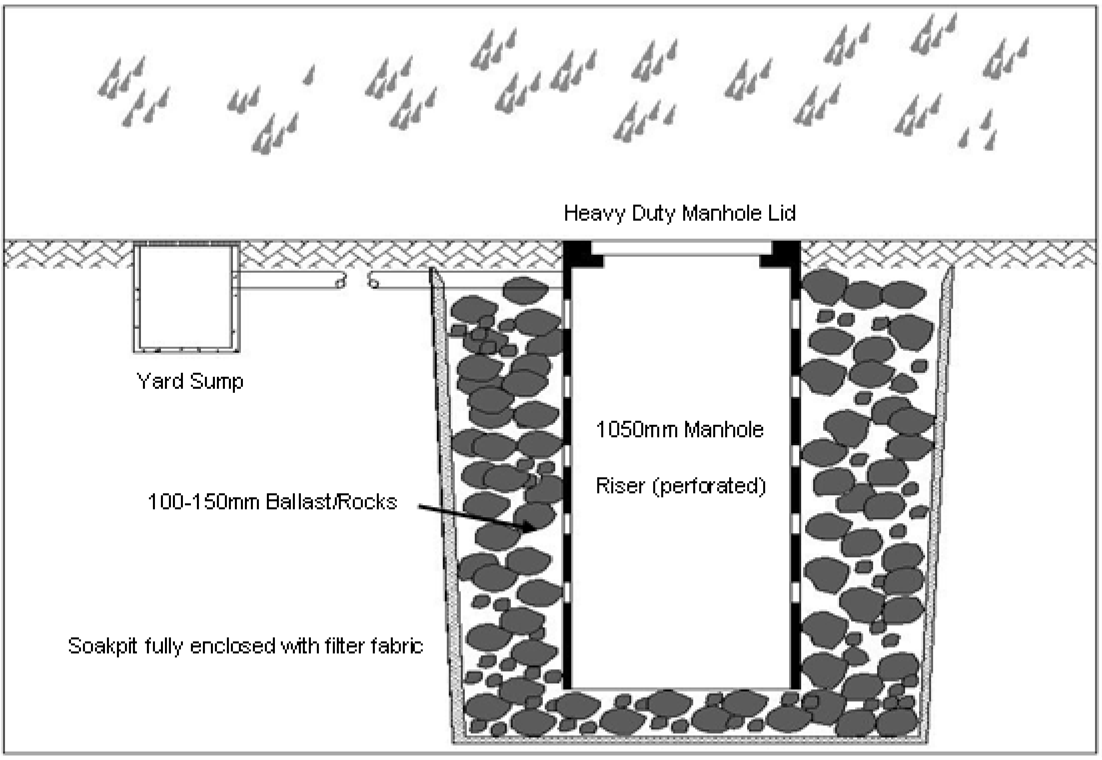
2.7 Produce drawing details of the soak pit

Details need to include:

- Location on site plan
- A secondary flow path with sufficient fall (overflow)
- Where discharging the overflow to (street or water course)
- A sump on the inlet pipe to filter out leaves and debris
- A removable lid.

3. MAINTENANCE

Soak pits require regular maintenance to prevent "clogging". They should be located above the winter water table and not on a stormwater secondary flow path. They shall be designed to take water from surrounding property if required. If you are not sure seek professional advice from consulting engineers and the like.



Typical Soak Pit Layout for Yard Sump

Note: Details are schematic only. For more detailed drawings of soakage pits and pre-treatment measures, refer other accepted industry guidelines such as Auckland Council's Soakage Design Manual.