Section 5 Device description and guidance notes

In this section

Device description and general guidance notes for:

5.1 Detention tank

5.2 Pond

5.3 Roof garden

5.4 Roof gutters

5.5 Depression storage

5.6 Permeable pavement

5.7 Treatment trench / rock filter

5.8 Catchpit insert

5.9 Gross pollutant trap, litter trap, hydrodynamic separator

5.10 Oil and water separator

For each device:

- description of device
- applicability
- maintenance
- references

5.1 Detention tank

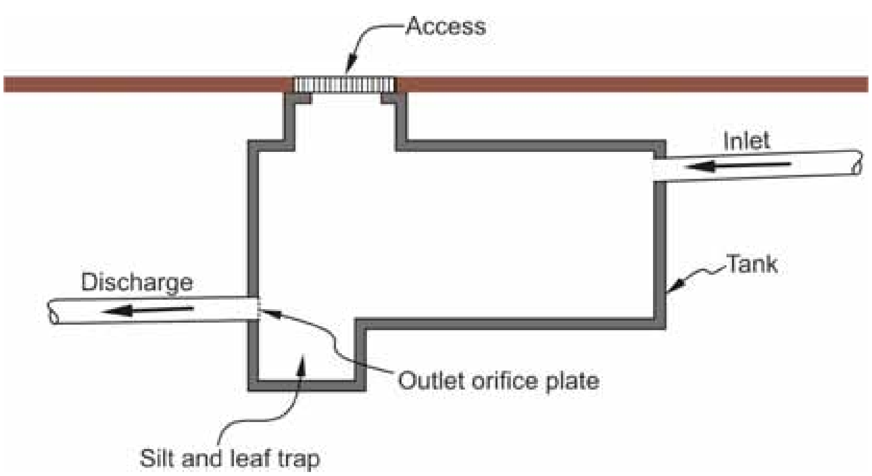
Description

A tank intended to temporarily store runoff and release it at a slower rate. Differs from the rain tank (refer Section 4.5) in that it works solely as a detention device, for peak floe reduction, with no water re-use function. Also known as OSD tank, where OSD is an acronym for on- site detention).

Key features are:

- may be located below ground or above ground
- may be fed by roof and/or site runoff: if the latter, it generally includes a catchpit before the tank to intercept debris and coarse sediments (i.e. to avoid blockage of the tank outlet orifice, and reduce the frequency of tank clean-out)
- water is fed into the top of the tank
- incorporates the following outlets, connected to the public stormwater system:
  - an orifice, located just above the base, sized to meet the required peak outflow rate
  - a top overflow outlet

Figure 5.1 Detention tank schematic



Applicability

Caution: *refer red flag box below regarding the acceptance of detention tanks by NZ local authorities*

The detention tank is used only for peak flow reduction i.e., flood attenuation. They can be used in a wide range of applications and, aside from the maintenance issue (refer below), can be cost-effective.

Precedents

The Upper Paramatta River Catchment Trust (UPRCT 1999) in Sydney is a major proponent of OSD tanks and publishes a very detailed manual on the topic (refer References).

Although the tank sizing basis is unique to the locality (i.e. the requirement is for a storage capacity of 470 m^3/ha), the coverage on detailing and case studies is noteworthy. Of interest also is the requirement for a separate discharge control pit (DCP) rather than an orifice in the tank, and the preference for off-line systems where the DCP feeds water into and out of the tank.

Design and detailing issues

- tank sizing: the tank can be sized in the same manner as for the temporary storage component of a rain tank (refer Section 4.5)
- catchpit: where the tank receives site runoff, a catchpit should be installed upstream of the tank
- levels: As well as locating the tank so that water can be fed into it (also accounting for the need for a catchpit, if applicable), there is a need for adequate fall between the tank outlet and the receiving system (e.g. street gutter or pipe)
- tank materials: can be plastic, concrete or steel: especially where the tank is to partially or fully underground, account needs to be taken of:
    - structural integrity and water-tightness (e.g. cracking can result in leakage to/from groundwater which is both undesirable and not visible)
    - corrosion (e.g. without a special surface coating, steel is generally not suitable for undergrounding)

Maintenance

Where the detention tank receives roof runoff only, maintenance needs are basically as for a rain tank (refer Section 4.5).

However, where the detention tank receives site runoff containing contaminants, such as hydrocarbons which are not intercepted by the catchpit, such contaminants may be toxic in a confined space, requiring special maintenance safety practices

As an example of the potential maintenance issues, Auckland City Council used to require such tanks with new infill housing in areas served by combined sewers. However, experience showed that, due to inadequate provisions for debris capture (e.g. as would occur in a catchpit), the outlet orifice would block. To resolve the problem, the often-applied solution was to disconnect the tank and feed flow direct to the combined sewer.

An advantage of the rain tank (refer Section 4.5) over the detention tank in respect to maintenance is that the former provides the benefit of a useful water supply source. In areas of reticulated water supply, this can offer a potentially worthwhile cost savings on mains water charges. In order to secure this benefit, owners are more likely to engage in sound maintenance practices for a rain tank than for a detention tank.

> Note that the detention tank is a forerunner to the rain tank (refer Section 4.5), but has fallen out of favour to a degree, due to the potential for re-use to be cost-effective with a rain tank, and the maintenance issues (refer immediately above). For these reasons, some New Zealand local authorities will not accept detention tanks.

Reference

Upper Parramatta River Catchment Trust (1999). *On-site detention handbook*. (UPRCT 1999). From www.upperparariver.nsw.gov.au

5.2 Ponds

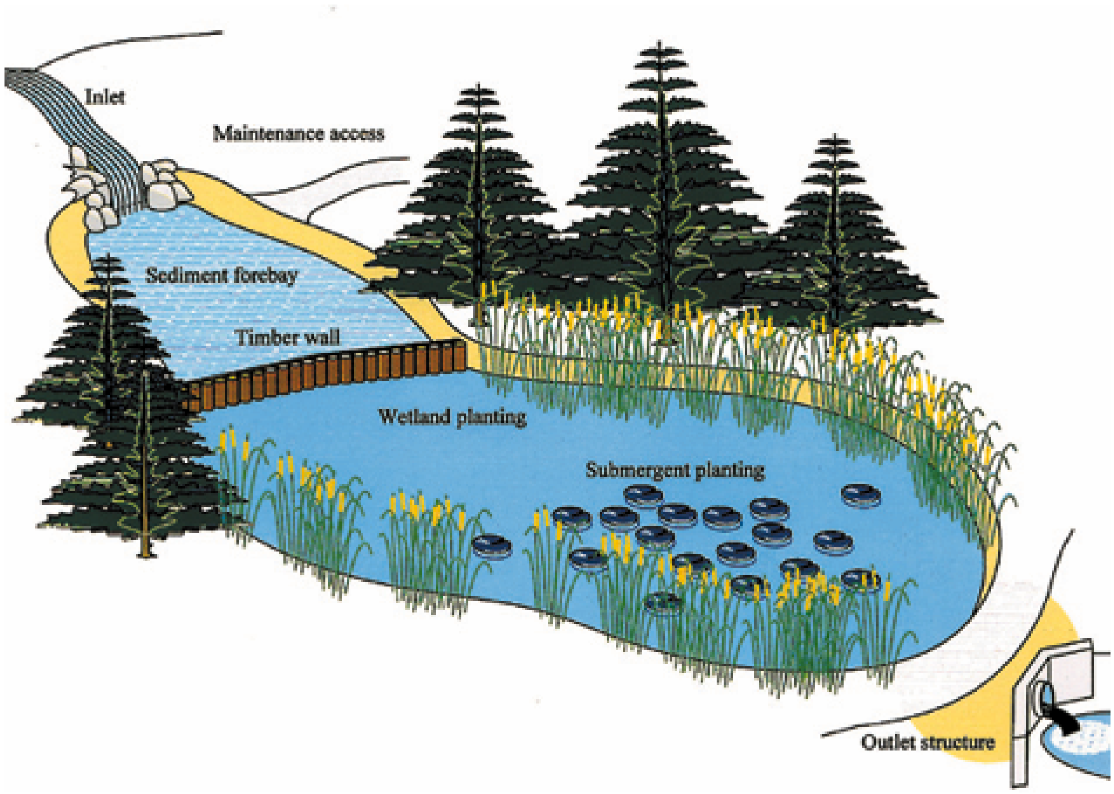
Description

Also includes wet detention basins. Ponds can be of two types:

- dry ponds which temporarily store stormwater runoff to control the peak rate of discharge and provide water quality treatment, primarily through the use of extended detention. These ponds are typically dry between storm events
- wet ponds, which have a permanent standing pool of water. They provide water quality treatment through the permanent pond and in conjunction with detention provided through the additional temporary storage provided when the pond water level rises above the permanent pond level. They can also provide peak flow attenuation for flood protection and downstream channel protection in conjunction with extended detention

Ponds can provide aesthetic benefit.

Figure 5.2 Pond schematic



Applicability

- ARC TP10 states that dry ponds are not normally recommended for stormwater management systems, due to lower water quality performance than wet ponds, ongoing maintenance problems and less aesthetic appeal than wet ponds
- dry ponds are used as a detention basin in Christchurch, (CCC 2003) with extensive vegetation which is aesthetically pleasing
- primarily for large lots, including some industrial sites, or to serve several lots
- can be used upstream of wetlands to provide removal of coarse material
- require a significant contributing catchment area (2 to 3 hectares in the Auckland region) or continuous base flow to maintain a permanent pool of water
- not suitable on steep sites or on fill unless approved through geotechnical assessment
- may require liner in porous soils to maintain permanent water pool
- require civil and geotechnical engineering expertise for design, construction and maintenance
- may not be suitable if receiving water is temperature sensitive due to warming of pond surface area
- need to address potential mosquito breeding both in design and operation and maintenance
- safety issues need to be addressed
- can have adverse effects if constructed on perennial streams due to impedance of fish passage and temperature effects on downstream receiving water

Maintenance

- require regular removal of accumulated sediment, which may be contaminated and require appropriate off-site disposal
- require monitoring for mosquito breeding and appropriate action if a problem

References

Auckland Regional Council. (2003). *Stormwater treatment devices: design guideline manual*. ARC Technical Publication No. 10 (ARC TP10). From http://www.arc.govt.nz/arc/index.cfm?34C9C2A8-1BCF-4AA1-91AF-CC49CFE4A80C

Christchurch City Council. (2003). *Waterways, wetlands and drainage guide*. (CCC 2003)

5.3 Roof garden

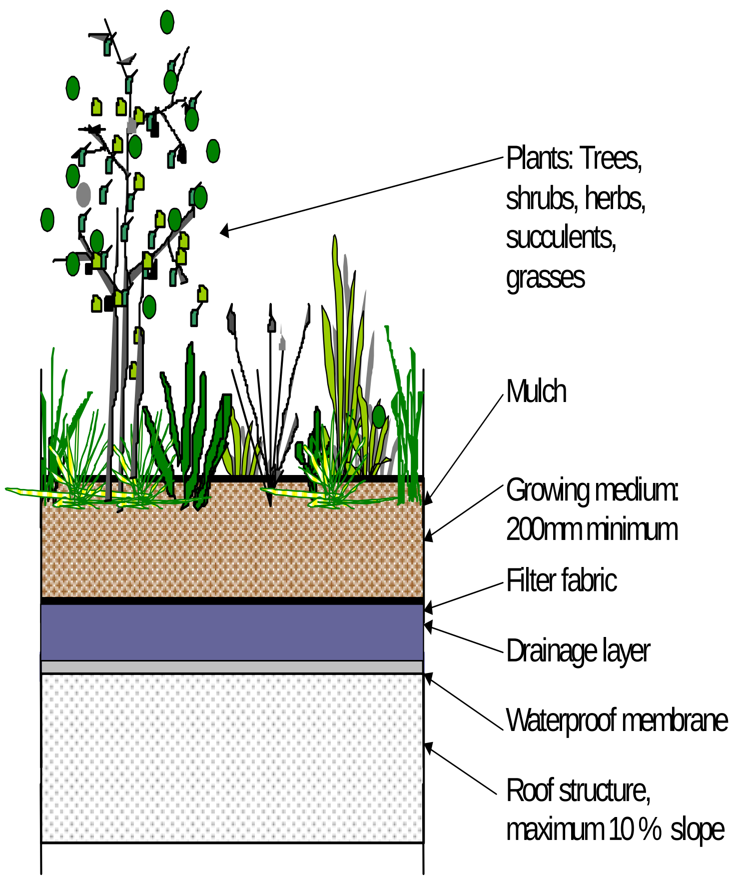
Description

A roof with a soil and vegetation cover, used in place of a conventional roof to achieve quantity and quality control. In many ways, it is similar to a rain garden (refer Section 4.3), but with negligible water storage capacity. It can also be known by the terms green roof and eco-roof.

Key features are:

- the roof structure is overlain by a waterproof membrane
- soil, with an underlying drainage system (proprietary), supports vegetation
- flow attenuation is achieved by evapotranspiration and soil capture
- contaminants are removed by filtration through the soil

Figure 5.3 Roof garden cross-section



Applicability

***Caution**: refer red flag box below regarding roof structural requirements*

Although quite novel in its concept, the roof garden is not only effective, but can also serve as an attractive landscaping feature when it can be seen from nearby decks or roofs.

Precedents

The City of Portland, Oregon, USA, is a leading proponent of roof gardens, and eco-roofs, a lighter-weight derivative. These are covered in its Stormwater Management Manual (CoP 2002). Both this and ARC TP10 provide both an overview and include details as to:

- waterproof membrane specification
- drainage layer specification
- filter fabric specification
- topsoil specification
- planting recommendation (but note should be taken of climatic differences)
- operation and maintenance provisions

Performance

Roof gardens act like pervious areas, although there is no net loss of water to soil infiltration. They can replicate the greenfield regime with respect to peak flows but not flow volume. Correspondingly, there is not generally a need to analyse their peak flow control performance.

Given that a roof garden only controls the roof runoff, there may be a need to use it in conjunction with another on-site device (e.g. controlling site runoff) to meet the overall performance standard.

Design and detailing issues

- roof gardens should not be used with roof slopes greater than 10% (roof gardens), or up to 25% with lighter weight eco-roofs
- careful structural and waterproofing detailing is needed to avoid leakage into the building
- the required soil depth will depend on the local climatic conditions and applicable plant species (note: appropriate plant selection is vital, to both ensure that they can survive the conditions and will maximise the evapotranspiration potential; plants may require irrigation in dry periods)
- soil of adequate fertility and drainage needs to be applied

Maintenance

The Portland Manual (CoP 2002) presents a sound example of the maintenance provisions for a roof garden. In summary, the main provisions cover:

- irrigation (if required)
- vegetation management (note that the use of fertilizers is discouraged, as nutrients will be leached out)
- soil substrate erosion
- structural components and drains
- debris and litter control
- access and safety

A key issue with roof gardens is the need for an adequate roof structure, to support the extra weight and ensure deflection is controlled to stay within the performance limits of the waterproofing material. Correspondingly, the costs of the roof structure and proprietary waterproofing systems should be checked before committing to a roof garden.

References

Auckland Regional Council. (2003). *Stormwater treatment devices: design guideline manual*. ARC Technical Publication No. 10 (ARC TP10). From http://www.arc.govt.nz/arc/index.cfm?34C9C2A8-1BCF-4AA1-91AF-CC49CFE4A80C

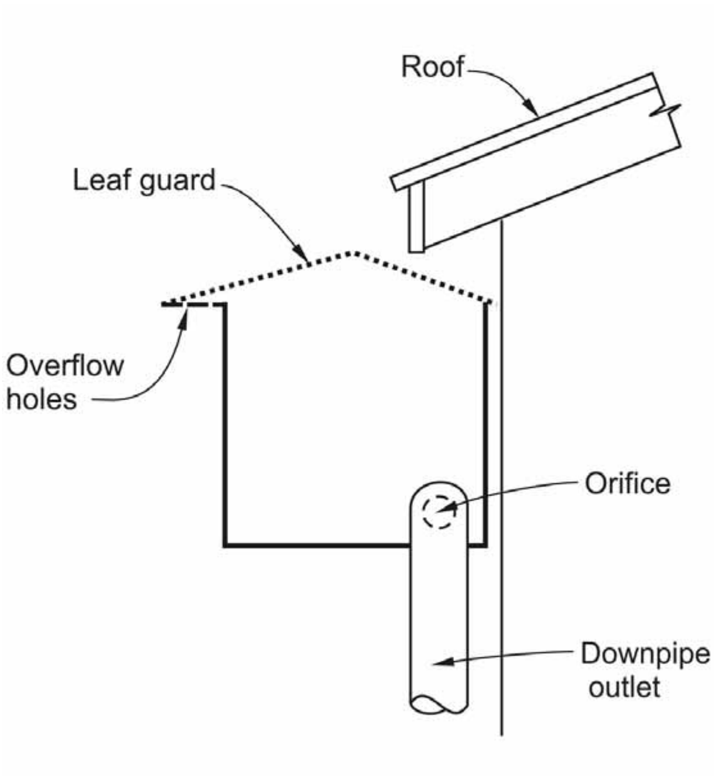
City of Portland. (2002). *Stormwater management manual*. Bureau of Environmental Services, City Of Portland, Oregon, USA, (CoP 2002). From http://www.cleanrivers-pdx.org/tech_resources/index.htm

5.4 Roof gutters

Description

Like tanks, over-sized gutters/spouting, with outlet flow throttling by orifices, can be used to provide flow attenuation. A variant, applicable to buildings with flat roofs, involves temporarily storing water on the roof for later release at a lower rate.

Figure 5.4 Roof gutter schematic



Applicability

Gutters will generally need to be quite large to meet typical flow attenuation targets, so will take the form of internal gutters. In turn, internal gutters can pose watertightness issues.

The sizing is illustrated by the following example (for Auckland – but note that actual capacities are dependent on the design storm frequency, the flow attenuation target, whether the gutters attenuate the roof or roof + site runoff, etc.):

- required storage: 1.5 – 2.0 m^3 per 100 m^2 of roof area in Auckland
- internal gutter size for a 100 m^2 roof: 40 m long (i.e. roof perimeter) x 0.4 m wide x 0.10 – 0.125 m deep

Design and detailing issues

The sizing of gutter detention will follow the same procedure as that for the temporary storage component of a rain tank (refer Section 4.5).

Points to note in designing/detailing roof gutters (or roof storage) include:

- careful structural and waterproofing detailing is needed to avoid leakage into building
- correct sizing of outlet orifices, and maintenance to avoid blocking, is critical
- care is needed with calculations for multi-level roofs where a down pipe stub-connection would normally be used to feed water from the upper roof to the lower one (in practice, it is simpler if each roof section is direct-connected to a down pipe)

Maintenance

The main maintenance needs are:

- regular cleaning and checking for blockage of the outlet orifice
- periodic checking gutters for water-tightness

Key issues to consider when contemplating the installation of gutter (or roof) detention include:

- is this approach acceptable to the local authority?
- can the potential for leakage into the building be adequately safeguarded against?

Reference

Auckland Regional Council. (2003). *Stormwater treatment devices: design guideline manual*. ARC Technical Publication No. 10 (ARC TP10). From http://www.arc.govt.nz/arc/index.cfm?34C9C2A8-1BCF-4AA1-91AF-CC49CFE4A80C

5.5 Depression storage

Description

Depression storage takes the form of a natural or man-made surface depression capable of temporarily detaining runoff and will normally dry outside storm times. Examples include:

- depression in a lawn
- sunken garden
- low area in a car-park

Larger-scale and more sophisticated versions may be called retarding basins.

These types of devices work by providing temporary storage to attenuate runoff peak flows.

Stormwater disposal can be by:

- a combination of soakage and piped discharge for vegetated areas
- or by piped discharge for paved areas.

Treatment will be provided by sedimentation, bioretention and filtration in vegetated areas and by sedimentation for paved areas.

Figure 5.5 Depression storage

Applicability

On-site depression storage has the attribute of being simple and cost effective. If used in vegetated areas of low permeability, without a low level piped outlet, water may be for retained for a significant time after a storm. Siting must avoid the risk of flooding adjacent buildings/properties.

It will typically be applicable where the site has the following characteristics:

- topography with an existing hollow or allowing a depression to be constructed relatively easily (without significant earthworks)
- situations where ponding of stormwater will not cause a hazard or risk to buildings or other assets and will be acceptable to the site owner/occupier/local authority

Design and detailing issues

Sizing of detention storage can be done by spreadsheet based routing (refer Appendix C), similar to that applied in the case of the temporary storage component of a rain tank. For paved areas, outlets need to be sized and designed to minimise the risk of blockage from debris.

The treatment benefit can be assessed by comparing the mechanisms of the depression storage with other types of devices, for example:

- where significant disposal is achieved by soakage, treatment may be similar to an infiltration trench
- for shallow surface flow through vegetated areas at slopes not more than 5%, treatment may be similar to that of a swale or grass filter strip
- for paved areas where short duration ponding occurs, removal of coarse sediment only is likely to be achieved

Detailing should follow the guidelines for the most directly equivalent device.

Maintenance

Maintenance measures should follow the guidelines for the most directly equivalent device (i.e. as noted above)

Key issues to consider when contemplating the use of depression storage include:

- does the site have suitable topography
- will ponding on the site be acceptable to the site owner, occupier and local authority

5.6 Permeable pavement

Description

Also termed porous paving. For this guideline the term ‘permeable pavement’ refers to a pavement that is specifically designed to facilitate and maximise infiltration of rainfall through the pavement in order to provide any of the following:

- water quality benefit
- peak flow reduction
- volume reduction

Final disposal is typically by infiltration to underlying ground, but can be used where final disposal is via a piped reticulation or to surface water.

Permeable pavements can be divided into several types (described below):

- porous concrete and porous asphalt
- plastic modular systems
- interlocking concrete paving blocks (including modular blocks and lattice blocks)

The term permeable pavement is often used to include the underlying gravel base which may provide a stormwater management function. The gravel base, may, depending on the situation, operate as a rock filter, refer to Section 5.7.

Porous concrete and porous asphalt

- these incorporate stable air pockets encased with in them that allow water to drain uniformly to underlying ground
- are described as porous pavement in 832-F-99-023 Technology Fact Sheet (EPA,1999g)
- the porous pavement surface is typically placed over a highly permeable layer of open-graded gravel and crushed stone
- traditionally these have had high failure rates (EPA,1999g)
- used in a limited way for low traffic areas
- porous asphalt is used on some highways in New Zealand, with an impermeable liner to prevent entry of water to the subgrade, for traffic spray reduction, rather than stormwater quality or quantity

Plastic modular systems

- comprise proprietary plastic grid systems placed on a base of blended sand or gravel
- voids in the grids are filled with sand/topsoil or gravel
- can provide a high degree of permeability
- manufacturers provide guidance on selection of materials and design
- proprietary systems available in New Zealand include *Grasspave, Gravelpave and Ecoblock*

Interlocking concrete paving blocks (including modular blocks and lattice blocks)

- these are shaped to provide a nominated percentage of the surface area to be space between the paving blocks to allow drainage of water through permeable material
- some proprietary systems use pavers that themselves are permeable
- stormwater infiltrates down to an aggregate material which serves as a reservoir for temporary storage until water infiltrates into the ground or drains to a piped system
- proprietary systems available in New Zealand include *Formpave,* which has been installed by Waitakere City Council (WCC) at Parrs Park in 2000 – this installation included a 350 mm thick granular sub-base, a 50 mm thick laying course and a geotextile layer - WCC require that maintenance be carried out twice per year using a mechanical suction brush

Figure 5.6 Permeable paving 'Formpave' at Parrs Park, Waitakere City

Applicability

- primarily parking areas, low volume and low load roadways or driveways
- most successful US applications have been stated to be in coastal areas with sandy soils and flatter slopes (LID,2003)
- contributing catchment should not have a significant source of sediment or other fine material that could blind the surface of the pavement

Disposal of infiltrated water

- final disposal can be to soil infiltration or by piped discharge.
- for disposal by ground infiltration the suitability of the location for such disposal needs to be assessed, refer Sections 3.4, 3.8 and 3.10 of the guideline; it is recommended that geotechnical advice is obtained regarding subgrade and basecourse depth and construction specifications

Design issues

- particular care is need in the design of the pavement foundations with respect to effects of infiltration, traffic loads, the nature of the subgrade and pavement durability
- for use in soils that contain significant amounts of silt or clay or that are highly compressible or are expansive, detailed analysis of the soils should be conducted as part of design (LID 2003)
- for porous asphalt and concrete pavement, slopes to be less than 5%(EPA1999g)

Maintenance

- ongoing maintenance is a crucial aspect. Active street sweeping measures are required in the catchment area, ideally four times a year (LID 2003)

There are potentially significant issues with respect to blinding of the surfaces of permeable pavements with fine material. This may in some situations be prevented or minimised by ongoing maintenance, for example using suction devices. If blinding does occur, some types of permeable pavements may not be able to be renovated or renovation may require removal and replacement of pavers.

References

Auckland Regional Council. (2003). *Stormwater treatment devices: design guideline manual*. ARC Technical Publication No. 10 (ARC TP10). From http://www.arc.govt.nz/arc/index.cfm?34C9C2A8-1BCF-4AA1-91AF-CC49CFE4A80C

Environmental Protection Agency. (1999g). Stormwater Technology Fact Sheet: *Porous pavement*. EPA 832-F-99-023. (EPA 1999g). From http://www.epa.gov/npdes/pubs/porouspa.pdf

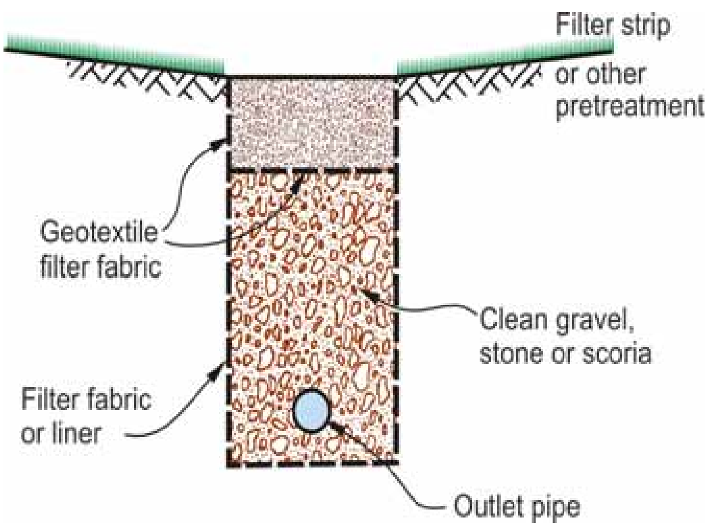
Low Impact Design Center Inc. (2003). *General permeable paver specifications*, (LID 2003). From www.lid-stormwater.net/permeable_pavers/permpaver specs.htm

5.7 Treatment trench / rock filter

Description

An excavated trench, backfilled with stone or scoria media. Basecourse or sub-base material under permeable pavements may act as a rock filter. Stormwater from paved areas enters the trench / rock filter and trickles through the trench media. Treatment is provided within the trench, before disposal to a piped reticulation system or to surface water.

Figure 5.7 Treatment trench / rock filter



Applicability

Treatment trenches / rock filters are able to:

- treat runoff from impermeable hardstand ground surfaces in commercial, residential and industrial areas
- treat road or parking lot runoff
- be located so as to take up a small amount of space
- may in some situations, provide flow attenuation and extended detention and thus may be able to be used for flood control stream channel protection

Treatment trenches are not able to:

- treat sediment-laden water from construction sites. Install after site works are complete and contributing areas have been fully stabilised in order to prevent excess sediment loading

Little published data is available on contaminant removal rates for trenches or rock filters in impermeable soils where disposal is to piped reticulation or surface disposal. Breitenberger and Lewis (2001) reported that for a trial rock filter under a permeable pavement at Waitakere City, hydrocarbon removal and hydrocarbon biodegradation occurred.

Meyer and Singhal (2004) reported on a number of studies on the treatment performance of permeable pavement in conjunction with an underlying stone base. These data show removal of a range of contaminants by filtration and other mechanisms. Some researchers have reported removal of petroleum derived hydrocarbons by insitu microbial degradation and that experimental results indicate that appropriately constructed porous pavements can be used successfully to both trap and degrade oil which is accidentally released onto parking surfaces.

Design methodology

There do not seem to be useful available guidelines for designing such systems. Guidelines for use of permeable pavements that incorporate the treatment and flow control aspects of rock filter media under permeable pavements are currently being prepared on behalf of several local authorities in the Auckland area.

General design comments, which are similar to those for infiltration trenches are:

- for car parks and other areas with high hydrocarbon loads: inflow preferably to be via grass strip, but may not be essential if inflow is through permeable pavement and / or if flushing points provided
- trench preferably horizontal along its length, maximum slope along trench less than 5%,to avoid wastage of trench volume
- ensure minimum separation distance of 600 mm between bottom of the device and the seasonably high water table (Georgia Stormwater, 2001)
- adequate clearance to existing utilities and to site boundaries
- provide downstream overland flow path to avoid scour damage or flood damage to assets
- can incorporate large pipes within trench to provide additional pore space to assist with providing peak flow reduction
- possibly could add organic matter to the medial to enhance removal of metals and nutrients
- device catchment area probably preferably not more than 2 hectares

Maintenance

Likely to include the following:

- regular clearance of debris, litter from entry and contributing areas
- remove small section of upper trench and inspect upper layer of filter fabric for sediment deposits. If clogged, restore to original condition
- flushing to remove accumulated sediment and slime

References

Breitenberger, M. & Lewis, G. (2001) *The removal of stormwater contaminants by a rock filter treatment system*. School of Biological Sciences (University of Auckland) report to Ecowater.

Meyer, P., & Singhal, N. (2004). *Pervious pavement: a literature review*. Department of Civil and Environmental Engineering, University of Auckland

Georgia Stormwater. (2001). *Georgia stormwater management manual volume* 2. From www.georgiastormwater.com

5.8 Catchpit insert

Description

A catchpit insert (also known as a catchpit filter) is a proprietary device taking the form of a fine-mesh filter bag which hangs inside a standard catchpit to intercept sediments in the incoming stormwater. It is designed to handle site runoff and has no water quantity control effect.

Key features are:

- units are generally made-to-measure by the manufacturer
- includes a high-flow bypass to avoid surcharging (different brands have different overflow arrangements)
- to ensure all incoming water is fed into the insert, a rubber seal is provided at the top to connect between the edge of the catchpit walls and the insert frame
- incorporates a nylon mesh bag (typical aperture size 200 µm) fitting within a galvanised steel or plastic frame, to avoid the bag being sucked into the catchpit outlet pipe

The bag must be emptied every 3 – 6 months and replaced with a laundered bag; the bag contents are disposed off at a landfill.

Manufacturers/suppliers in NZ include:

- Ingal (Enviropod brand) URL: www.ingalenviro.com
- Ecosol URL: www.ecosol.co.au
- Hynds URL: www.hynds.co.nz

Applicability

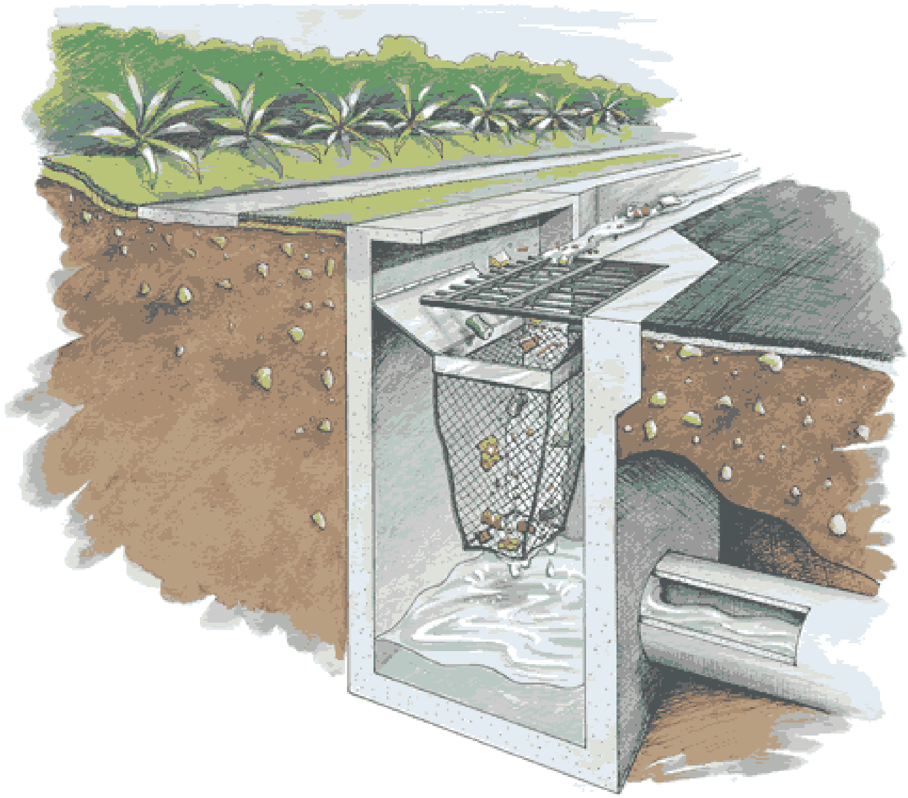
The catchpit insert is designed to intercept litter and sediment from site runoff. They are well-suited to medium-large impervious areas (e.g. car parks, roads). Because the insert is made to measure, it can be used in new or retro-fit situations.

Precedents

There are a number of large-scale applications of catchpit inserts, covering both street catchpits and commercial/industrial developments. Information on these field applications can be obtained from:

- manufacturers/suppliers
- councils (e.g. North Shore City, Waitakere City)
- Australian trials under the auspices of the Upper Paramatta River Catchment Trust (UPRCT 1999)

Figure 5.8 Catchpit insert



Performance

Available information on the sediment capture performance of catchpit inserts is quite sparse. Early field-based tests, involving sampling the inlet and outlet stormwater, proved difficult, especially in larger storm events and few reliable results were obtained.

Against this background, in 2003 Auckland City Council commissioned laboratory trials of two makes of catchpit inserts which had passed field-based reliability trials. This testing, carried out at Auckland University, sought to quantify the sediment capture performance and also determine the head loss characteristics of the filter fabric to establish its potential to limit the hydraulic capacity and cause flow to bypass the insert unit. In addition, a catchpit without the insert unit was tested. Testing was done for a range of flow rates and with different sediment concentrations. The mode of testing and the results are presented in the paper. In summary, for a composite street sweep sediment sample, the overall capture percentage for the insert units with 200 µm aperture size bags over a series of flows was found to lie in the range 78 – 98%. A Technical Paper is available on the trials (Ockleston and Butler 2004).

Design and detailing issues

These will typically be the responsibility of the manufacturer/supplier. Points to note in specifying/selecting such units include:

- the adequacy of the seal connecting between the edge of the catchpit walls and the insert frame
- the adequacy of the high flow bypass arrangement
- parts of the unit that may deteriorate and require repair/replacement (e.g. bags, galvanising on insert frame, any moving parts, etc)

Maintenance

Manufacturers/suppliers will typically provide details of the routine maintenance requirements for their units. Units are typically serviced every 3 – 6 months; with the actual frequency depending on the catchment area feeding the catchpit, and the level of sediment generated in that catchment (the frequency is typically determined by frequent inspections of the units over the first few months to see how quickly they are filling-up).

Servicing typically covers:
- emptying the bag, typically by means of by a sucker-truck
- replacing the used bag with a laundered bag (bags are typically found to last 5 years)
- inspection of the insert frame and seals to identify the need for any repairs

A key question with maintenance is who will be responsible for doing it – in some cases the supplier may offer this as part of a supply and maintain package. In looking at approving the use of such devices, local authorities will typically want to be satisfied that there is a long-term maintenance arrangement in place, by a suitably qualified operator.

Key issues to consider when contemplating the installation of catchpit inserts include:
- are they acceptable to the local authority?
- who will be responsible for their ongoing operation and maintenance?

References

Ockleston, G. & Butler, K. (2004). *Auckland City's field and laboratory testing of stormwater catchpit filters*. Paper presented to NZWWA Stormwater Conference May 2004

Stormwater Industry Association Australia. (2000). Stormwater Source Control. *Workshop proceedings*, 13 July 2000.

Upper Parramatta River Catchment Trust. (1999). *On-site detention handbook*. (UPRCT 1999). From www.upperpararriver.nsw.gov.au

5.9 Gross pollutant traps, litter traps and hydrodynamic separators

Description

These devices are described together as they are generally targeted at removing coarse sediment, litter and debris. Some of these devices can remove oil. They include specifically designed devices as well as proprietary devices.

Gross pollutant trap

Typically a sediment trap with a litter (or trash) rack, usually located at the end of the trap. Can be purpose designed or proprietary device. Similar devices include coarse sediment traps and grit traps. Some proprietary devices that are called gross pollutant traps include a filtration basket and sediment sump.

Litter Traps

A wide range of devices including:

- gross pollutant traps as describe above
- litter collection baskets
- boom diversion systems
- release nets –nets over the outlet of a pipe
- trash racks
- return flow litter baskets
- hydraulically operated trash racks
- flexible booms
- circular settling tanks
- hydrodynamic separators
- self cleaning screens
- downwardly inclined screens

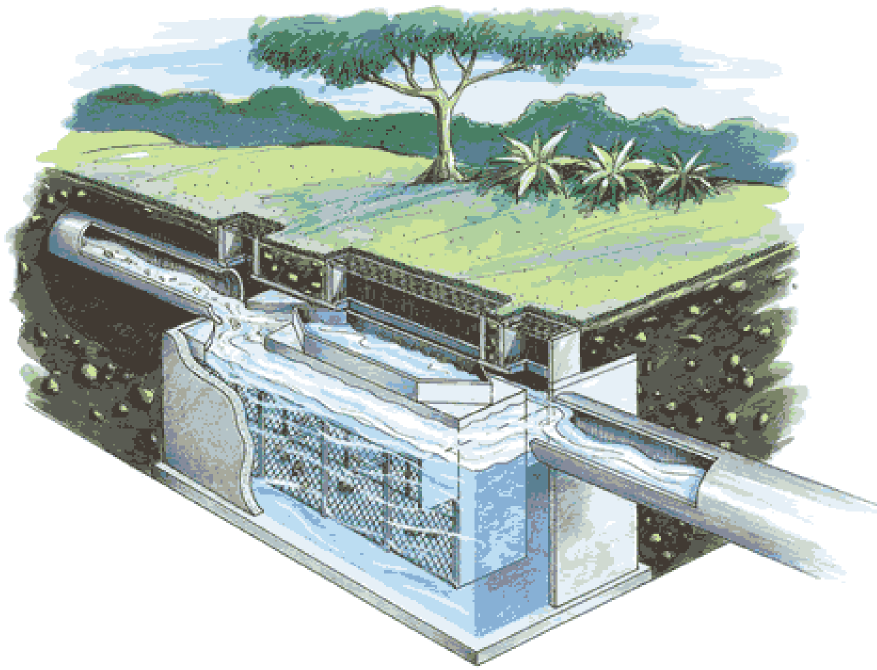
Hydrodynamic separators

These devices induce a vortex on the entering stormwater, which separates sediments. They incorporate a collection chamber at the base of the separator that is periodically cleaned or separated sediment can be piped to sewer.

Applicability

- intended to remove only coarse sediment, litter and debris, unlikely to remove fine sediments or soluble contaminants
- often used at the head of a treatment train, for example to prevent coarse sediment entering a wetland or other stormwater treatment device
- can be used for a range of contributing catchment sizes
- can be retrofitted into existing development sites
- small devices can be located underground, minimising visual impact
- potential to aggravate upstream flooding if trash rack becomes blocked by debris
- ongoing operation and maintenance, including sediment removal can be expensive

Figure 5.9 Gross pollutant trap schematic



New Zealand manufacturers/suppliers

- Ecosol New Zealand Ltd: www.ecosol.co.au
- Hynds Environmental www.hynds.co.nz
- Ingal Environmental Services www.ingalenviro.com
- Bisleys Environmental Ltd: http://www.bisleys.net

Maintenance

- require regular clearance of debris, litter and sediment
- for proprietary devices, maintenance is likely to be required to be carried out by a specialist contractor and may be expensive

References

Waters and Rivers Commission. (1997). *Stormwater quality management manual* (Draft)

Environmental Protection Agency. (1999h). Stormwater Technology Fact Sheet: *Hydrodynamic separators*. EPA 832-F-99-017. (EPA 1999h). From http://www.epa.gov/npdes/pubs/hydro.pdf

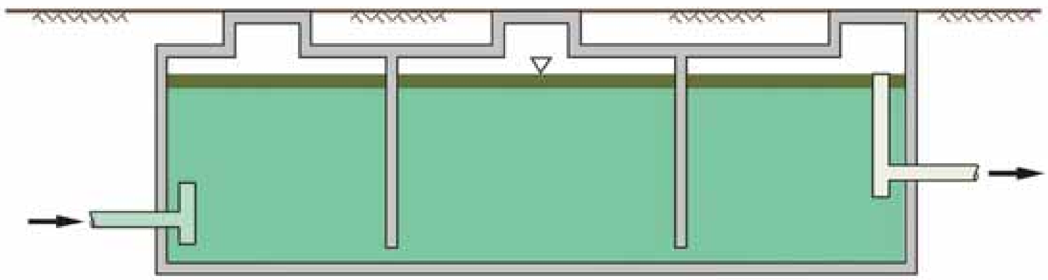
5.10 Oil and water separators

Description

These devices are primarily aimed at removing oil from stormwater at sites where hydrocarbon products are handled and small spills regularly occur on paved surfaces. Can include specifically designed devices as well as proprietary devices. Commonly used separators are API (American Petroleum Institute) and plate separators. They typically include baffles or walls within an underground concrete tank, to allow separation of oil droplets on the surface of the water within the device, which can then be removed. They usually have an initial compartment for sedimentation.

Various types of proprietary devices are available that can remove oil from stormwater (see below).

Figure 5.10 API Separator



Applicability

- intended to remove only hydrocarbons that are less dense than water
- typically used at service stations, airports, storage terminals
- should be located close to source of hydrocarbon product
- not applicable for general urban runoff
- objective to treat over 90% of the flow to an acceptable degree (15mg/l oil and grease)
- cannot treat elevated suspended solids; sites with high suspended solids loads should incorporate separate sediment removal
- require systematic, regular maintenance
- can be retrofitted into existing development sites
- small devices can be located underground, minimising visual impact

New Zealand suppliers include:

- Alpha Environmental (Nelson)
- Ecosol www.ecosol.com.au
- Hynds Environmental Systems Ltd www.hynds.co.nz
- Maskell productions: www.maskell.co.nz
- Westfalia Separator NZ Ltd: www.westfalia-separator.com

Maintenance

- regular clearance of debris, litter from entry and contributing areas
- removal of accumulated sediment from initial chamber
- removal of floating oil and appropriate disposal
- usually requires a specialist contractor

References

Auckland Regional Council. (2003). *Stormwater treatment devices: design guideline manual*. ARC Technical Publication No. 10 (ARC TP10). From http://www.arc.govt.nz/arc/index.cfm?34C9C2A8-1BCF-4AA1-91AF-CC49CFE4A80C

Ministry for the Environment. (1998). *Environmental guidelines for water discharges from petroleum industry sites in New Zealand*. From http://www.mfe.govt.nz/publications/hazardous/water_discharges_guidelines_dec98/