# Stormwater Management: Water Sensitive Urban Design

20 Helen Street, Northcote

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| A | 24/11/2023 | LF | - | Draft |
| B | 11/12/2023 | LF | - | TP |
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# Contents

# 1. Summary

This Stormwater Management Plan was completed for the residential development located at 20 Helen Street, Northcote, as a response to the Victorian Planning Provision 53.18 and 55.03-4 required for two or more dwellings on a lot.

# 2. Objectives

Increase in urban water runoff from impervious surfaces, traditionally collected in stormwater pipes, has negative effects on the health of waterways. Large quantities of stormwater contribute to flooding and disturb the ecosystem.

Water Sensitive Urban Design addresses the above impacts by providing different means to treat stormwater runoff by imitating the natural cycle.

Apart from stormwater management, Water Sensitive urban Design (WSUD) encourages rainwater harvesting and reuse, urban cooling and improving local habitat.

# 3. Requirements

Victoria best practice stormwater performance targets as set out in the Urban Stormwater Best Practice Environmental Management Guidelines (BPEMG), require that stormwater leaving the site achieve the following reductions:

- 80% of suspended solids
- 45% of total nitrogen
- 45% of total phosphorus
- 70% of litter

These requirements can be demonstrated by achieving a minimum STORM score of 100% or demonstrated reduction in all 4 categories using proprietary modelling software.

# 4. WSUD Response

WSUD requirements will be met by rainwater harvesting and reuse and demonstrated by achieving a STORM score of 100% or greater.

The following will be done to meet the above objectives:

- Stormwater runoff from all roofed area and terrace of each townhouse will be collected in a 3000L rainwater tank (RWT) located under the driveway.
- The tanks will be connected all the toilets.
- Rainwater collection, storage and distribution will be designed and installed in accordance with plumbing regulations and relevant Australian Standards including AS/NZS 3500 series and HB230-2008

# 5. Construction Management

**During construction, the builder will implement best practice stormwater protection by following Melbourne Water guidelines for keeping stormwater clean, which can be downloaded via:** https://www.clearwatervic.com.au/user-data/resource-files/Keeping_Our_Stormwater_Clean-A_Builders_Guide%5b1%5d.pdf

At a minimum, the builder must do the following:

1- Manage all construction activities within site boundaries
2- Retain vegetation around the perimeter of the site wherever possible throughout construction up until landscaping
3- Cover stockpiles
4- Contain litter in bins or cages
5- Manage chemical disposal as per EPA guidelines
6- Manage erosion especially between roofing and downpipe connection stages by connecting downpipes asap or direct to a pond or grassed area
7- Provide crushed rock at site entrance to provide dry access point to vehicles
8- Put a gravel sausage on the downstream street stormwater curbside pit.

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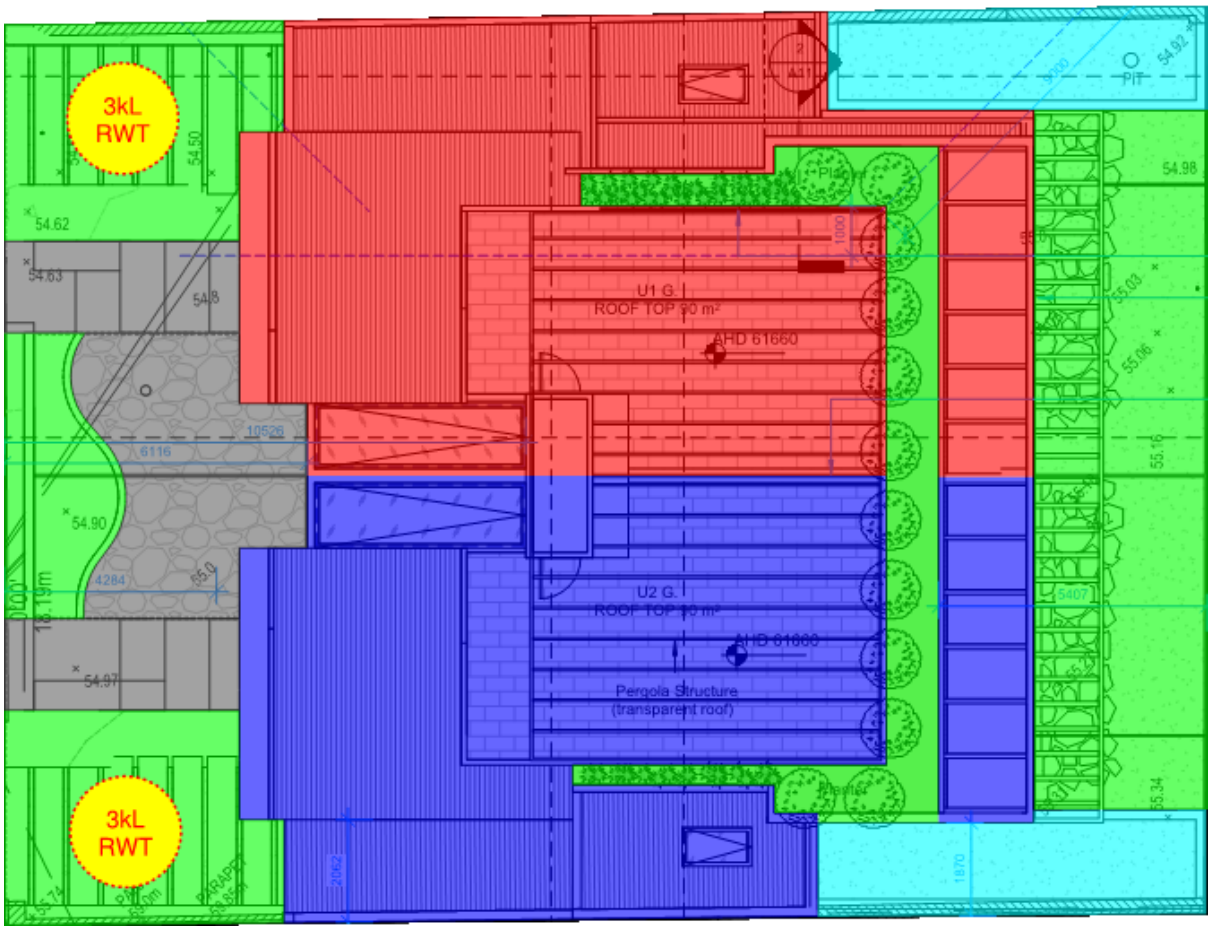
# Appendix A: Catchment Plan




| WSUD Legend | | |
|---|---|---|
| | *Description* | *Area* |
| | Impervious area - no treatment | 38 |
| | Permeable area | 129 |
| | Pool area_excluded from assessment | 31 |
| | TH1 Roof and terrace to tank | 123 |
| | TH2 Roof and terrace to tank | 119 |

# Appendix B: STORM Report

## Melbourne Water STORM Rating Report

| | |
|---|---|
| TransactionID: | 0 |
| Municipality: | DAREBIN |
| Rainfall Station: | DAREBIN |
| Address: | 20 Helen St |
| | Northcote |
| | VIC |
| Assessor: | Ecoharmony |
| Development Type: | Residential - Multiunit |
| Allotment Site (m2): | 443.00 |
| STORM Rating %: | 104 |

| Description | Impervious Area (m2) | Treatment Type | Treatment Area/Volume (m2 or L) | Occupants / Number Of Bedrooms | Treatment % | Tank Water Supply Reliability (%) |
|---|---|---|---|---|---|---|
| TH1_Roof and terrace | 123.00 | Rainwater Tank | 3,000.00 | 3 | 120.20 | 96.20 |
| TH2_Roof and terrace | 119.00 | Rainwater Tank | 3,000.00 | 3 | 120.90 | 96.30 |
| Imperious - no treatment | 38.00 | None | 0.00 | 0 | 0.00 | 0.00 |

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# Appendix C: Rainwater Harvesting and Reuse

**Rainwater in this report is limited to low-risk usage including toilet flushing, washing machine connection, garden watering, outdoor uses…should the water be used in higher risk areas, further consultation and risk assessment would be required. Rainwater collection, storage and distribution must be designed and installed in accordance with plumbing regulations and relevant Australian Standards including AS/NZS 3500 series and HB230-2008.**

Rainwater collected from roof areas is considered a valuable resource, collection and reuse is key for sustainable developments. Incorporating rainwater tanks does not only help in reducing stormwater runoffs, but also reducing potable water usage and meeting regulatory requirements for Class 1 dwellings.

There are two methods of rainwater tank connection: wet and dry

A wet system uses underground pipes to connect all downpipes and then up again to feed to tank, it is also known as charged system. This configuration allows for long runs while maintaining aesthetics. Care should be taken to avoid mosquito breeding in the charged pipe as detailed in the succeeding sections. Charged pipe drain should also be considered especially for areas with prolonged dry season.

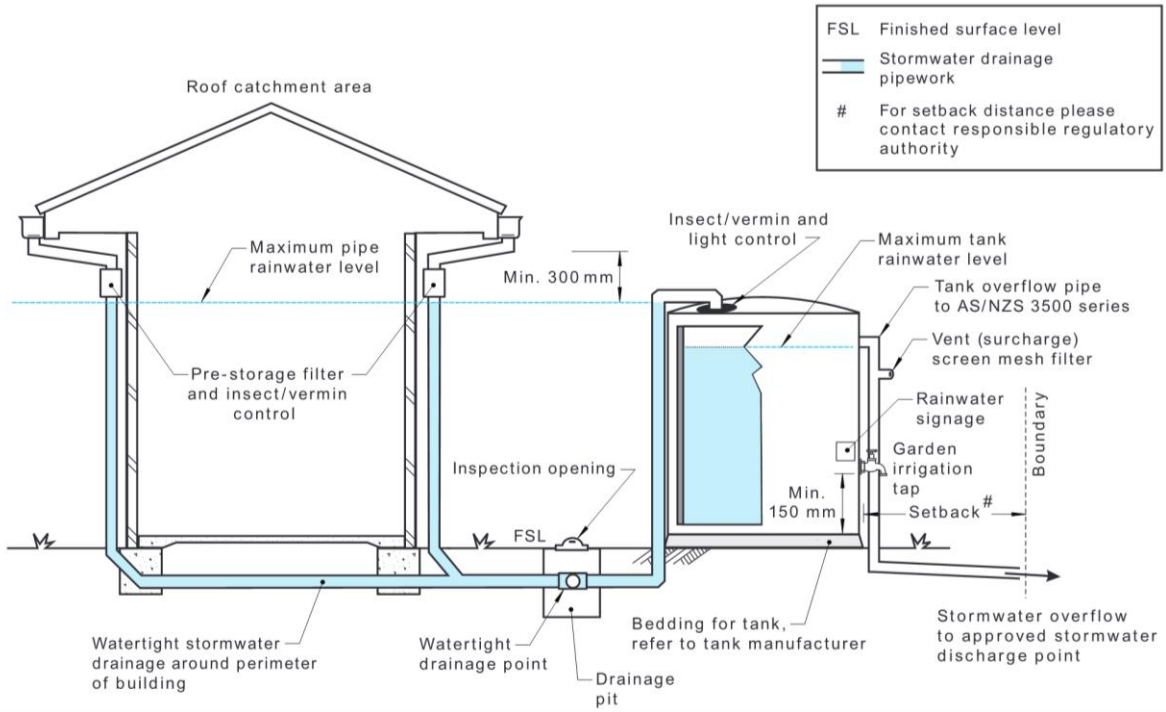


*Figure 1: Charged (wet) above ground installation (source: Australian Standards 2008)*

A dry system is more suitable for shorter runs or when roof sections are connected to separate tanks. Where underground pipes drain to a lower installed underground tank, or when above ground tanks are placed on the lower end of a sloping site, these would also be considered as dry.

## System Components

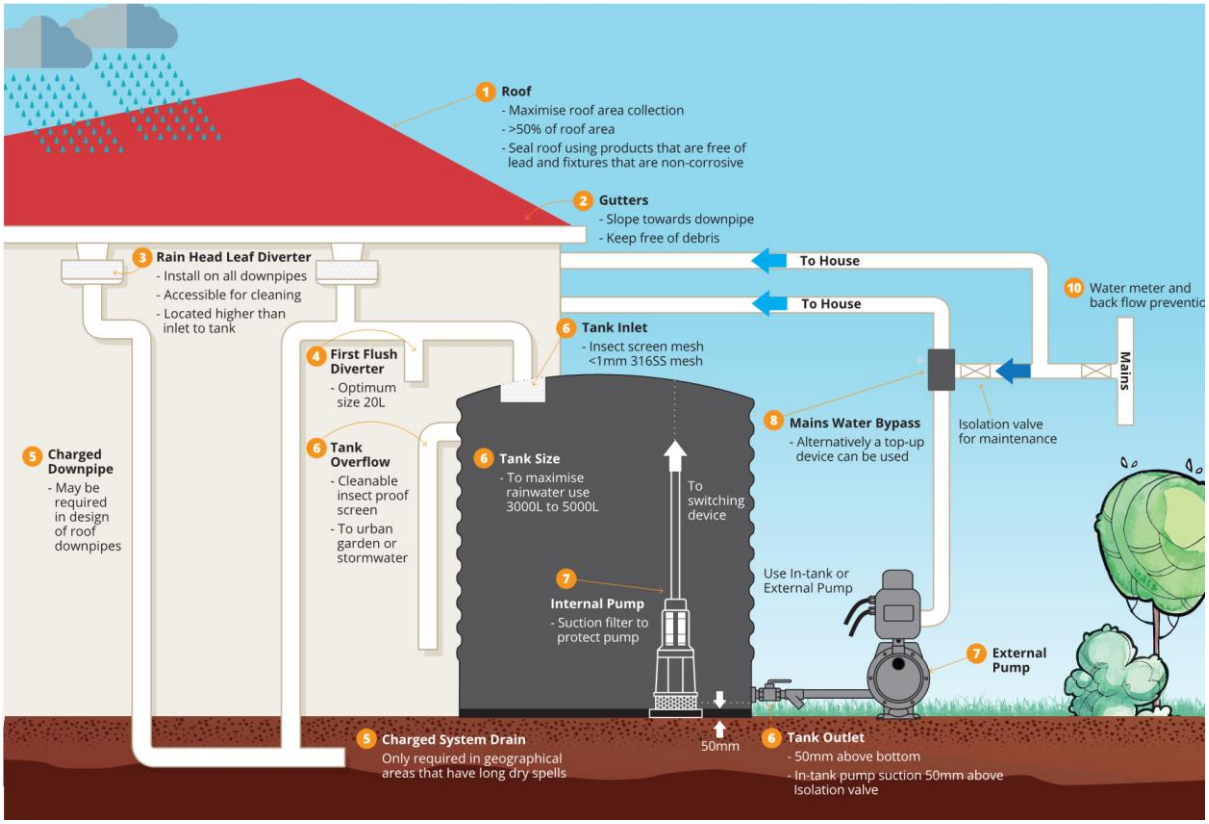


*Figure 2: Different components of an above ground rainwater tank (source: RHAA & UWCS)*

**Roof**

According to the department of health (2013), for low risk of ingestion, the below guidelines for roof catchment can be followed

- Prune overhanging vegetation or use gutter guard
- To prevent water stagnation, gutters should be installed with a slope of 1:100. Stationary water allows debris catchment, algae growth, and mosquito breeding
- Discharge from roof mounted appliances, such as coolers and hot water, should be directed outside the catchment area
- Avoid the use of chemicals for roof cleaning or choose carefully
- Exclude sections affected by emissions from industrial processes

Moreover, the following are good practice but most important where risk of ingestion is higher

- Seal or avoid collection from roof areas containing hazardous chemicals such as lead, bitumen, and treated timber.
- Restrict roof access and remove or relocate any structure where birds can perch.
- Slow combustion heaters flues should be installed in accordance with relevant Australian Standards

**Rain head leaf diverters**

Known also as Leaf Eaters, should be installed at each downpipe at an elevation higher than the inlet of the tank but low enough to provide easy maintenance access.

The mesh should be less than 1mm to prevent mosquito breeding access and preferably made from stainless steel for longevity.

**First flush diverters**

First flush normally contains more contaminants, the diverter ensures that it doesn't reach the tank. First flush diverters can be wall mounted or in-ground allowing for complex installations.

Sizing is based on 20L per 100 $m^2$ of roof catchment


*Figure 3: An in-ground first flush diverter and tank connection (source: Raindog)*

**Tanks**

- All tank access points should be sealed, and an inlet strainer should be installed. A 1mm hole diameter mesh with should also be installed at the inlet and overflow pipes to prevent mosquitoes and other vermin accessing the tank.
- Tanks should be light proof to avoid algae growth.
- In-ground tanks need to be sealed against surface run-off and should not be installed in contaminated ground or near septic tanks.
- Outlet should be at least 150mm from tank bottom, while calmed inlets ensure sediments are not disrupted.

**Pumps**

Pump can either be submerged or external, in both cases, correct quality sourcing, sizing and installation, is key to uninterrupted supply.

- Being the weakest link in the rainwater system, investing in good quality pump is preferable.
- A variable speed pump is a more efficient and environmentally friendly option than fixed speed.
- Pumps should be installed and maintained to manufacturers' specifications.

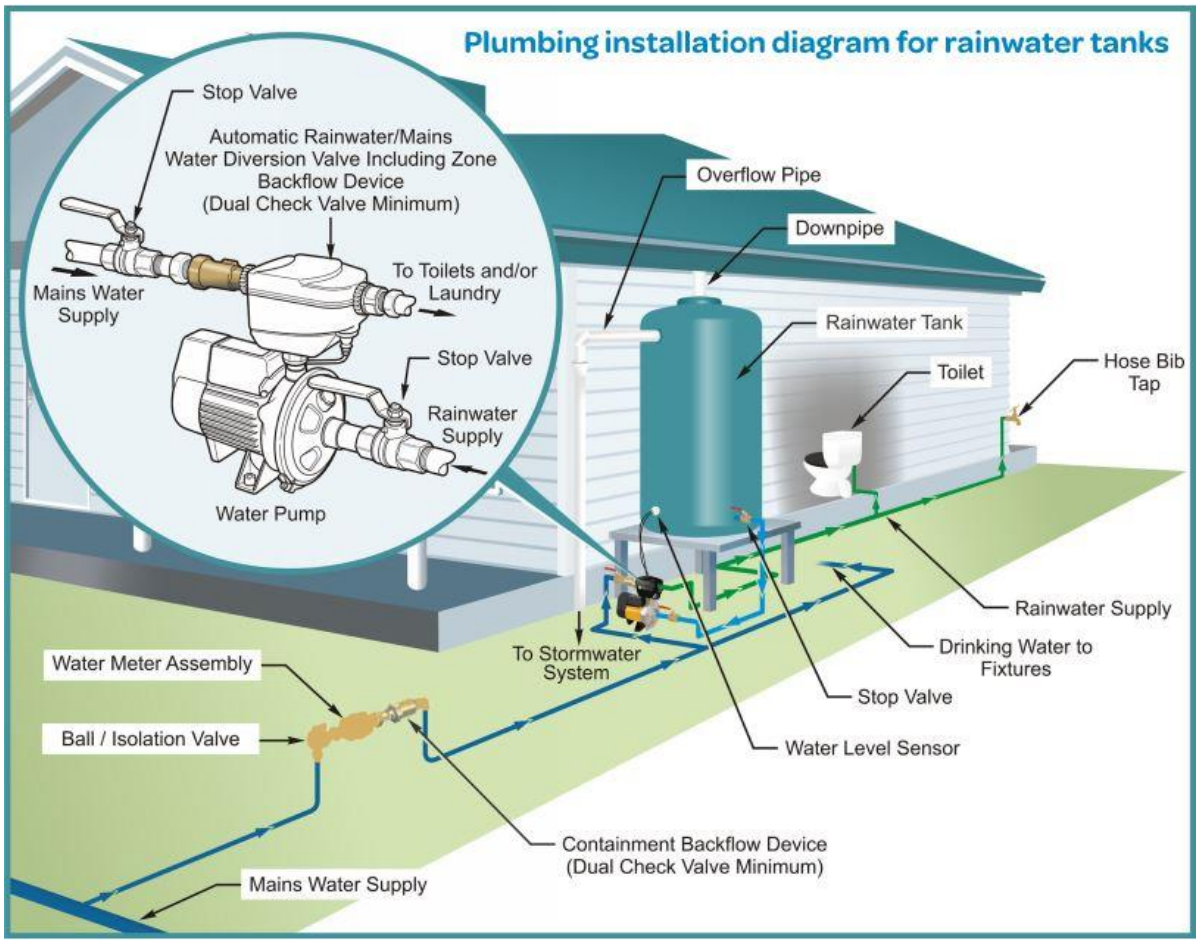


*Figure 4: Mains water bypass (source: Southeast Water)*

**Mains water bypass**

When rainwater is not available (empty tank), a mains water bypass, known also as switching device or diverter, insures uninterrupted supply to fixtures and appliances.

- Unless integrated within the water bypass, Australian Standard compliant backflow prevention devices, which is check valve allowing one directional flow, should be installed between pump and mains, so that rainwater does not infiltrate into potable water pipes. These devices can either be mechanically or electronically activated.
- Stop valves before and after equipment allow for easy maintenance or replacement

**Treatment**

- Rainwater quality is a function of a whole system approach, correct design, installation, and maintenance. When collected from restricted access roofs and used solely for low risk uses including irrigation, toilet flushing and washing machine, rainwater should not require additional downstream filtration
- Water discoloration is mainly due to settling and decomposing leaves which should be managed before reaching the tank or by an activated carbon post filter which also removes odors

- Suspended solids are removed via sediment filtration averaging 20 microns while finer filters down to 0.01 microns are also available for the removal of finer contaminants
- Chlorine an UV treatment is the final stage, usually only used for installations with high risk of ingestion
- Correct sizing and cartridges change are essential to prevent supply pressure drop

## Maintenance

Maintaining the rainwater harvesting system is the most important part to ensure acceptable water quality for the designated usages

The below inspection and maintenance checklist is provided by Australian Standard AS HB 230-2008.

| Indicative frequency | Inspection and criteria | Maintenance activities (where required) |
|---|---|---|
| Annual | Check whether any tree branches overhang the roof or are likely to grow to overhang the roof | If safe and where permitted, consider pruning back any overhanging branches |
| | Check that access covers to storage tanks are closed | Secure any open access covers to prevent risk of entry |
| | Check that screens on inlets, overflows and other openings do not have holes and are securely fastened | Repair any defective screens to keep out mosquitoes |
| | Inspect tank water for presence of rats, birds, frogs, lizards or other vermin or insects | Remove any infestations, identify point of entry and close vermin and insect-proof mesh |
| | Inspect tank water for presence of mosquito larvae (inspect more frequently in sub-tropical and tropical northern Australia, based on local requirements) | Identify point of entry and close with insect-proof mesh with holes no greater than 1.6 mm in diameter |
| | Inspect gutters for leaf accumulation and ponding | Clean leaves from gutters—remove more regularly if required. If water is ponding, repair gutter to ensure water flows to downpipe |
| | Check signage at external roofwater taps and that any removable handle taps are being properly used | Replace or repair the missing or damaged signage and fittings |
| | Check for cross-connections and inappropriate tapings by checking visible plumbing fittings and alternately turning off supplies | Remove any cross-connections and inappropriate tapings identified |
| | Check plumbing and pump connections are watertight/without leakage | Repair any leaks as necessary |
| | Check suction strainers, in-line strainers and pump location for debris | Clean suction strainers, in-line strainers or debris from pump location |
| | Check pump installation is adequate for reliable ongoing operation | Modify and repair as required |
| | Check first flush diverter, if present | Clean first flush diverter, repair and replace if necessary |
| | Check health of irrigation area and irrigated grass or plants | Investigate any adverse impacts observed that might be due to irrigation |
| | Check condition of roof and coatings | Investigate and resolve any apparent changes to roof condition, such as loss of material coatings |
| Triennial | Drain, clean out and check the condition of the tank walls and roof to ensure no holes have arisen due to tank deterioration | Repair any tank defects |
| | Check sediment levels in the tank | Organise a suitable contractor to remove accumulated sediment if levels are approaching those that may block tank outlets |
| | Undertake a systematic review of operational control of risks to the system | Identify the reason for any problems during inspections and take actions to prevent failures occurring in future |
| After 20 years and then every 5 years | Monitor the effectiveness of the irrigation equipment to assess for any clogging due to algal growth | Clean or replace clogged equipment |
| Ongoing | Inspect and follow up on any complaints or concerns raised that could indicate problems with the system | Repair or replace any problems that are notified |

*Figure 5: Rainwater harvesting inspection and maintenance activities (source: AS HB 230-2008)*