Three-Tier Stormwater Management Guidelines

Refer to the Design Criteria Manual for more robust descriptions and full requirements.

The Three Tiers of Rainfall Events			
Tier A	**Tier B**	**Tier C**	
Small events less than 50% of MAR	Larger events exceeding Tier A up to and including MAR	Extreme storm events that exceed Tier B	
Appropriate drainage system			
• Infiltration • Evapotranspiration • Re-use	• Detention/retention ponds • Exfiltration trenches • Dry wells • Bio-swales • Rain gardens • Etc.	**Minor system** Same as Tier B, plus: • Storm sewers • Culverts • Channels	**Major system** The following systems have max. hydraulic grade line below MBE: • Roadways • Overland flow paths • Channels • Watercourses
Drainage system goals			
All runoff should be handled on site	Detain runoff from the entire site and release it at the two-year forested flow rate	**Minor system** Detain the ten-year post-development event and release it at the two-year pre-development flow rate	**Major system** Accommodate runoff from the 100-year event
Requirements for design and documentation			
Demonstrate how 50% of MAR is being captured on site. This includes the lots and runoff from roads/ parking/ landscaping	Use the Modified Rational Method to determine the volume of the detention tank. Detention systems that discharge to the storm sewer, including flow-control manholes, shall be located on private property	**Minor system** The storm sewer in the road allowance needs to convey the ten-year event	**Major system** The hydraulic grade line for catch basin inlets and storm sewers designed to carry the 100-year event must be shown on the drawings
	Water quality needs to be addressed on site before discharging to the storm sewer. Demonstrate how this will be achieved (oil/grit separator, stormceptor, etc.)		

Calculating rainfall capture

Tier A

Use the entire site area and do not apply a runoff coefficient for the volume calculation. Tier A should be calculated using 43 mm of rain over the site area. That amount needs to be detained on site through infiltration, evapotranspiration, or re-use.

$$Tier\ A\ target\ rainfall\ capture = 50\%\ MAR\ depth\ \times A$$

Where
50% MAR depth = 0.043 m
A = Total site area (m^2)

Tier B

Slow forested flow rate using MAR intensity

Tier B slow release rate shall be achieved by using a maximum of 16.5 mm diameter circular orifice (or equivalent) in a flow control manhole.

$$Tier\ B\ release\ rate = forested\ runoff\ coefficient \times A \times MAR\ intensity \times N$$

Where:
Forested runoff coefficient = 0.1 x soil adjustment factor
A = Total site area (hectares)
MAR intensity = 3.3 mm/hr.
N = 0.00278

Full forested flow rate using derived rainfall intensity

In addition to the slow-release orifice, it may be necessary to have a second orifice/opening to reach full release rate for Tier B.

$$Tier\ B\ release\ rate = forested\ runoff\ coefficient \times A \times intensity \times N$$

Where:
Forested runoff coefficient = 0.1 x soil adjustment factor
A = Total site area (hectares)
Intensity = (calculate)
N = 0.00278

With the full release rate, the required Tier B detention volume can be calculated using a modified Rational Method. See the Design Criteria Manual section 2.4.

Tier C

Tier C shall be calculated using the methods detailed in the Design Criteria Manual, section 2.4. Tier C cannot rely on any infiltration. Tier C must detain the ten-year storm over the entire site and release at the two-year pre-development rate. This will require an orifice/opening sized for the Tier C pre-development rate.

The time of concentration shall be based on pre-development conditions.

As with Tier B, determine the storage volume based on the Tier C release rate.