FLOW SPLITTING DESIGN CRITERIA

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"Flow splitting" is used for diverting a quantity of water from a larger flow volume. Flow splitting is commonly used to separate the water quality volume (WQV) from larger flows. The objective is to isolate the WQV as much as possible from the diluting and mixing effects of larger flows. Isolation increases the efficiency of the pollutant removal mechanisms of the water quality treatment. Separation is accomplished through these guidelines as follows:

A. Typical Methods of Flow Splitting

1. Surface Flow Splitters

A typical rip-rap storm drain outfall drains to an open, shallow, concrete wall containment area, which has a low-flow orifice set in one wall at the bottom elevation. This orifice delivers the treatment volume to the water quality treatment facility. Once that volume/flow has been delivered, larger flows then overtop a weir set in another wall to flow to the quantity control facility or to a safe outfall system. This may also be accomplished through the use of a yard inlet, which overflows into a designed swale in large storm events.

2. Underground Storm Drain Structure Splitters

At the lowest invert of a typical storm drain structure, a low flow pipe is placed to deliver the treatment volume to the water quality treatment facility. Once that volume/flow has been delivered, larger flows exit the structure through a typical outgoing 10-year storm drain pipe to flow a safe, non-erosive outfall.

3. Integral Flow Splitters

The above technique can easily be adapted to underground quality treatment structures by adding an additional chamber to provide for diversion of flow.

4. Splitter Weir

A weir is constructed in the bottom of a storm drain facility, often an inlet, to divert flows to a low flow pipe. The weir is sized to divert the required WQV.

B. Flow Splitting Design

There are two general methods used to achieve flow splitting; Storage Method and Flow Restriction Method.

1. Storage Method

The preferred, easiest, and most effective method to design a flow splitter is with the "storage" method. This method uses the chosen treatment storage volume (the WQV) as the key to the system. The treatment volume is delivered to the quality facility. The facility is sized to store this design volume. The water surface elevation of that treatment volume is then used to set the elevation of the controlling overflow weir or pipe in the flow splitter structure. The delivery opening to the quality facility must be checked to ensure it is non-restrictive, but will not allow too much flow to enter the facility. This is accomplished via item “2” below. The diameter of the flow split delivery pipe should be one standard size larger than the size required for the restricted flow method.

With this method of flow splitting, the embankment must be designed to provide a minimum of 1 foot of freeboard above the 10-year WSEL within the facility. Overflows occur through the flow splitter structure … no overflow weir or other structure is allowed in the facility embankment. If the freeboard can not be achieved and an overflow structure is required in the embankment, then the “flow restriction” method must be used.

2. Flow Restriction Method

If site constraints preclude the storage method from working, then the flow splitter can be designed with the "flow restriction“method. This is a less preferred method. With this method computations are supplied to demonstrate that the treatment volume delivery opening is restrictive to peak flows (Q’s) greater than that produced by the WQV. Usage of this method requires a structural overflow weir or riser in the water quality facility to pass the flow produced by larger storms. Grassed weirs are not acceptable.

To follow this method, determine the peak treatment discharge (Q) as outlined in Appendix D.10 of the 2000 Maryland Stormwater Design Manual.

Utilizing the Q calculated above, determine either the pipe or orifice size that will convey only the required flow via the orifice flow equation. The head on the pipe should be taken from the centerline of the first flush pipe to the invert of the overflow pipe.

C. Materials/Pipe Criteria

Flow splitting pipes typically range in size between 6 - 12 inches; however, larger pipes may also be used. The minimum pipe size allowed is 6 inches. When splitting from a publicly maintained manhole, a maximum distance of 12 inches is allowed between the invert of the 10-year outgoing storm drainpipe and the crown of the first flush pipe. Weirs are not allowed in public structures.

D. Trash Rack Criteria

Trash racks must be designed to be self flushing whenever possible. Refer to the Montgomery County detail entitled Diversion Structure Manhole Detail. All flow split delivery openings or pipes smaller than 15 inches in diameter require trash racks. If the flow split delivery opening or pipe is 15 inches or larger in diameter, a trash rack is not required. Trash racks may be either expanded metal or rebar. All trash racks must be removable.

E. Construction Notes on Plans

It is extremely important that flow-splitters be built correctly. Please insure the detailed plans reflect the following:

1. The Sequence of Construction must specifically identify the flow splitter by structure number.

2. Add the actual dimension between the invert of the flow splitter pipe and the invert of the overflow pipe to the detail on the plans.

3. Add a note to the detail calling for “the contractor to verify that dimension prior to backfilling around the structure, and to notify the design engineer immediately if there is a discrepancy.”