



Nashville, TN Stormwater Design Guide

Downstream Defender®



Rated for 50% TSS Removal

The Downstream Defender® is an advanced vortex separator approved by Nashville, TN Metro Water Services for **pretreatment** (50% TSS removal) of stormwater runoff.

The pretreatment designation allows the Downstream Defender® to be used upstream of other stormwater treatment practices, such as infiltration (Fig.1).

The Downstream Defender® is approved for “online” or “offline” use.



Fig.1 The Downstream Defender® is approved for pretreatment (50% TSS removal) by Nashville Metro Water Services.

Table 1. Approved Treatment Flow Rates for the 2.45" / hr Nashville, TN Design Storm

Approved Nashville Metro Water Services Water Quality Flow Rate	Recommended Peak Online Flow	Downstream Defender Model & Diameter	Maximum Pipe Size	Recommended Inlet pipe/outlet pipe size for offline design	Rim Elevation to Outlet Invert ^{1,2}	Outlet Invert to Sump Floor
(cfs)	(cfs)	(ft)	(in)	(in)	(ft)	(ft)
1.12	3.0	4	12	10 / 12	2.8	4.08
2.52	8.0	6	18	15 / 18	3.4	5.86
4.49	15.0	8	24	20 / 24	4.2	7.67
7.00	25.0	10	30	24 / 30	5.0	9.44
10.08	38.0	12	36	30 / 36	5.7	11.18

¹Including 4" frame and cover.

² Please contact your Hydro representative at (770) 380-7749 for product applications involving shallow or minimum cover.

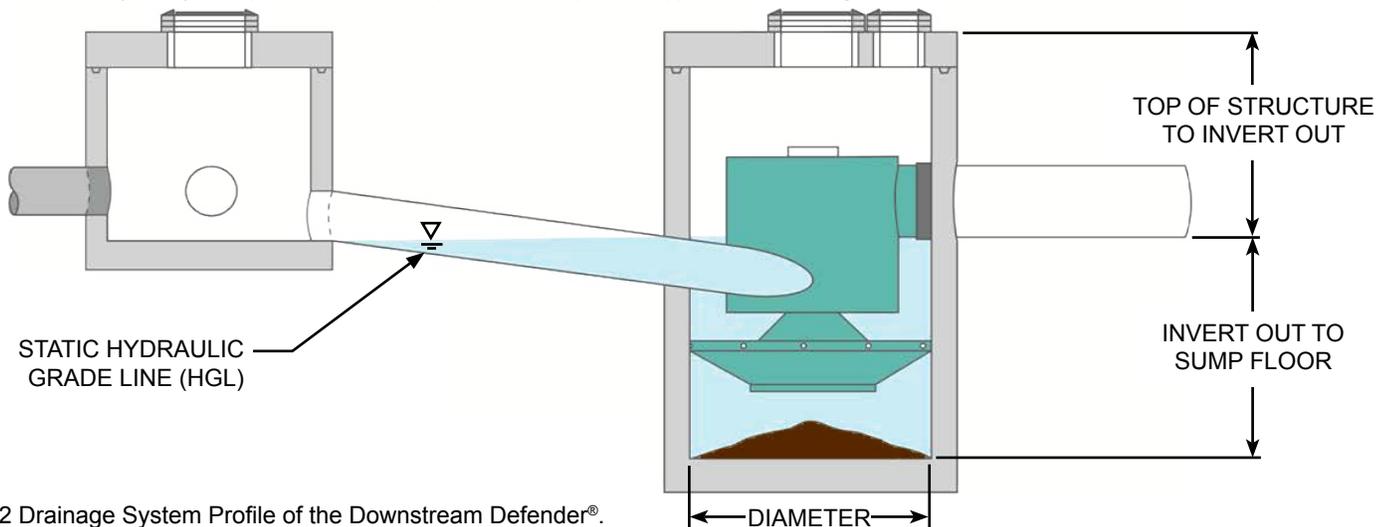


Fig.2 Drainage System Profile of the Downstream Defender®.



Downstream Defender®

Layout

Minimal Head Loss

The Downstream Defender® has a submerged tangential inlet and includes no internal orifices or weirs. These key features reduce the risk of blockage and decrease system headloss. The headloss through the Downstream Defender® is dependent on the pipe sizes. However, at recommended pipe sizes and Nashville approved treatment flow rates, headloss through the Downstream Defender® will only be 2-3 inches.

Setting the Inverts of the Downstream Defender®

The inlet pipe of the Downstream Defender® enters the manhole tangentially to generate rotational flow and is submerged to reduce the risk of blockage and decrease system headloss. The inlet pipe invert is exactly one pipe diameter lower than the outlet invert. The outlet pipe is set to match, or be lower than the outlet invert of the upstream bypass/junction structures. With this configuration, the overall HGL is not adversely affected (Fig.2).

No Bypass Manhole – Online Configuration

The Downstream Defender® is approved by Nashville Metro Water Services for Online Use (Fig.3). To prevent peak storm flows from washing previously captured pollutants out of stormwater treatment devices, only devices that are independently proven to prevent pollutant washout should be used online. As shown in Fig.3, an Online Downstream Defender® does not require an additional bypass or junction manhole and the entire peak storm flow is conveyed through its vortex chamber (i.e. there is no internal bypass).

A Downstream Defender® can be placed Online as long as the Water Quality Treatment Flow Rate (Refer to Table 1: Column 1) is greater than or equal to the “Nashville designstorm” flow rate and the drainage system pipe diameter is less than or equal to the Downstream Defender®’s maximum inlet pipe diameter (Refer to Table 1, Column 4). If the Downstream Defender®’s maximum inlet pipe size is too small compared to the drainage pipe, a larger model should be considered or a bypass/junction manhole should be provided.

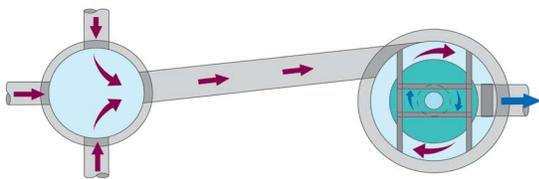


Fig.3 Online Downstream Defender®.

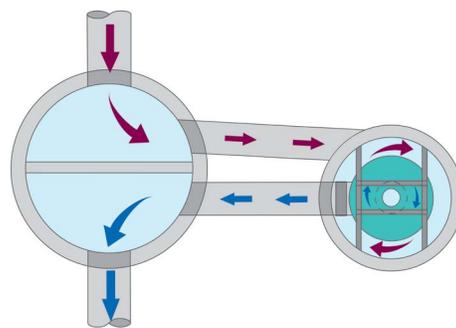


Fig.4 Offline Downstream Defender®.

Single Bypass/Junction Manhole – Offline Configuration

The Downstream Defender® can be designed with an external bypass or junction manhole (Fig.4). The advantages of this layout include diverting peak storm flows away from the treatment system, avoiding oversized treatment systems due to pipe size or peak flow and the treatment system can be located to avoid utilities or difficult maintenance and inspection areas.

Due to the flexibility of the Downstream Defender®’s internal components and tangential inlet, the offline design may only require one manhole for both bypass and junction.

Downstream Defender®

Downstream Defender® Sizing Calculator for Tennessee Projects

Hydro International recommends that consultants considering a Downstream Defender® for use on a Tennessee project use Hydro International's online Downstream Defender® Sizing Calculator for Engineers.

Using basic project-specific inputs such as Water Quality Flow Rate, the calculator determines the most appropriate Downstream Defender® model size for the job (Fig.5).

As the Downstream Defender® is approved for online or offline use by Metro Nashville, the calculator also uses inputs such as Peak Flow Rate to recommend whether an offline configuration is more appropriate than an online configuration. For Tennessee projects outside of Nashville, check your local ordinances to see if stormwater treatment devices are allowed online.

The Downstream Defender® Sizing Calculator for Engineers can also be used to generate site-specific detail drawings for either online or offline devices. Users may opt to submit their design to Hydro International for a technical review and pricing.

To use the online Sizing Calculator for Engineers visit <http://sizingcalculator.hydro-int.com/>.



Fig.5 The Downstream Defender® Sizing Calculator for Engineers is an online tool that determines the most appropriate Downstream Defender® model size for a specific project.

Important Links

Downstream Defender® on Hydro International Site: <http://www.hydro-int.com/us/products/downstream-defender>

Interactive Downstream Defender® Sizing Calculator for Engineers: <http://sizingcalculator.hydro-int.com/>

Tennessee Representative - Will Hall (770) 380-7749; whall@hydro-int.com

Hydro International, 94 Hutchins Drive, Portland, ME 04102

Tel: (207) 756-6200 Fax: (207) 756-6212

Email: stormwaterinquiry@hydro-int.com Web: www.hydro-int.com

Stormwater Solutions

Page | 3

© 2015 Hydro International DD_DG_Nashville_E/1508