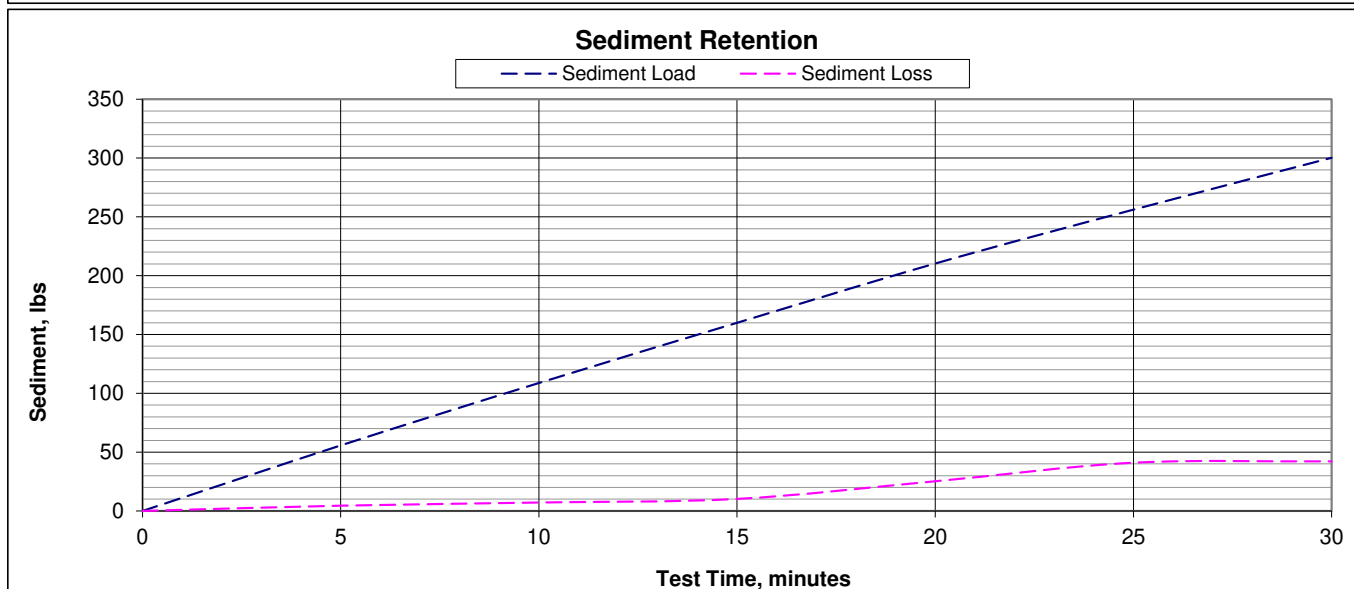
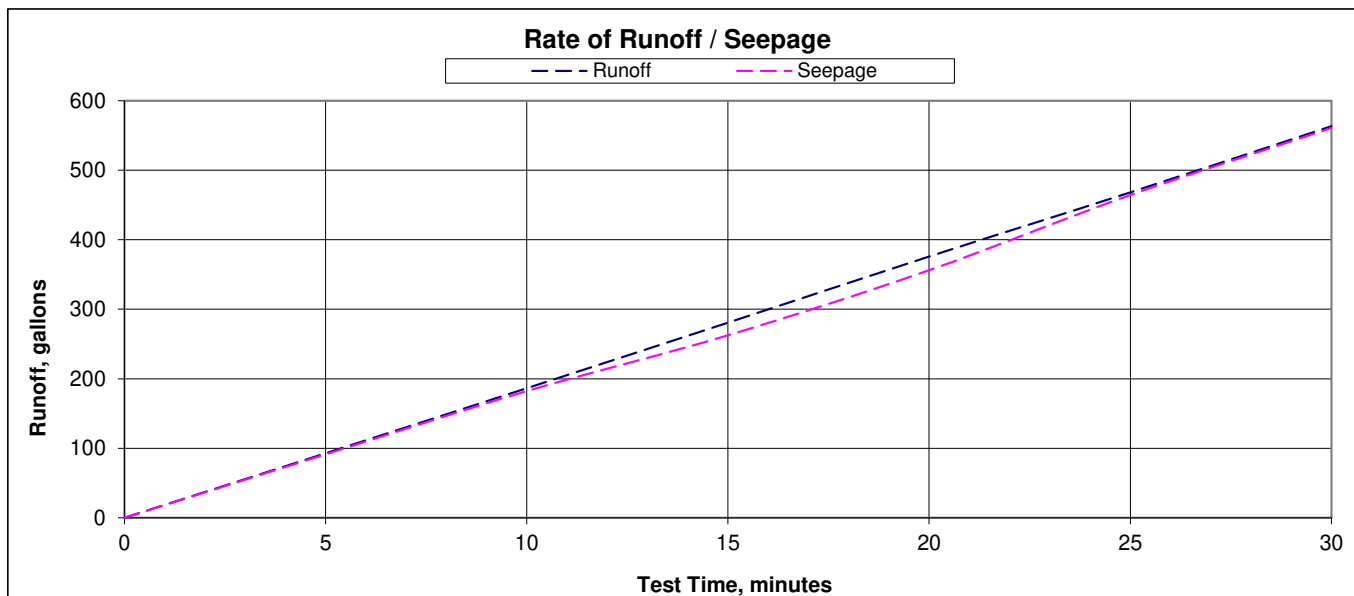


John M. Ellsworth Co., Inc.

Project: ASTM D 7351 Testing - modified for inlet protection
Client: _____ **Product:** Drain Guard
Test Date: 11/16/2023
SRD/Setup: Inside 2-ft Square Grated Inlet
Duration: 30 minutes
Water / Soil Input: 4700 lbs water 300 lbs soil
Sediment Concentration: 6.0% manufactured sand

Soil Retention Effectiveness: 85.95%
Water Retention Effectiveness: 0.45%



The testing is based upon accepted industry practice as well as the test method listed. Test results reported herein do not apply to samples other than those tested. TRI neither accepts responsibility for nor makes claim as to the final use and purpose

Testing Overview

The large-scale testing reported herein was performed in general accordance with ASTM D 7351 modified to present the flow to an area inlet. For this testing, a simulated area inlet installation comprised of an approximate 24-inch x 24-inch opening simulating a manhole inlet positioned at the center of a containment area was used. The SRD was installed inside of the inlet opening according to manufacturer recommendations and exposed to simulated runoff. Sediment-laden water was piped and discharged into the fully contained area around the inlet opening and allowed to run into and seep through the installed inlet protection SRD. The amount (via water and soil weight) of sediment-laden flow was measured both upstream and downstream of the SRD. The measurement of sediment that passes through the installed SRD is compared to the measured amount in the upstream flow and is used to quantify the effectiveness of the SRD in retaining sediments while allowing continued seepage. The measurement of water that passes through the installed SRD compared to the amount of the upstream flow is used to quantify the effectiveness of the SRD in allowing continued seepage.

Inlet Protection SRD "Benchmark" Properties

SRD fabric index properties were provided by the manufacturer and are included in Table 1. The properties are for the geotextile filter material comprising the device. These are considered the "benchmark" properties of the product tested.

Table 1. "Benchmark" Test Results (Geotextile Filter Material)

Property	Units	Test Method	Test Result
Grab Tensile Strength	lb	D4632	400 x 275
Grab Tensile Elong.	%	D4632	40 x 22
Trap Tear Strength	lb	D4533	165 x 140
CBR Puncture	lb	D6241	654
AOS	US Sieve	D4751	30
Permittivity	sec ⁻¹	D4491	0.25
UV Resistance - 500 hr.	% retained	D4355 / D5035	90

Test Setup

The test procedure requires an integrated system of equipment to accomplish the full-scale testing of inlet protection SRDs. The system used for this testing includes the following components:

- A tank with an internal paddle mixer device mounted on scales capable of holding/weighing 10,000 lb of sediment-laden water.
- An elevated simulated storm drain inlet with a fully contained area for upstream ponding and downstream accessibility for sampling.
- A tank mounted on scales of sufficient volume to collect all runoff passing the SRD.

Concentrated sediment-laden flow is conveyed by pipe from the mixing tank to the simulated storm drain inlet located between the mixing and collection tanks. The fully contained simulated inlet includes an 8 ft diameter retention zone encircling the inlet opening. For the testing reported herein, the sediment-laden water is discharged into the retention zone and allowed to run directly into the inlet and seep through the SRD installed inside the simulated inlet. The seepage migrates through the SRD and drains into the collection tank.

Test Soil

The test soil used had the characteristics shown in Table 2. A soil gradation report can be found in the appendix.

Table 2. Test Soil Characteristics

Soil Characteristic	Test Method	Value
% Gravel	ASTM D 422	0
% Sand		96
% Silt & Clay		4
Plasticity Index, %	ASTM D 4318	NP
Soil Classification	ASTM	SP

Inlet Protection SRD Installation

The inlet protection SRD in this testing was installed inside the inlet in accordance with the provided installation instructions and as shown in the pictures herein. Overflow / Bypass features of the installed SRD can contribute to product performance. The installed SRD was a geotextile bag hanging below the steel grate of the inlet structure. No overflow/bypass feature was apparent in the tested product.

Mixing Sediment-Laden Runoff

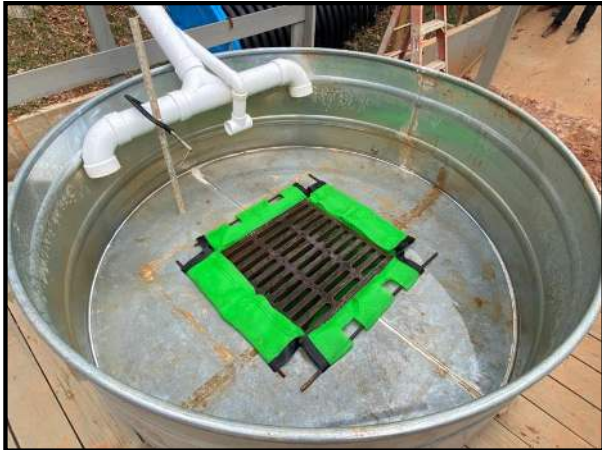
Sediment-laden runoff was created by combining water and soil in the mixing tank and agitating during the test. 4700 lb of water and 300 lb (dry weight) of test soil were combined to create the sediment-laden runoff of 6% (60000 mg/L). These quantities represent the "default" condition given in the standard which is a hypothetical 30-minute, peak flow from a 24-hour, 4-inch rainfall on a 100-ft long x 20-ft wide bare sand soil slope.

Specific Test Procedure

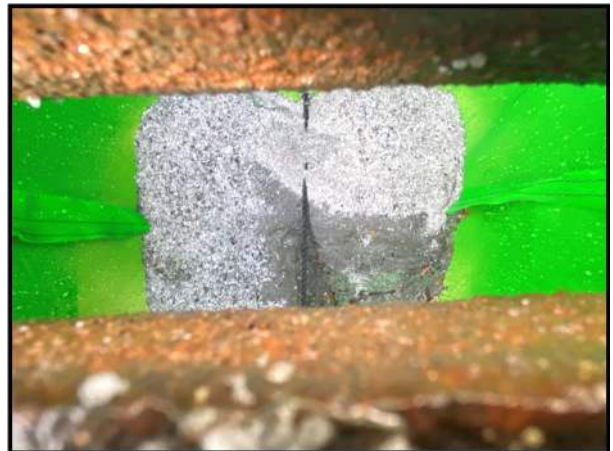
After the SRD is installed, the sediment-laden runoff is discharged evenly for 30 minutes while agitation is maintained. The quantity of released runoff is measured at 5-minute intervals by noting the reduction in weight in the mixing tank, adjusting the valve on the tank outlet to increase/decrease flow to stay as close as possible to the target ($5000 \text{ lb} / 30 \text{ min} = 167 \text{ lb} / \text{min}$). For this testing, the discharge flow is introduced to allow it to flow up to and into the SRD. Retention observations and ponding depths, and associated times, are recorded during the test. As runoff passing the SRD system is collected, the weight and volume of the collection tank is recorded and grab samples are taken, at 5 minute intervals. Cutoff time is the earlier of 90 minutes or when there is low-volume ponding and minimal discharge. Grab samples are evaluated in a lab to determine turbidity (when requested) and to determine percent dry solids content. Sediment retention effectiveness and water retention effectiveness are calculated from the grab sample sediment concentrations and the associated measured runoff and seepage.



Inlet Testing Setup (Typical)



Product Installed / Grate In Place / Test Initiated



Deposition At End-of-Test / Close-up of Captured Sediment

APPENDIX - DATA

Client: UltraTech	Product: Drain Guard
SRD/Setup: Inside 2-ft Square Grated Inlet	Soil: Manufactured Sand
Date: 11/16/2023	Start Time: 14:28

Sample Number	Test Time, minutes	Turbidity	Total Weight, g	Dry Weight, g	Bottle Weight, g	Dry Sediment Weight, mg	Total Collected Water Wt., g	Total Collected Volume, l	Sediment Conc., mg/l	% Solids	Reservoir Weight, lb	Assoc. Water Discharge, gal	Cumm Water Discharge, gal	Coll. Tank Depth, in	plot time	SRD Ponding Height, in	Cumm Soil Loss, lbs	Assoc. Solids Loss, lbs	Soil Retention Effectiveness, %	Water Retention Effectiveness, %					
Upstream																									
B0	0	645	375.07	171.42	156.53	14894	47.12	0.25	59576	6.82%	5000	92.8	92.8		5.0		55.7	55.7							
B5	5	726	381.96	171.682	156.80	14882	53.48	0.25	59526	6.61%	4170	93.6	186.4		10.0		108.8	53.1							
B10	10	784	384.55	170.061	156.08	13979	58.41	0.25	55917	6.12%	3336	94.3	280.7		15.0		160.0	51.2							
B15	15	747	387.82	170.692	156.61	14087	60.52	0.25	56346	6.09%	2498	95.1	375.9		20.0		210.4	50.4							
B20	20	707	385.46	170.998	157.67	13327	56.79	0.25	53308	5.85%	1654	92.3	468.2		25.0		256.1	45.8							
B25	25	798	386.80	169.242	156.90	12344	60.66	0.25	49374	5.37%	838	95.2	563.4		30.0		300.2	44.1							
B30	30	769	388.21	169.753	157.88	11871	60.57	0.25	47482	5.15%	0	-	-		-		-	-							
Water Added To Mixer (lbs): 4700				Soil Added To Mixer (lbs): 300				AVGS:		54504	6.00%	TOTALS:		563.4					300.2						
Downstream													0	0	0										
A0	0	713	371.53	158.93	157.00	1934	55.60	0.25	7735	0.90%	0	91.3	91.3	0.0	5	0.0	4.5	4.5	85.95%	0.45%					
A5	5	636	358.01	157.50	156.96	539	43.55	0.25	2156	0.27%	766	90.9	182.3	39.0	10	15.0	7.2	2.7							
A10	10	614	352.01	159.54	158.68	851	33.79	0.25	3405	0.44%	1528	80.3	262.6	77.8	15	24.0	10.2	3.1							
A15	15	483	382.40	159.59	158.53	1053	64.28	0.25	4210	0.47%	2201	93.6	356.2	112.0	20	31.0	25.2	15.0							
A20	20	715	359.01	161.81	155.08	6732	42.12	0.25	26930	3.30%	2997	108.2	464.4	152.5	25	31.0	41.0	15.8							
A25	25	421	374.07	155.76	155.47	287	62.84	0.25	1148	0.13%	3915	96.4	560.8	199.3	30	33.0	42.2	1.1							
A30	30	481	375.70	155.25	154.91	333	65.54	0.25	1334	0.15%	4721	-	-	-	-	-	-	-							
A35	35																								
A45	45																								
A60	60																								
A75	75																								
A90	90																								
								6703		0.81%	4721	560.8			42.2										
Soil Collected (lbs):				n/a				(avg)		(avg)	(total)	(total)	(approx.)												