BMP T8.##: Filter System Box

Description

The Filter System Box is a stormwater treatment device constructed in a mountable box that is designed to treat elevated guideway portions of light rail track. The system utilizes a proprietary high-flow media, Filterra or BioPod, to allow for a smaller device footprint. The box also offers the flexibility to be at grade or underground depending on site conditions.

Applications and Limitations

Due to its design flexibility, the Biofiltration Box can be used in elevated, at grade, and underground treatment scenarios that exist within light rail Right-Of-Way (ROW). Either Filterra or BioPod StormMix medias can be selected for use in this device.

If the device is installed at grade or underground, it must be placed 5 feet away from the base of the guideway column to allow for seismic inspections. The device shall be placed under the elevated guideway and in line with the track so as not to require additional right-of-way. This BMP assumes a design contributing drainage basin of 0.09 aces of impervious surface, which is the typical area between two columns of aerial guideway (28 feet wide by 140 feet long).

Design Criteria

Follow design criteria for BMP T7.30 except where differences are noted below.

Sizing Procedure

If selecting Filterra Media

- The footprint of the treatment device will be based a hydraulic loading rate of 175 inches per hour per square foot of media surface area, or as approved the latest Technology Assessment Protocol – Ecology (TAPE) General Use Level Designation (GULD) for Enhanced. A minimum media depth of 1.75 feet is required.

If selecting BioPod StormMix Media

- The footprint of the treatment device will be based a hydraulic loading rate of 1.6 gallons per minute per square foot of media surface area, or as approved the latest TAPE GULD for Enhanced. A minimum media depth of 1.5 feet is required.

The Filter System box shall be designed to treat the water quality design flow rate. The flow rate is the peak 15-minute flow rate calculated using the Western Washington Hydrology Model (WWHM) or other Ecology-approved continuous runoff model for Western Washington and any of the three approved methodologies in Chapter 2.7.6 of the SWMMEW for Eastern Washington.

The required surface area should be determined by dividing the water quality design flow rate by the hydraulic loading rate.

The Filter System Box should be a rectangular box constructed of corrosion resistant and lightweight material. The box shall be 4 feet wide by 4 feet long with a height that is dependent on the chosen treatment media and freeboard. The minimum required freeboard shall be 6 inches as shown in Figure T8.B. Three inches of mulch shall be placed on top of the treatment media. An underdrain surrounded by drainrock is required in this design. Other box sizes, to match site constraints and drainage basins, may be designed using SWMMWW procedures with an Ecology-approved continuous simulation model.

Inlet and Outlet

An inlet from the guideway downspout should be piped to the Filter System Box as shown in Figure X. The inlet pipe should have a minimum 0.5% slope to maintain positive drainage, and steep slopes should

be avoided to minimize flow velocity and scour potential as the pipe discharges into the treatment box. A rock splash pad should be installed at the base of the inlet pipe to prevent scour.

An underdrain should be installed along the bottom of the device and connected to the outlet. For BioPod, or as required by the selected technology's GULD, provide an orifice on the outlet pipe sized for the water quality flow rate. A standpipe connected to the outlet pipe will provide bypass during high-flow events.

If the device is mounted, the underdrain pipe will extend a few inches beyond the side of the box and capped to provide cleanout access. In this scenario, the inlet and outlet will be located on the same side of the box. If the device is installed at grade or underground, a cleanout standpipe should be installed within the box and connected to the underdrain pipe. In this scenario, the inlet and outlet will be located on opposite sides of the box. In all scenarios, an atrium or beehive grate should be placed on the overflow standpipe to prevent mobilizing debris during overflow events. See Figure X.XX for pipe configurations within the device.

Access

If the device is elevated, a ladder or bucket truck will be needed by maintenance personnel to reach the box so cleanouts, mulch raking, and media and mulch replacement can occur. If it is preferred, a telehandler can be used to remove the box from the column so maintenance work can be performed on the ground. If the treatment media needs to be replaced, a vactor truck will need access to the device to aid in media removal or the media will have to be removed by hand and shovel.

A formal access road is necessary to provide maintenance. The access shall provide for connection to a public road or property, not exceed the slope and width requirements for the required equipment, and be accessible all times of the year on an all-weather access. The filter box system cannot be used when security, site management, open space and landscaping requirements, air-space leases, or other factors limit or prohibit access to inspect or maintain the filter box system.

Recommended Design Features

If installing the device at grade or underground, a hasp should be installed to allow the owner to lock the lid to prevent access by unauthorized persons.

Construction Criteria

The Filter System Box shall not be put into operation until areas of exposed soil in the contributing drainage catchment have been sufficiently stabilized. Deposition of eroded soils can clog the engineered soil media or impede the growth of vegetation in the unit.

Filterra media shall be sourced from Contech Engineered Solutions, LLC and BioPod StormMix media shall be sourced from Oldcastle Infrastructure, Inc.

Installation Specification

If the device is elevated, a platform connected to the track column should be installed under the device as well as mounting braces to keep the box secure. See Figure X.XX for mounting details.

If the device is installed underground, an access hatch should be installed at grade for access into the vault.

The Filter System Box shall not be used as a sediment control BMP.

Inspection and Maintenance Criteria

Filter System Boxes should be inspected at minimum once every 12 months, or as recommended by the technology's GULD or by the vendor. Maintenance intervals should be more frequent if past inspections at this site or similar sites note heavy sediment loading, unacceptable system performance, or other indicators that more frequent inspection and maintenance is warranted. At a minimum the mulch should be replaced, trash removed, and the top few inches of engineered soil media raked once a year.

BMP T8.##: Filter System Downspout Unit

Description

The Filter System Downspout Unit is designed to treat stormwater runoff in areas with little space. The system contains pillows, filled with a high-capacity ion-exchange media, inside an 8-inch diameter PVC pipe. An overflow pipe is located at the top of the device for high flow events while a flow control valve is located at the bottom to ensure sufficient residence time for treatment.

Applications and Limitations

The Filter System Downspout Unit is indicated for elevated installations where treatment is needed along the track column from elevated sections of light rail track. This device should not be used for underground treatment installations.

Design Criteria

Sizing Procedure

The Filter System Downspout Unit should be designed to treat the water quality design flow rate. The flow rate is the peak 15-minute flow rate calculated using the Western Washington Hydrology Model (WWHM) or other Ecology-approved continuous runoff model for Western Washington and any of the three approved methodologies in Chapter 2.7.6 of the SWMMEW for Eastern Washington.

A single 8-foot-long section of the Filter System Downspout Unit can treat 7.4 gallons per minute. This flow is equivalent to the typical area between two columns of aerial guideway (28 feet wide by 140 feet long). If the water quality flow rate is greater than 7.4 gallons per minute, use multiple units. In these instances, the units will be installed in parallel with flow being split equally between each unit (see Figure X.XX). If site conditions dictate a shorter or longer section of pipe, the designer should coordinate with the vendor to determine the optimum unit length to meet treatment goals.

Inlet and Outlet

This device is designed to be placed as an add-on to the guideway downspout drainage pipe. A flow splitter attached to the drainage downspout pipe will be installed just above the Filter System Downspout Unit inlet routing water into the treatment device. Flow at the outlet of the unit is controlled by an orifice and runs through a pipe where it eventually connects back into the downspout drainage pipe. See Figure X.XX for the pipe configuration for a single unit.

If multiple devices are to be installed in series, the flow splitter will run into a horizontal distribution pipe with an exit to each unit. A flow control valve will be placed at the top of each unit to create an equilibrium between the units or to isolate a single unit for maintenance. The outlet configuration remains the same as the single unit, but all the flow is funneled into a single pipe that ties back into the drainage downspout pipe.

Access

The type of access needed for this device is dependent on the equipment that will be used, such as a bucket truck for cleanouts, valve adjustments, and media replacement. A formal access road is necessary to provide maintenance. The access shall provide for connection to a public road or property, not exceed the slope and width requirements for the required equipment and be accessible all times of the year on an all-weather access. Access cannot be provided and the filter box system cannot be used when security, site management, open space and landscaping requirements, air-space leases, or other factors limit or prohibit access.

Recommended Design Features

Select media for filling treatment pillows based on site conditions and necessary treatment requirements. A combination of different media pillows can be arranged in the unit to meet treatment requirements.

Construction Criteria

The Filter System Downspout Unit should not be put into operation until areas of exposed soil in the contributing drainage catchment have been sufficiently stabilized. Deposition of eroded soils can clog the engineered soil media or impede the growth of vegetation in the unit. The unit should not be used as a sediment control BMP.

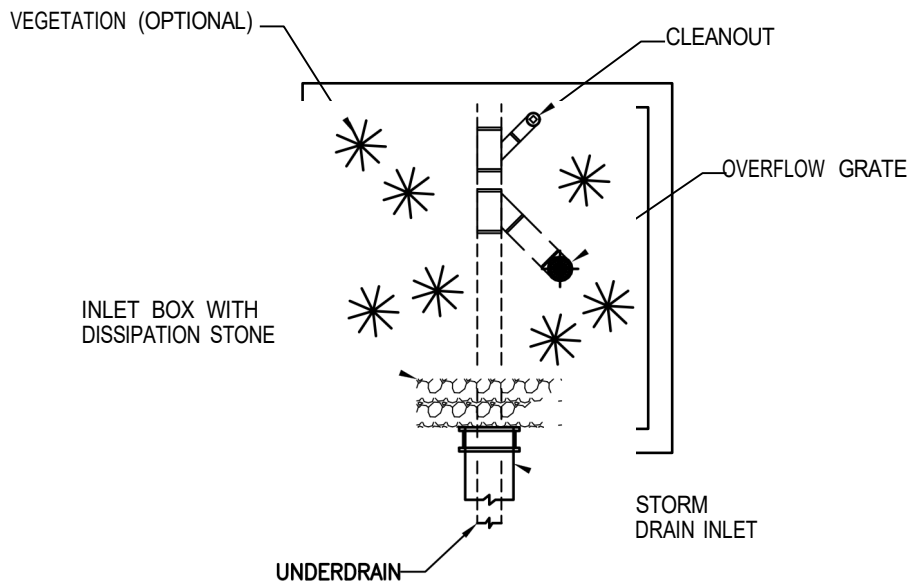
Installation Specification

The Downspout Unit should be secured to the track columns with corrosion resistant brackets. See Figure X.XX for detail on bracket placement.

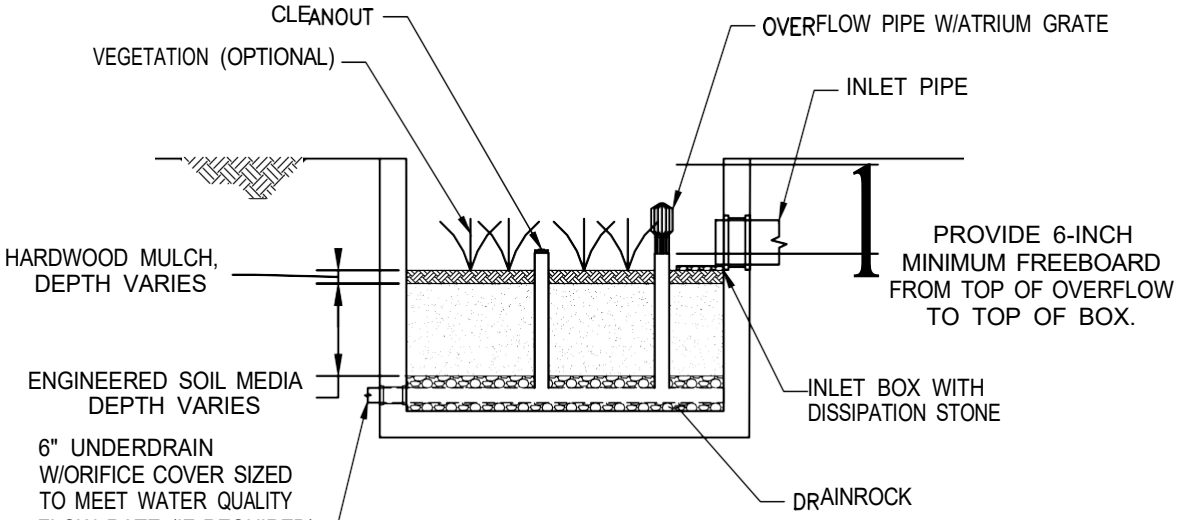
Inspection and Maintenance Criteria

Filter System Downspout Units should be inspected monthly for a minimum of 12 months after constructed to determine appropriate inspection and maintenance requirements. At a minimum each unit should be inspected monthly for signs of debris and oil accumulation. Media pillows should be replaced if there is evidence of blockage, presence of significant oil or grease on the unit walls, accumulation of excessive debris, or more than 2 inches of standing water remains in the unit between rainfall events.

Figure V-5.#: Filter System - Vault Box



VAULT BOX - OPEN TOP
PLAN VIEW



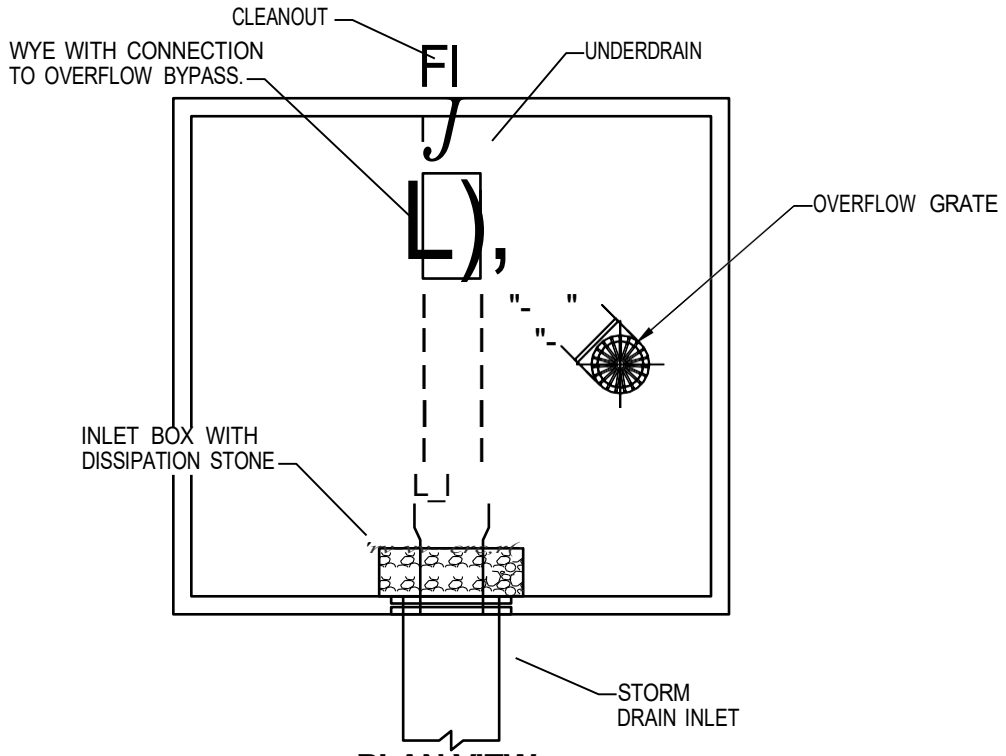
VAULT BOX - OPEN TOP
SECTION

NOTTO SCALE

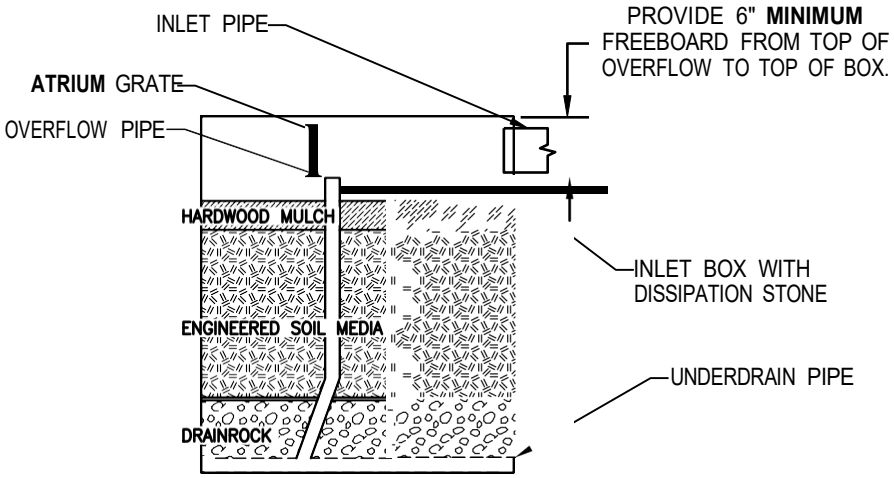
DRAFT IN DEVELOPMENT

Vault Box with Open Top - Plan and Section

Figure V-5.#: Filter System - Vault Box



PLAN VIEW



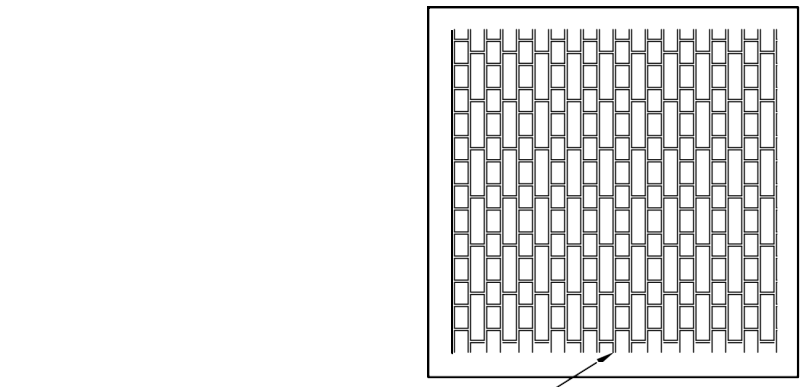
SECTION A-A

NOT TO SCALE

DRAFT N EVELOPMENT

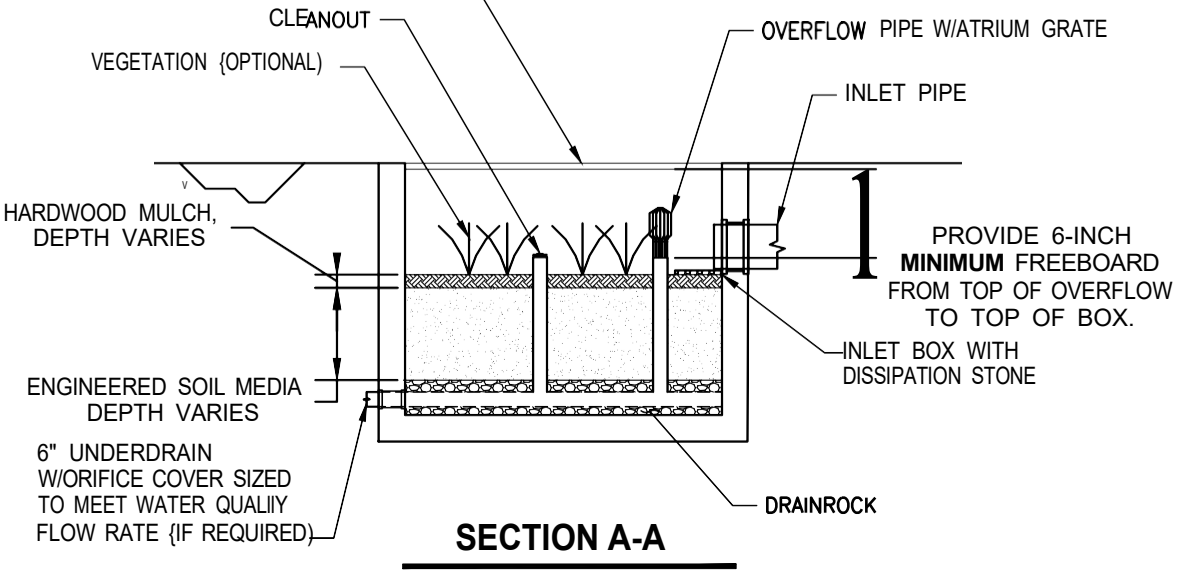
Typical Vault Box Plan and Section

Figure T-8.D: At Grade Filter System Box with Surface Grate



ADA RATED GRATE WITH OPEN AREA SUFFICIENT VEGETATIVE HEALTH

PLAN VIEW



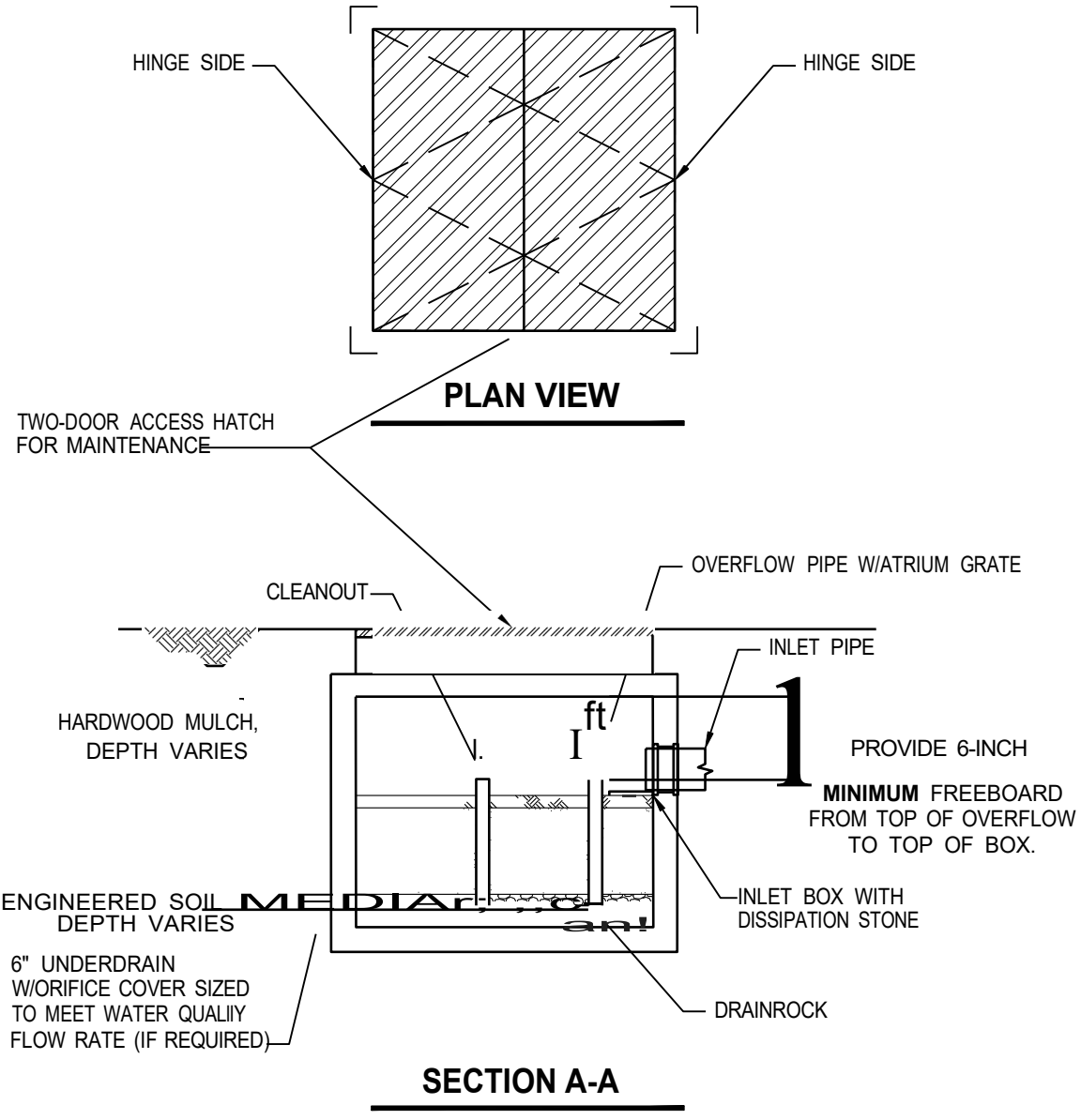
SECTION A-A

NOT TO SCALE

DRAFT N EVELOPMENT

At-Grade Filter System Box with Surface Grate

Figure T-8.E: Underground Filter System Box with Access Hatch

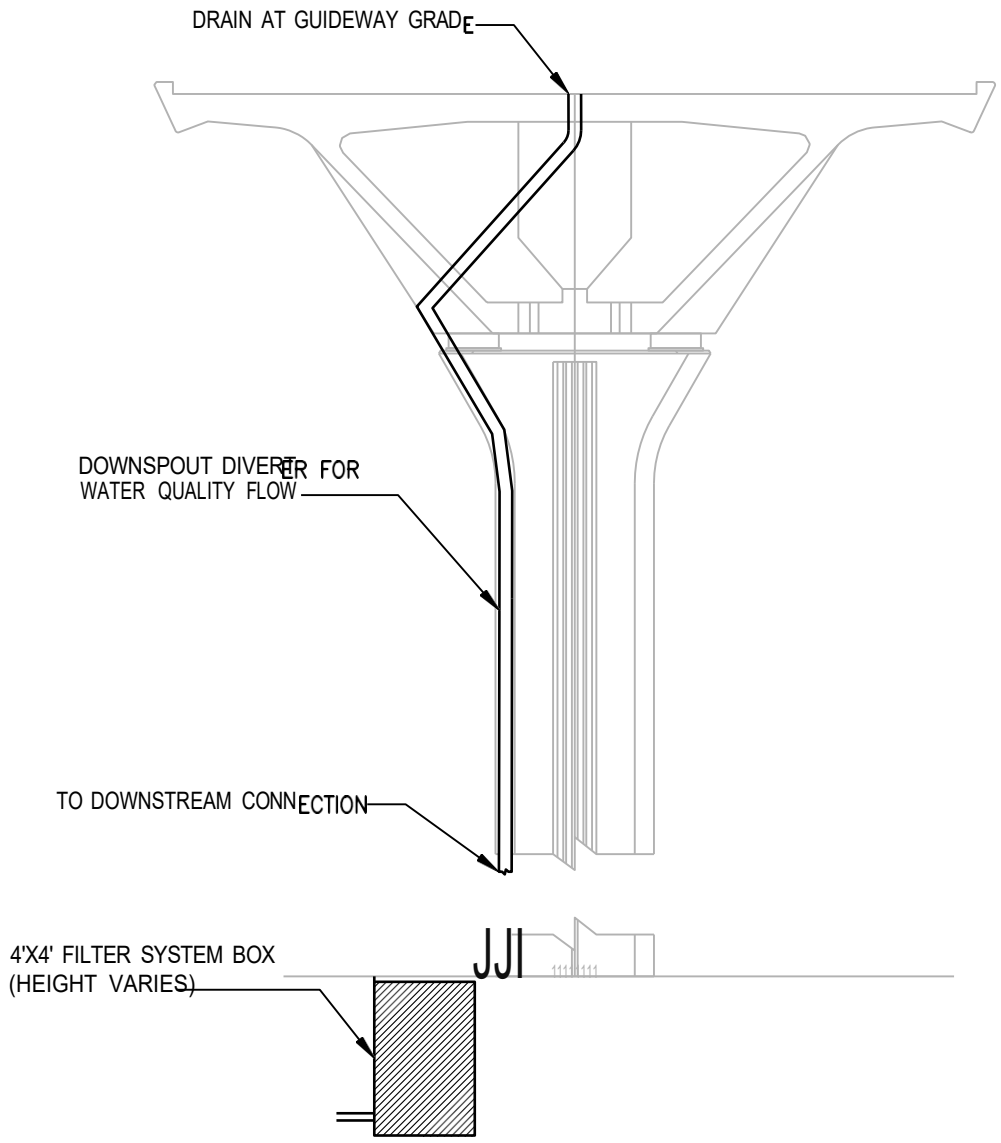


NOT TO SCALE

DRAFT N EVELOPMENT

Underground Filter System Box with Access Hatch

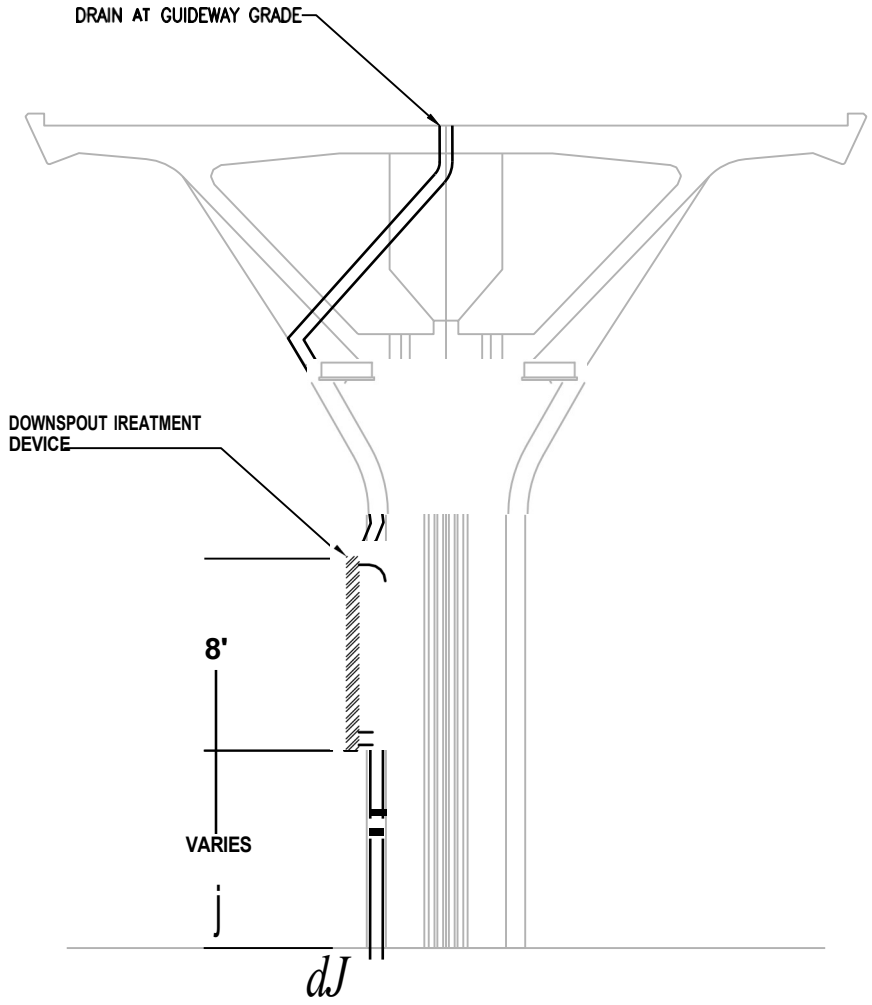
Figure T-8.F: Below Grade Filter System Box



NOT TO SCALE

Below Grade Filter System Box

Figure T-8.G: Filter System Downspout Unit

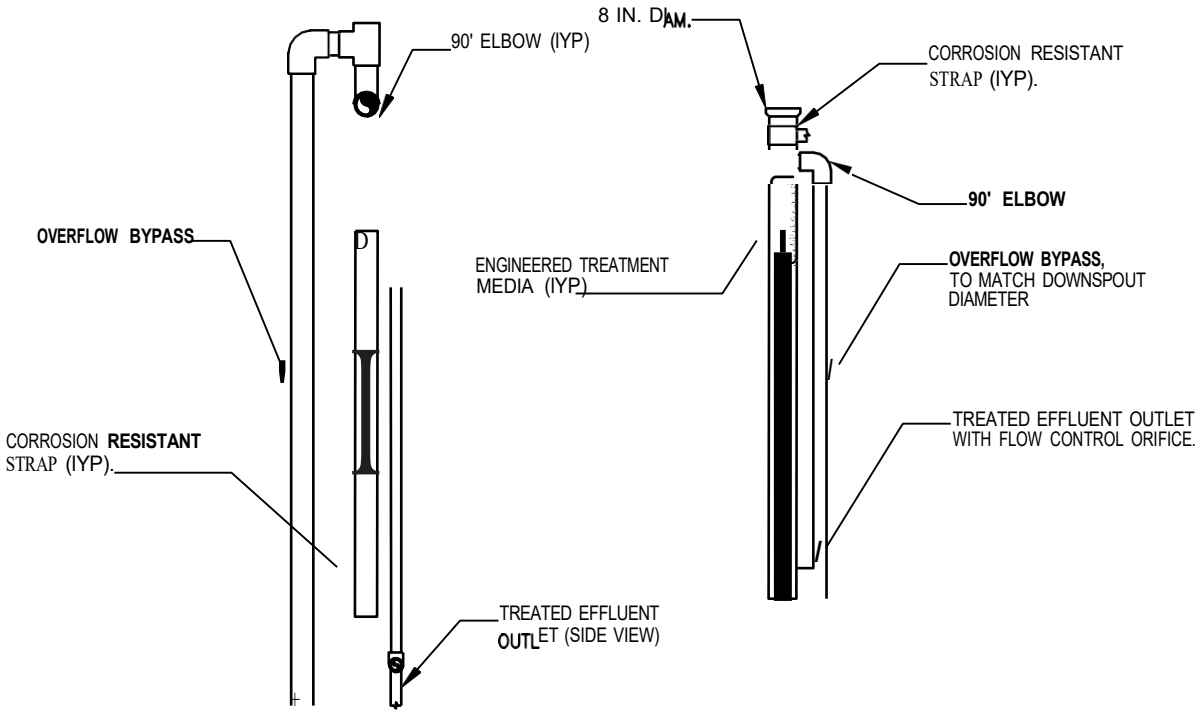


NOT TO SCALE

DRAFT N EVELOPMENT

Filter System Downspout Unit

FIGURE T-8.H: DOWNSPOUT TREATMENT DETAIL



PARALLEL CONFIGURATION

SECTION /A\

NO SCALE

SINGLE CONFIGURATION

DETAIL r1\

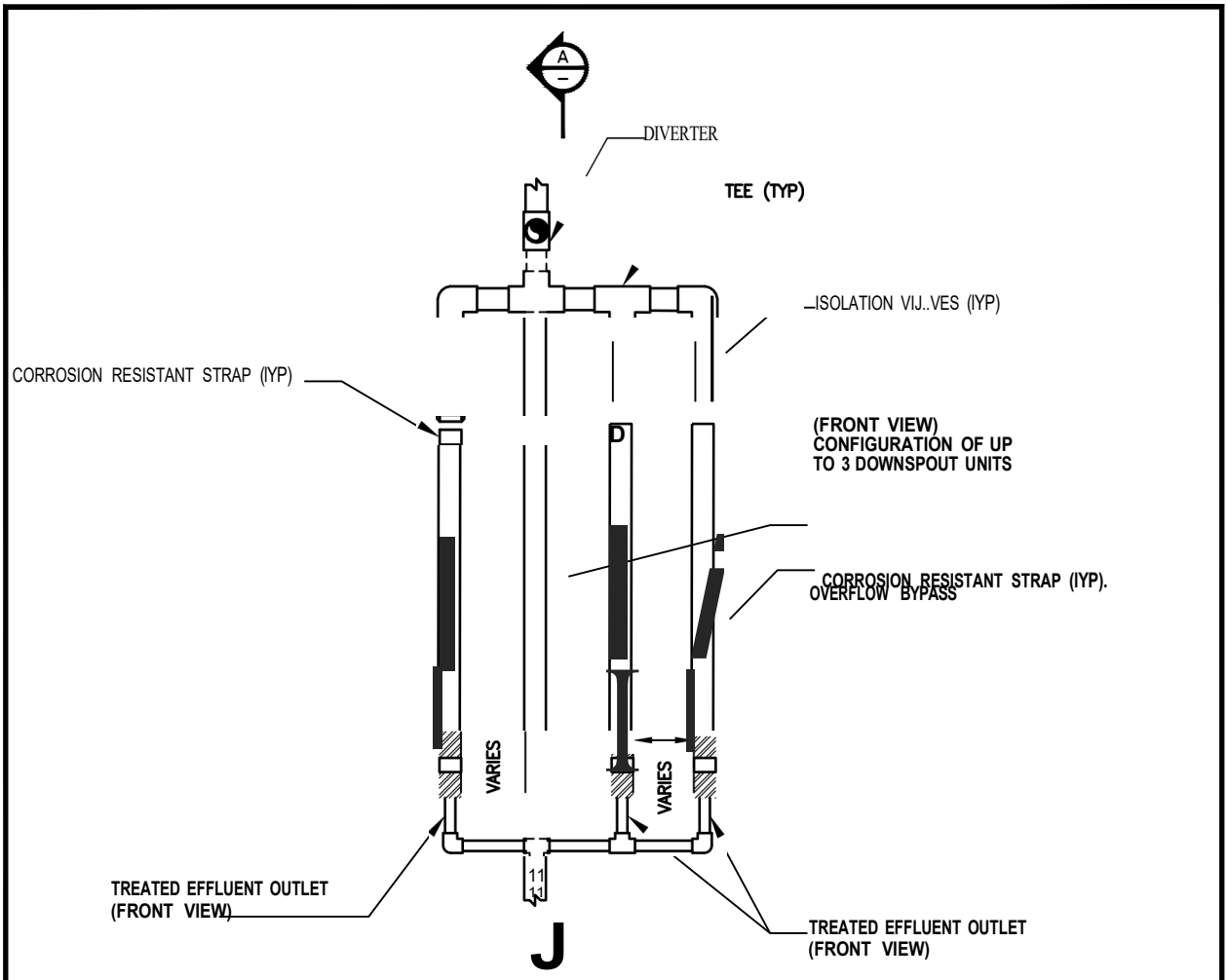
NO SCALE

NOT TO SCALE

DRAFT N EVELOPMENT

Downspout Treatment - Section View

Figure T-8.1: Downspout Treatment Detail



NOT TO SCALE

DRAFT N EVELOPMENT	Downspout Treatment - Parallel