Greenville County Technical Specification for:

RC-05 LEVEL ENERGY DISSIPATOR

1.0 Level Energy Dissipator

1.1 Description

Use Level Energy Dissipators to dissipate energy and disperse concentrated runoff into sheet flow. Level Energy Dissipators are constructed with an outfall box directing flow into a riprap lined swale which overtops over a level lip. The main function of a Level Energy Dissipator is to spread potentially erosive concentrated flow over the stable level lip to minimize erosion at the outlet. When designed and installed correctly, sheet flow and non-erosive conditions are achieved downstream of the Level Energy Dissipator. Level Energy Dissipator components include:

- Outfall Box
- Flow Spreading Swale
- Level Lip
- Solid Non-Perforated Drainage Pipe(s)
- Perforated Pipe(s)

Level Energy Dissipators are applicable for post-construction (stabilized) site conditions where runoff is released as concentrated flow, such as through pipe outfalls, pond outlets, curb cuts, or slope drains. Do not use Level Energy Dissipators in areas where the natural contours will cause runoff to re-concentrate after release from the Level Energy Dissipator.

1.2 Design

See Detail RC-05 for design requirements, key dimensions, and required inputs by the design engineer.

The Level Energy Dissipator is designed for energy dissipation purposes. It is not designed to detain a specific volume of water or to provide water quality treatment. **For flow spreading applications focused on water quality treatment, see Specification WQ-13 Level Spreader.**

Ensure the Level Energy Dissipator design accounts for runoff at ultimate build-out, including off-site drainage that flows through the structure.

The Level Energy Dissipator is designed with a length (L) to pass the 25-year design storm flow (Q) with a maximum flow depth of 6 inches (H) above the level lip. An example calculation is provided below:

$$Q = 3.2LH^{\frac{3}{2}} \rightarrow L = \frac{Q}{3.2H^{\frac{3}{2}}}$$

$Q = flow\ rate\ (\frac{ft^3}{s})$
$L = length\ of\ the\ weir\ (ft)$
$H = elevation\ head\ on\ the\ weir\ (ft)$

If Q = 37 ft^3/s and H = 6 inches = 0.5 ft, then the minimum L is **33 ft**.

$$L = \frac{Q}{3.2H^{\frac{3}{2}}} = \frac{37}{3.2(0.5)^{\frac{3}{2}}} = \mathbf{33\ ft}$$

1.3 Components

1.3.1 Outfall Box

The outfall box directs high velocity concentrated flows into the flow spreading swale to reduce velocity and dissipate energy. The outfall box has an open top for emergency overflow with a trash rack, simply to prevent entry into the structure for public safety. The outfall box has at least two orifices, with a typical orifice diameter of 12 inches. The orifices are not in-line with the incoming pipe so flow will hit the wall of the box and dissipate energy.

1.3.2 Flow Spreading Swale

The flow spreading swale is located between the outfall box and the level lip. It has a minimum bottom width of 1-foot with side slopes of 1H:1V or flatter and a minimum top width of 3 feet. The swale has a minimum depth of 1-foot and a flat bottom with a maximum longitudinal grade of 0.5%. Each end of the flow spreading swale terminates at the flow control berm which is at least 1-foot higher than the level lip. The swale bottom, sides, and ends tying into the flow control berm are stabilized with non-woven geotextile fabric and Class A (6-inch diameter) riprap. After storm events, runoff remaining in the swale dewaters through the non-perforated underground drainage pipe(s) passing through the downgradient berm forming the level lip.

1.3.3 Flow Control Berm

The flow control berm is an earthen berm or embankment stabilized with riprap that is at least 1-foot higher than the level lip. It encloses the entire Level Energy Dissipator area upgradient of the level lip, including the outfall box and flow spreading swale, to ensure flow is directed over the level lip. The flow control berm may include an existing embankment, for example when a pipe outfall projects from a fill slope. The flow control berm is stabilized with non-woven geotextile fabric and Class A (6-inch diameter) riprap. to a minimum elevation of 1-foot higher than the level lip.

1.3.4 Level Lip

The level lip is adjacent to and downgradient of the flow spreading swale. It has a minimum lip width (parallel to flow) of 1-foot and a lip length (perpendicular to flow) designed to pass the 25-year design storm flow with a maximum flow depth of 6 inches above the level lip. The level lip and downstream areas are stabilized with non-woven geotextile fabric and Class A (6-inch diameter) riprap to prevent erosion as flow passes over the lip.

1.3.5 Swale Drainage Pipe and Perforated Outlet Pipe

One or more non-perforated drainage pipes are installed through the downgradient berm forming the level lip to dewater the flow spreading swale after a storm event. The number of pipes is chosen by the design engineer to ensure the swale will dewater. Each non-perforated drainage pipe has a minimum diameter of 4 inches and a minimum slope of 1% to maintain positive drainage. At the downstream terminus, each non-perforated drainage pipe is connected to a perforated pipe oriented perpendicular to the drainage pipe to disperse concentrated dewatering flow. The perforated pipe is of the same material and diameter as the non-perforated swale drainage pipe, is securely connected to the drainage pipe, and has a minimum length of 1-foot.

1.4 Construction Requirements

Construct Level Energy Dissipators along the ground contour to allow for a level lip. Remove excess excavated materials from the Level Energy Dissipator area and dispose of them properly.

1.4.1 Site Preparation

Before Level Energy Dissipator construction, verify that ground contours are parallel to the Level Energy Dissipator.

Ensure there is adequate access around the Level Energy Dissipator site to accommodate for post construction inspection and maintenance. Regular maintenance is required for the Level Energy Dissipator to function as designed.

1.4.2 Installation

Install Level Energy Dissipators with the following typical construction sequence:

- Install outfall box per the Plans.
- Excavate swale downstream of outfall.
- Excavate and install drainage pipe(s) and downstream perforated outlet pipe(s).
- Backfill drainage pipe(s) and construct compacted swale berm and level lip.
- Construct flow control berm that is a minimum of 1-foot higher than the level lip.
- Verify swale, lip, and flow control berm elevations are correct per Detail RC-05 and the Plans.
- Line flow spreading swale, flow control berm, level lip and downstream areas with non-woven geotextile fabric and a minimum 1-foot thickness of Class A (6-inch diameter) riprap to protect all parts of the Level Energy Dissipator from erosion.

1.4.3 Construction Conditions

Level Energy Dissipators are intended to be used in post-construction (stabilized) site conditions and are not designed for sediment trapping during construction conditions. However, if temporary heavy sediment loads are anticipated or experienced, the design engineer may specify additional depth of the flow spreading swale to provide some temporary sediment trapping. The swale must be graded to final dimensions and stabilized with geotextile fabric and Class A (6-inch diameter) riprap after the temporary sediment trapping phase is complete.

1.5 Inspection and Maintenance

Regular inspection and maintenance are critical to the effective operation of Level Energy Dissipators.

Summary of inspection requirements:

- During the first year after construction, inspect Level Energy Dissipators for proper distribution of flows and signs of erosion during and after all major storm events.
- After the first year, inspect Level Energy Dissipators annually. It is recommended to also inspect after major storm events.

Summary of maintenance requirements:

- Maintain Level Energy Dissipators annually.
- Check the Level Energy Dissipator and downstream outfall area for signs of erosion.
- Address erosion that is discovered through re-grading, additional riprap, adding turf reinforcement matting (TRM), and/or adding vegetation as necessary.
- Remove sediment and debris from the outfall box, riprap lined swale and drainage pipe inlet(s).
- Remove trash from areas in or around the Level Energy Dissipator.