

4.2 Level Spreader



Description

A level spreader is a constructed weir that is shaped or graded flat perpendicular to the direction of flow. Level spreaders are used to convert concentrated flow to sheet flow over nearly level areas without causing erosion, formation or gullies, or flooding.

Condition Where Practice Applies

This practice applies to sites where:

1. Small concentrated flows, less than 30 cfs from a 10-yr. frequency storm, can be converted to sheet flow using a level spreader
2. The outlet area below the level spreader is stable with dense vegetation with a slope less than 10%. The soils are nonerosive and gully formation is not a concern.
3. A level spreader can convert runoff from an impervious surface (i.e. parking lot) or concentrated runoff from curb cuts or roof downspouts to shallow uniform sheet flow
4. Concentrated flows from storm drains, or diversions can be released onto a nearly flat natural densely vegetated area
5. The level lip of the spreader can be constructed in undisturbed soil
6. The level spreader is needed in conjunction with another measure (i.e. vegetated filter strip, detention pond, etc.)

Planning Considerations

The following benefits and impacts of level spreaders should be considered where they are planned:

- Level spreaders are relatively low cost structures that can uniformly disperse impervious surface runoff, roof downspout runoff, or other small volumes of concentrated flow.
- Runoff containing high sediment loads must be treated by a sediment trapping device prior to release into the level spreader
- Level spreaders must be placed where there would be no traffic over the spreader to assure that the level lip remains level and undisturbed
- Level spreaders can be used below pipe outlets where the flow can be converted to and continue as sheet flow. However, the pipe outlet must be stabilized with outlet protection prior to release of runoff into the level spreader.

Design Criteria

Capacity

The design capacity of the level spreader shall be estimated by determining the peak rate of runoff from a 10-yr. frequency storm. The design flow should not be greater than 30 cubic feet per second (cfs) from a 10-yr.-frequency storm.

Spreader Dimensions

Select the length and depth of the spreader from Table 4.2.1 below.

- The minimum width (W) is in the direction that is perpendicular to the flow.
- The minimum depth (D) of the level spreader shall be at least 0.5 feet measured down from the level lip. Depth may be greater to increase temporary storage capacity, improve trapping of debris, and enhance settling of any suspended solids based on erosion potential or other site conditions.

Table 4.2.1 Level Spreader Dimensions

Flow Rate (cfs)	Minimum Depth – D (ft)	Minimum Width – W (ft)
0 – 10	0.5	10
10 – 20	0.6	20
20 – 30	0.7	30

The level lip of the spreader must be constructed completely level (0% grade) to insure uniform spreading of the runoff over the entire length of the spreader.

Flows released from level spreaders must outlet onto undisturbed stable areas with a slope not exceeding 10%, where sheet flow are maintained and concentrated flow prevented.

When constructing a level spreader as an outlet for a diversion, the last 20 feet of the diversion should be used to smoothly transition the width of the diversion to the width of the spreader to ensure uniform outflow. The grade of the channel for the last 20 feet of the diversion entering the level spreader shall be 1.0% or less.

Side Slopes

The sides of the spreader shall be tied into higher ground to prevent flow around the spreader. Side slopes shall be 2 to 1 (horizontal to vertical) or flatter.

Weir Materials

- For design flows less than 4 cfs, the level spreader lip may be vegetated natural earth (not fill).

The ***vegetated lip spreader*** shall be protected using an erosion control blanket (installed according to manufacturers recommendations) to prevent erosion and allow vegetation to become established. The blanket shall start a minimum of 4 feet above the lip and extend at least 1 foot downstream over the spreader lip secured with heavy-duty staples with the downstream and upstream ends buried at least 6 inches in a vertical trench.

- For design flows greater than 4 cfs, the level spreader lip must be constructed of rigid, durable, non-erodible material (i.e. riprap, concrete, or precast block or geosynthetic materials).

The ***rigid lip spreader*** constructed of riprap shall meet ODOT Type D riprap and shall be carefully installed with a 2-foot wide level lip. An apron with existing vegetation shall extend downstream from the rigid lip at least 3 feet. The riprap shall be a minimum of 12 inches thick. Spread gravel or soil over top of the placed riprap surface to fill the voids and interlock the riprap together. A rigid lip spreader constructed from other durable, non-erodible material (ie –concrete curbing) shall be constructed of material that is anchored securely at least 4 inches below existing ground to prevent displacement. An apron of AASHTO No. 1 stone shall be placed adjacent to and downstream from the rigid lip at least 3 feet. The top of the stone shall be at the same elevation as the top of the lip.

Use with Pipe Outlet Protection

Level spreaders can be used below pipe outlets where the flow can be converted to and continue as sheet flow. However, the pipe outlet must be stabilized with outlet protection prior to release of runoff into the level spreader.

Establishing Vegetation

All level spreaders shall be vegetated or otherwise stabilized, as soon as possible after construction. Stabilization should be done according to the appropriate Standards and Specifications for Vegetative Practices (e.g. Permanent Seeding, Mulching, Matting).

Maintenance

A maintenance plan shall be established to maintain the level spreader, its capacity, vegetative cover, and other associated structural components such as outlets, headwalls or rock.

Items to consider in the maintenance program include:

- Determine responsible party to inspect and maintain the practice after construction
- Protect the practice from damage by equipment and traffic
- Fertilize the vegetated area annually to and maintain a vigorous stand of grass
- Mow the vegetated area to maintain a healthy and vigorous stand of grass.
- Check the level spreader periodically to verify that the spreader is distributing flow uniformly. If problems are noted, make repairs to ensure even flow over the level lip.
- Repair damage to the level spreader immediately. Missing materials should be replaced as soon as possible. Seed and mulch any bare areas that develop.
- Remove sediment and debris that have accumulated.

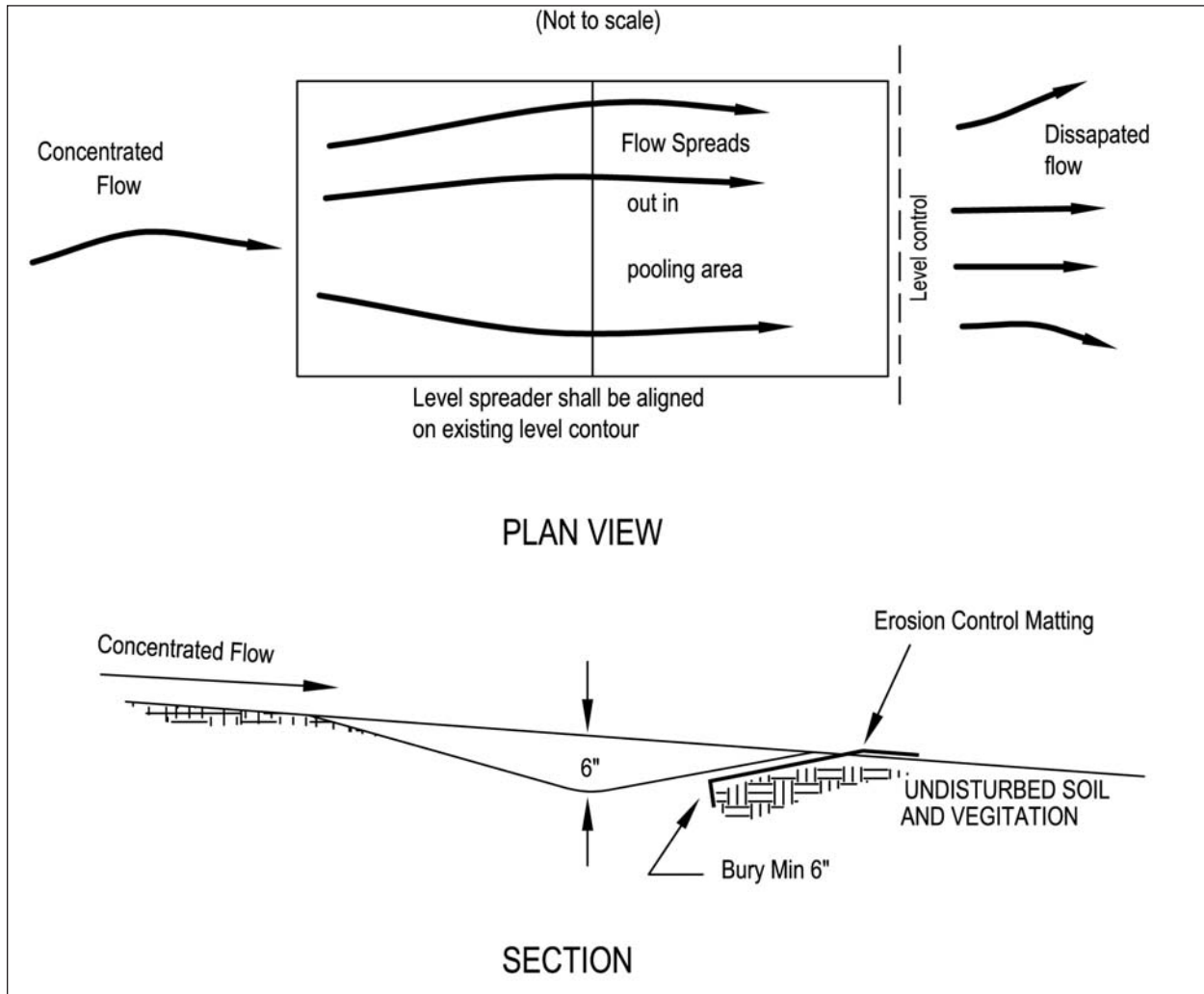
- Easements, or other means, should be obtained to ensure the level spreader is maintained as constructed.

References

Additional guidance for evaluation, planning, and design of level spreaders is given in:

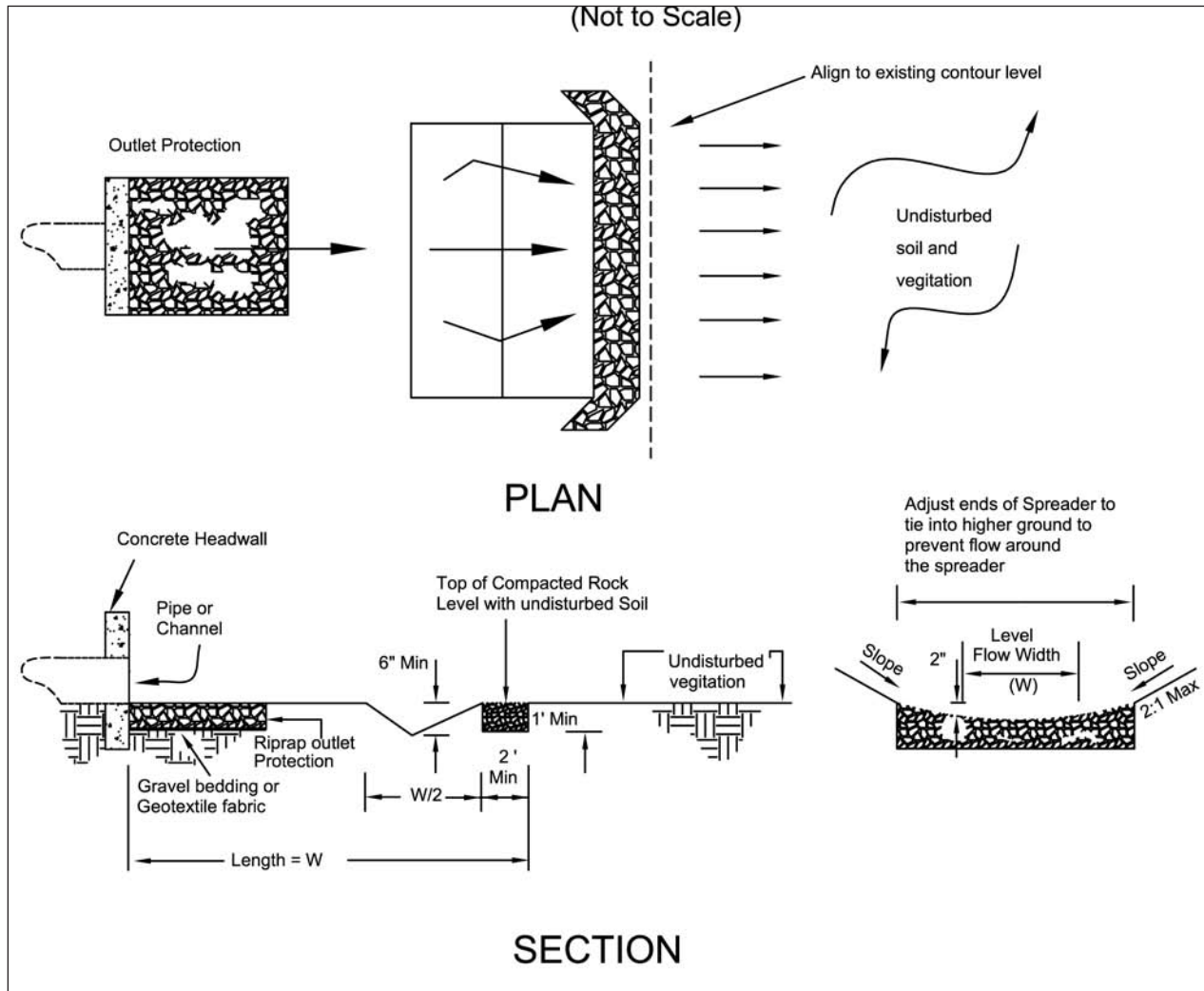
- Illinois Urban Manual: A Technical Manual Designed for Urban Ecosystem Protection and Enhancement, prepared for the Illinois EPA by Illinois NRCS
- Ohio Rainwater and Land Development Manual, Second Edition 1996
- NRCS Design Note 24, Guide for Use of Geotextiles

Specifications
for
Vegetated Level Spreader



1. Construct level spreader on a level grade to ensure uniform spreading of storm runoff.
2. Level spreaders must be constructed on undisturbed soil, NOT on fill.
3. The level spreader must outlet to erosion-resistant areas with established existing vegetation.
4. Vegetated lip spreaders shall be protected using an erosion control blanket installed according to manufactures' recommendations. The blanket shall start a minimum of 4 feet above the lip and extend at least 1 foot downstream over the spreader lip, secured with heavy-duty staples and the downstream and upstream ends buried at least 6 inches in a vertical trench.
5. Fertilizing, seeding, and mulching shall conform to the recommendations in the applicable vegetative specification.

Specifications
for
Rigid Lip Level Spreader



1. Construct level spreader on a level grade to ensure uniform spreading of storm runoff.
2. Level spreaders must be constructed on undisturbed soil, NOT on fill.
3. The level spreader must outlet to erosion-resistant areas with established existing vegetation.
4. Rock shall be ODOT Type D where 50% of the material by weight is larger than 6 inches, and 85% of the material by weight is larger than 3 inches but less than 12 inches.
5. Rock in level spreader shall be compacted with at least two passes of heavy machinery to prevent further settling. Spread gravel or soil over top of the placed riprap surface to fill the voids and interlock the riprap together.
6. Fertilizing, seeding, and mulching shall conform to the recommendations in the applicable vegetative specification.