Erosion and Sediment Control
E&SC Basics

Erosion Controls

- 1st line of defense
- Prevent erosion thru soil stabilization and runoff controls
- Relatively easy and very effective
E&SC Basics

Sediment Controls

- Last line of defense
- Remove sediment from water
- Very challenging
E&SC Construction Plans

- Description of temporary and permanent structural and vegetative measures for soil stabilization, runoff control and sediment control

For example:

- Annual ryegrass will be applied at a rate of 100 lbs./acre
- Permanent rock check dams shall be constructed of 2" to 9" angular limestone with the downslope dam crest even with the upslope dam toe
- Silt fence and orange snow fence will be installed along the 100-foot wetland adjacent area before clearing and grubbing
E&SC Construction Plans

- Implementation and Maintenance Schedule for E&SC measures, including timing of placement and minimum time frame each practice will remain in place

For example:

- Bare soil areas will be seeded and mulched within 14 days of the last grading activity in that area
- Contractor will keep pavement areas free of soil and debris
- Sediment trap #1 will be constructed before dry swales
E&SC Construction Plans

- Construction drawing(s) showing specific locations, size and length of each erosion and sediment control practice
E&SC Construction Plans

- Material specifications, dimensions and installation details

Must be in conformance with the New York State Standards and Specifications for Erosion and Sediment Control ("Blue Book")
Silt Fence

**Example Specifications**

1. **Maximum drainage area** = \( \frac{1}{4} \) acre (100 ft. by 100 ft.) per 100 feet of fence.
2. **Steeper slopes** = closer silt fence spacing.
3. **Installed perpendicular** to the direction of flow.
4. **Never installed in** channels or ditches.

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**STANDARD AND SPECIFICATIONS FOR SILT FENCE**

**Definition**

A temporary barrier of porous fabric installed on the concave across a slope used to intercept sediment laden runoff from small drainage areas of disturbed soil.

**Purpose**

The purpose of a silt fence is to reduce runoff velocity and effectively deposit transported sediment load. Limits imposed by ultraviolet stability of the fabric will dictate the maximum period the silt fence may be used (approximately one year).

**Conditions Where Practice Applies**

A silt fence may be used subject to the following conditions:

1. Maximum allowable slope length contributing runoff to a silt fence placed on a slope are:

<table>
<thead>
<tr>
<th>Slope</th>
<th>Maximum Length (ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2:1</td>
<td>25</td>
</tr>
<tr>
<td>3:1</td>
<td>50</td>
</tr>
<tr>
<td>4:1</td>
<td>75</td>
</tr>
<tr>
<td>5:1 or Flatter</td>
<td>100</td>
</tr>
</tbody>
</table>

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**Design Criteria**

Design computations are not required for installations of 1 month of less. Longer installation periods should be designed for expected runoff. All silt fences shall be placed as close to the area as possible, being at least 10 feet from the toe of the slope to allow for maintenance and flood areas beyond the fence must be undisturbed or stabilized.

Sensitive areas to be protected by silt fence may need to be reinforced by using heavy wire fencing for added support to prevent collapse.

Where ends of filter cloths overlap, they shall be overlapped, folded and stapled to prevent sediment bypass. A detail of the silt fence shall be shown on the plan. See Page 55.8 to page 55.21 for details.

**Criteria for Silt Fence Materials**

1. **Silt Fence Fabric** The fabric shall meet the following specified items unless otherwise approved by the appropriate erosion and sediment control plan approval authority. Such approval shall not constitute statewide acceptance.

<table>
<thead>
<tr>
<th>Fabric Properties</th>
<th>Minimum Acceptable Value</th>
<th>Test Method</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight (lbs)</td>
<td>90</td>
<td>ASTM D1182</td>
</tr>
<tr>
<td>Elastic Limit (%)</td>
<td>50</td>
<td>ASTM D1182</td>
</tr>
</tbody>
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Typical Runoff Controls

- Diversions
- Swales
- Water Bars
- Check Dams
- Lined Channels
- Outlet Protection
- Pipe Slope Drain
Clean runoff from offsite not diverted or controlled soon becomes dirty runoff
Temporary Lined Channel

A conveyance channel to divert off-site drainage from the active construction site

- Runoff control
  - reduces amount of water flowing onto the construction site
  - usually not permanent

- Considerations
  - rock lining stabilizes channel
  - stone size based on flow rate
  - lined with fabric
Grassed Waterway

A wide, shallow channel below adjacent ground level that is stabilized by vegetation

- Erosion control
  - conveys runoff without causing erosion

- Consideration
  - if erosion occurs, a lined waterway should be used
Check Dam

A small barrier or dam, constructed of stone, bagged sand or gravel across a drainage way

- Runoff and Erosion control
  - restricts velocity
  - temporary

- Considerations
  - downstream crest = upstream toe
  - stone size = 2-9”
  - lined with fabric
Check Dam

- Downstream crest equal elevation to Upstream toe
- Parabolic shape
- Filter fabric
- Cutoff trench
Manufactured Check Dam

A flexible, reusable erosion control product for use in shallow channels

- Runoff and Erosion control
  - restricts velocity
  - temporary

- Considerations
  - downstream crest = upstream toe
  - filter fabric apron for stabilization
Check Dam

Use with Caution!
Check Dam

Errors and Deficiencies

Unacceptable check dam materials cause erosion
No flow concentration over center of dam
Check Dam

Errors and Deficiencies

Wrong materials used
Not anchored by a cutoff trench

Wrong practice choice
Lined Waterway

A channel lined with rock, concrete or other permanent material

- Erosion control
  - conveys runoff without causing erosion
  - Reduces velocity

- Considerations
  - Underlined with filter fabric
  - Rock size based on velocity
Outlet Protection

Rock, Riprap or concrete placed at the outlet end of a culvert or channel

- Erosion control
  - Reduces velocity, depth and energy of water in a non-erosive manner

- Considerations
  - Rock size and apron length based on velocity and drainage area
Rock riprap below these outlets reduces flow velocity so that it is non-erosive…

… and it also allows sediment to drop out
Lined Waterway or Outlet

Errors and Deficiencies

No rock below pipe causes slope failure
Rounded rocks are unstable – use angular rock
Pipe Slope Drain

Temporary drainage structure to reduce erosion on slopes

- **Runoff and Erosion control**
  - conveys runoff down slopes in a non-erosive manner
  - temporary

- **Consideration**
  - runoff must be directed to the pipes at the top of slope
Water Bar

Temporary or permanent drainage structure to reduce erosion on sloping roads

- Runoff and Erosion control
  - conveys runoff in a non-erosive manner along slopes at pre-designed intervals

- Consideration
  - placed at points of concentrated flow
  - aligned diagonally to low side of road
  - spacing depends on slope percent
Soil Stabilization

- Correct Clearing and Grading
- Seeding and Mulching
- Rolled Erosion Control Products
- Dust Control
Seeding

Perennial vegetative cover such as grasses

- Required on inactive areas
- Erosion control
  - stabilizes soil
  - reduces soil loss by up to 90%
  - the most cost-effective erosion control available
- Sediment control
  - filters runoff
Seeding
Seeding
Seeding
Grass Seed applied before snow cover will germinate in spring before the soil is dry enough to work
Insufficient seed application can cause sediment accumulation in conveyances and ponds – maintenance becomes difficult and costly.
Errors and Deficiencies

- Insufficient application rate
- Soil left exposed for greater than 14 days
- Lack of maintenance, mulch, or watering
Hydroseeding

Pressure spraying a seed mix, in liquid form, through a nozzle – can also include mulch, fertilizer, a polymer (tackifier), etc.

- Erosion control
  - fast
  - effective – good germination rate
  - easy
  - expensive
  - good on critical areas and slopes
Hydroseeding
- Don’t spray hydroseed on top of RECP
- Application on steep slopes without mulch
- Applied just before rain
Mulching

Coarse plant residue or chips as a soil cover

- Erosion control
  - protects seeding
    - conserves moisture
    - lessens temperature fluctuations
  - breaks raindrop velocity
  - stabilizes soil in non-growing months
  - usually temporary (biodegradable)
  - can be permanent (stone)
Mulching