

Construction Site Storm Water  
**BMP**  
BEST MANAGEMENT PRACTICES



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June 2009



**WILSON**  
& COMPANY

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### **STANDARD SPECIFICATIONS**

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# **BMP SUMMARY**

**SUMMARY OF BMP's FOR LAND DISTURBANCE ACTIVITIES**

<b>BEST MANAGEMENT PRACTICES FOR LAND DISTURBANCE ACTIVITIES</b>				
<b>TITLE</b>	<b>DESIGN GUIDELINE</b>	<b>STD. DRAWING</b>	<b>SPEC. * SECTION</b>	<b>GENERAL CONDITIONS FOR BMP APPLICABILITY</b>
<b>Permanent Seeding</b>	ESC-1.0	N / A	3.3	Areas of site where land disturbance activities are complete.
<b>Temporary Seeding or Alt.</b>	ESC-2.0	N / A	3.4	Areas of site where land disturbance activities have temporarily ceased for 14 days or more.
<b>Surface Roughening</b>	N / A	N / A	3.9	Slopes steeper than 6:1, not ready for seeding and will not be disturbed for 7 days or more.
<b>Dust Control</b>	N / A	N / A	3.10	Contractor shall take effective measures to prevent blowing dust from site.
<b>Temporary Const. Entrance</b>	ESC-3.0	ESC-3.0	4.13	All locations vehicles leave site.
<b>Area Inlet Protection</b>	ESC-4.0	ESC-4.0	4.12	Stormwater area inlets that drain areas of land disturbance 1 acre or less.
<b>Curb Inlet Protection</b>	ESC-4.0	ESC-4.1	4.12	Stormwater curb inlets that drain areas of land disturbance 1 acre or less.
<b>Culvert Inlet Protection</b>	ESC-5.0	ESC-5.0	4.12	Culvert inlets that drain areas of land disturbance.
<b>Outlet Stabilization</b>	ESC-6.0	N / A	4.5	Stabilize unstable channel or conduit outlets until permanent protection is established.
<b>Temporary Diversion</b>	ESC-7.0	ESC-7.0	4.10	Intercept and divert runoff to stabilized outlets, such as along top of cut or fill slopes. (5 acres or less)
<b>Temporary Slope Drain</b>	ESC-7.1	ESC-7.0	4.11	Convey concentrated runoff from top of a slope down to the toe, in a conduit. (5 acres or less)
<b>Temporary Stream Crossing</b>	ESC-8.0	ESC-8.0	4.15	Vehicular access or utility crossing for stream with drainage area of one square mile or less.
<b>Temporary Slope Break</b>	ESC-9.0	N / A	4	Long or steep slopes with no other erosion control practice.
<b>Temporary Sediment Basin</b>	ESC-10.0	ESC-10.0	4.14	Concentrated, sediment-laden runoff from large disturbed area (3 - 100 acres), flowing from site.
<b>Temporary Sediment Trap</b>	ESC-11.0	ESC-11.0	4.5; 4.10	Concentrated, sediment-laden runoff from small disturbed area (3 acres max.), flowing from site.
<b>Temporary Check Dam</b>	ESC-12.0	ESC-12.0	4.4; 4.5	Low flow ditches or swales carrying sediment-laden runoff .
<b>Sediment Fence</b>	ESC-13.0	ESC-13.0	4.4	Divert or Trap runoff to capture sediment for small areas (1/4 acre per 100 feet of fence).
<b>Sediment Fence (Reinforced)</b>	ESC-13.0	ESC-13.1	4.4	Divert or Trap runoff to capture sediment for concentrated runoff from small areas.
<b>Straw Wattle</b>	ESC-14.0	N / A	4.7	Circular tube, small height barrier for diversion or sedimentation for flows 1 cfs or less.
<b>Erosion Control Blankets</b>	ESC-15.0	ESC-15.0 - ESC-15.3	3.8	Steep slopes susceptible to rain drop erosion, Bank stabilization, assist establish vegetation.
<b>Turbidity Curtains</b>	ESC-16.0	N / A	4.16	A floatation device to minimize sediment transport into any body of water.
<b>Individual Building Lot Layout</b>	N / A	ESC-17.0	N / A	Used to establish Sediment and Erosion Control for Individual Lot Construction.
<b>Concrete Washout</b>	ESC-18.0	ESC-18.0	4.17	Designated area for concrete washout on construction site.

\* Sub-Section of Standard Specifications

**DESIGN GUIDELINES  
&  
STANDARD DRAWINGS**

## DESIGN GUIDE 1.0 - PERMANENT SEEDING

- A. **Description:** Permanent seeding is the establishment of perennial vegetation on disturbed areas for periods longer than 12 months. Permanent vegetation provides economical, long-term erosion control and helps prevent sediment from leaving the site.
- B. **Application:** This practice is used when vegetation is designed to permanently stabilize the soil. It is necessary to protect earthen structures such as dikes, channels, and embankments. Particular care is required to establish a thick cover of permanent grass.
- C. **Planning Considerations:** Prior to the start of construction, preparation of soil, fertilizer requirements, plant materials, seeding rates, environmental conditions, mulching and maintenance should be specified by a qualified professional. Plans and specifications should be referred to by field personnel throughout the construction process. To ensure germination and growth, prepare seedbed, add fertilizer according to soil tests, mulch all but the most ideal sites, and follow seeding dates. Permanent seeding shall commence after topsoil preparation and landscape grading have been completed, at the earliest time environmental conditions allow.
- D. **Design Criteria:**

Seeding rates and mixes shall be as follows:

See Standard Specification, Section 3.3

Fertilizer type and rates shall be as follows:

See Standard Specification, Section 3.3

Mulching type and rate shall be as follows:

See Standard Specification, Section 3.3

Maintenance requirements are as follows:

See Standard Specification, Section 3.3

## DESIGN GUIDE 2.0 - TEMPORARY SEEDING

- A. **Description:** Temporary seeding is the establishment of fast-growing annual vegetation to provide economical erosion control for up to 12 months and reduce the amount of sediment moving off the site. Annual plants which sprout rapidly and survive for only one growing season are suitable for establishing temporary vegetative cover.
- B. **Application:** This practice applies where short-lived vegetation can be established before permanent seeding can be completed. It helps prevent costly maintenance operations on other erosion control systems such as sediment basin clean-out. Temporary or permanent seeding is necessary to protect earthen structures such as dikes, diversions, and the banks and dams of sediment basins.
- C. **Planning Considerations:** Prior to the start of construction, preparation of soil, fertilizer requirements, plant materials, seeding rates, environmental conditions, mulching and maintenance should be specified by a qualified professional. Plans and specifications should be referred to by field personnel throughout the construction process. To ensure emergence, vigorous growth of seedlings, and continued plant growth, prepare seedbed, add fertilizer according to soil tests, mulch all but the most ideal sites, and follow seeding dates. Temporary seeding shall commence immediately after soil preparation and grading have been sufficiently completed.
- D. **Design Criteria:**

Seeding rates and mixes shall be as follows:

See Standard Specification, Section 3.4

Contractor may submit request for equal substitute temporary seed mix and rate to Engineer for Consideration.

Fertilizer type and rates shall be as follows:

See Standard Specification, Section 3.4

Mulching type and rate shall be as follows:

See Standard Specification, Section 3.4

Maintenance requirements are as follows:

See Standard Specification, Section 3.4

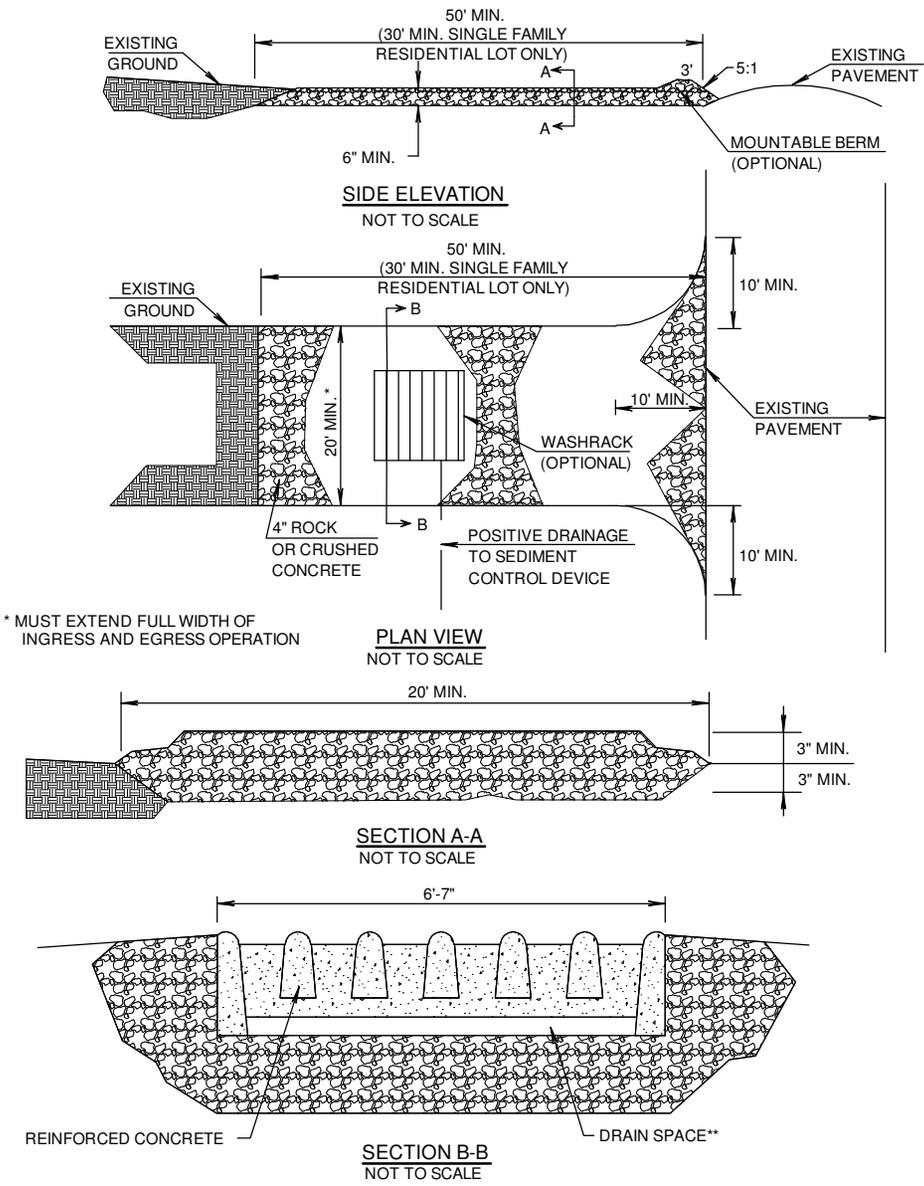
E. **Alternative Soil Stabilization Erosion Control Methods**

Alternative temporary soil stabilization erosion control methods are available, including Mulch Cover, Hydrocover (Standard or Specialty Mix) and Erosion Control Blankets. See Standard Specification.

## DESIGN GUIDE 3.0 - TEMPORARY CONSTRUCTION ENTRANCE

- A. **Description:** A temporary construction entrance is a stabilized layer of large aggregate or crushed concrete that is located at any point where traffic leaves a construction site and moves directly onto a public road or other paved area.
- B. **Application:** A temporary construction entrance is a stabilized stone or crushed concrete pad designed to provide a buffer area where construction vehicles can be cleaned to avoid transporting the soil from the site onto the roads and drives.
- C. **Planning Considerations:** Areas that are graded for construction vehicle transport and parking purposes are especially susceptible to erosion. The exposed soil surface is continually disturbed, leaving no opportunity for vegetation to become established. During wet weather, they often become muddy quagmires that generate significant quantities of sediment deposits transported off site on the wheels of construction vehicles. These non surfaced traveled ways can become so unstable during wet weather that they are virtually unusable and unsafe. Therefore, unpaved traveled ways for construction shall be planned and minimized to provide necessary access. Temporary construction entrances shall be installed at all locations vehicles leave the site.
- D. **Design Criteria:**
1. **Length** – Minimum of 50 feet or 30 feet for single residence lot.
  2. **Width** – Minimum of 20 feet and should be flared at the existing road to provide a turning radius.
  3. **Rock or Crushed Concrete** – See Standard Specification, Section 4.5, Rock or Crushed Concrete Barrier.
  4. **Surface water** – All surface water flowing to or diverted toward construction entrances shall be piped under the entrance to maintain positive drainage. Pipe installed under the construction entrance shall be protected with a mountable berm. The pipe shall be sized according to the drainage with the minimum diameter being 12 inches. A pipe will not be necessary when the entrance is located at a high spot.
  5. **Location** – A temporary construction entrance shall be located at every point where construction traffic enters or leaves a construction site. Vehicles leaving the site must travel over the entire length of the stabilized construction entrance.
- E. **Standard Drawing:** See Standard Drawing ESC-3.0 (Temporary Construction Entrance).
- F. **Standard Specification:** Standard Specification, Section 4.13 (Stabilized Pad).

**TEMPORARY CONSTRUCTION ENTRANCE**



**TEMPORARY CONSTRUCTION ENTRANCE PAD NOTES:**

**A) INSTALLATION:**

1. AVOID LOCATING ON STEEP SLOPES OR AT CURVES ON PUBLIC ROADS. IF POSSIBLE, LOCATE WHERE PERMANENT ROADS WILL EVENTUALLY BE CONSTRUCTED.
2. REMOVE ALL VEGETATION AND OTHER UNSUITABLE MATERIAL FROM THE FOUNDATION AREA, GRADE, AND CROWN FOR POSITIVE DRAINAGE.
3. IF SLOPE TOWARDS THE PUBLIC ROAD EXCEEDS 2%, CONSTRUCT A 6 TO 8-INCH HIGH RIDGE WITH 3H:1V SIDE SLOPES ACROSS THE FOUNDATION APPROXIMATELY 15 FEET FROM THE EDGE OF THE PUBLIC ROAD TO DIVERT RUNOFF.
4. INSTALL PIPE UNDER THE ENTRANCE IF NEEDED TO MAINTAIN DRAINAGE DITCHES ALONG PUBLIC ROADS.
5. PLACE ROCK OR CRUSHED CONCRETE TO DIMENSIONS AND GRADE AS SHOWN ON PLANS. LEAVE SURFACE SMOOTH AND SLOPED FOR DRAINAGE.
6. DIVERT ALL SURFACE RUNOFF AND DRAINAGE FROM THE ENTRANCE TO A SEDIMENT CONTROL DEVICE.
7. CONSTRUCTION ENTRANCE SHALL BE CONSTRUCTED SIMULTANEOUSLY WITH RECEIVING SEDIMENT CONTROL DEVICE.
8. SEE STANDARD SPECIFICATION, SECTION 4.13 (STABILIZED PAD)

**B) TROUBLESHOOTING:**

1. CONSULT WITH A QUALIFIED DESIGN PROFESSIONAL IF ANY OF THE FOLLOWING OCCUR:
  - a. INADEQUATE RUNOFF CONTROL TO THE EXTENT THAT SEDIMENT WASHES ONTO PUBLIC ROAD - INSTALL DIVERSIONS OR OTHER RUNOFF CONTROL MEASURES.
  - b. SMALL ROCK OR CRUSHED CONCRETE, THIN PAD, OR ABSENCE OF GEOTEXTILE FABRIC RESULTS IN RUTS AND MUDDY CONDITIONS AS ROCK OR CRUSHED CONCRETE IS PRESSED INTO SOIL - INCREASE ROCK OR CRUSHED CONCRETE SIZE OR PAD THICKNESS OR ADD GEOTEXTILE FABRIC.
  - c. PAD TOO SHORT FOR HEAVY CONSTRUCTION TRAFFIC - EXTEND PAD BEYOND THE MINIMUM 50-FOOT LENGTH AS NECESSARY.

**C) INSPECTION AND MAINTENANCE:**

1. INSPECT ROCK OR CRUSHED CONCRETE PAD AND SEDIMENT DISPOSAL AREA WEEKLY AND AFTER 1/2-INCH OR GREATER STORM EVENTS.
2. RESHAPE PAD AS NEEDED FOR PROPER DRAINAGE AND RUNOFF CONTROL.
3. TOPDRESS WITH CLEAN 4-INCH ROCK OR CRUSHED CONCRETE AS NEEDED.
4. IMMEDIATELY REMOVE MUD OR SEDIMENT TRACKED OR WASHED ONTO PUBLIC ROAD. REPAIR ANY BROKEN ROAD PAVEMENT IMMEDIATELY.
5. REMOVE ALL TEMPORARY ROAD MATERIALS FROM AREAS WHERE PERMANENT VEGETATION WILL BE ESTABLISHED.

## DESIGN GUIDE 4.0 - AREA INLET AND CURB INLET PROTECTION

- A. **Description:** Inlet protection consists of a sediment barrier with free-draining material such as sediment fence around a storm drain area inlet or curb inlet. Sediment barriers other than those listed in paragraph C.4 of this section shall be approved by the City.
- B. **Application:** Inlet protection prevents sediment from entering storm drainage systems prior to permanent stabilization of the disturbed area.
- C. **Planning Considerations:** Prior to the start of construction, inlet protection structures should be designed by a registered design professional. Plans and specifications should be referred to by field personnel throughout the construction process.
1. Storm sewers which are made operational prior to stabilization of the associated drainage areas can convey large amounts of sediment to natural waterways. In case of extreme sediment loading, the storm sewer itself may clog and lose its capacity. To avoid these problems it is necessary to prevent sediment from entering the system at the inlets.
  2. There are several types of inlet protection and traps which have different applications depending on site conditions and type of inlet. Other innovative techniques for accomplishing the same purpose are encouraged, but shall be approved only after specific plans and details are submitted to the City for review.
  3. Care should be taken when choosing a specific type of inlet protection. Inlet protection which causes excessive ponding in an area of high construction activity may become so inconvenient that it is removed or bypassed. In such situations, a structure with an adequate overflow mechanism should be utilized.
  4. The following inlet protection devices are allowed for drainage areas of one acre or less. Runoff from larger disturbed areas should be routed to a temporary sediment trap or a temporary sediment basin. The following are allowable area and curb inlet protection devices:
    - a. Sediment Fence – Standard Drawing ESC-4.0 and Standard Specification, Section 4.4
    - b. Gravel Bags – Standard Drawing ESC-4.1 and Standard Specification, Section 4.9
- D. **Design Criteria:**
1. Drainage Area: Less than 1 acre.
  2. Capacity: 2-year or design storm should enter inlet without bypass flow.
  3. The inlet protection device shall be constructed in a manner that will facilitate clean out and disposal of trapped sediment and minimize interference with construction activities.
  4. The inlet protection devices shall be constructed in such a manner that any resulting ponding of stormwater will not cause excessive inconvenience or damage to adjacent areas or structures.
  5. Design criteria more specific to each particular inlet protection device shall be provided in the Standard Plan Drawings and Standard Specifications.
  6. For inlet protection devices which utilize stone as the chief ponding medium, a range of stone sizes should be used. The designer or plan reviewer should maximize treatment action and minimize stone size while not creating significant ponding problems.

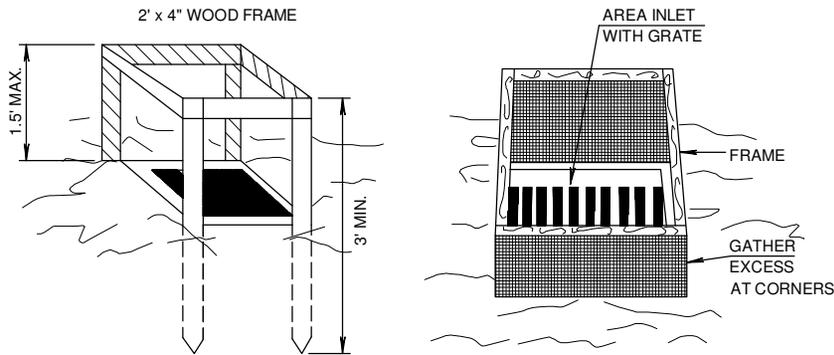
7. High porosity geotextile fabric may be added to any of the devices which utilize coarse aggregate to significantly enhance sediment removal. The fabric, which must meet the physical requirements noted for extra strength, should be secured between the stone and the inlet on wire-mesh if it is present. As a result of the significant increase in treatment efficiency provided by the fabric, a larger range of stone sizes may be utilized with such a configuration. The larger stone will help keep larger sediment masses from clogging the cloth. Notably, significant ponding may occur at the inlet if geotextile cloth is utilized in this manner.

E. **Standard Drawings:** See Standard Drawings ESC-4.0 (Area Inlet Protection) and ESC-4.1 (Curb Inlet Protection).

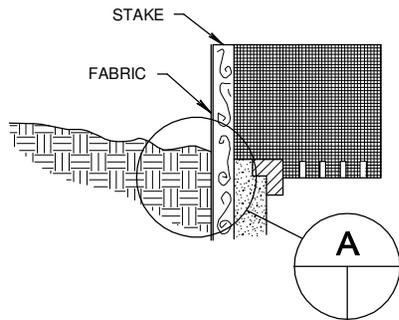
F. **Standard Specification:** See Standard Specification, Section 4.12 (Inlet Protection).

**SEDIMENT FENCE AREA INLET PROTECTION**

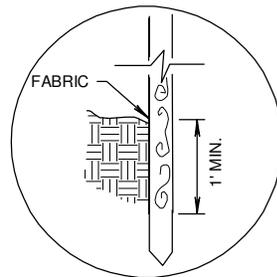
NOTE: FOR ALTERNATE AREA INLET PROTECTION METHODS, SEE STANDARD SPECIFICATION, SECTION 4.12.



**PERSPECTIVE VIEWS**  
NOT TO SCALE



**ELEVATION OF STAKE AND FABRIC ORIENTATION**



**DETAIL A**  
NOT TO SCALE

**SEDIMENT FENCE AREA INLET PROTECTION NOTES:**

**A) CONSTRUCTION SPECIFICATIONS:**

1. SEDIMENT FENCE SHALL CONFORM TO THE CONSTRUCTION SPECIFICATIONS FOR EXTRA STRENGTH FOUND IN THE TABLE BELOW AND SHALL BE CUT FROM A CONTINUOUS ROLL TO AVOID JOINTS.

PHYSICAL PROPERTIES OF FABRIC IN SEDIMENT FENCE:

PHYSICAL PROPERTY	TEST	REQUIREMENTS
FILTERING EFFICIENCY	ASTM 5141	75%
TENSILE STRENGTH AT 20% (MAX.) ELONGATION*	ASTM 4632 AASHTO M288-96	EXTRA STRENGTH - 50 LBS./LINEAR INCH
FLOW RATE	ASTM 5141	0.3 GAL./SQ.FT/ MINUTE**
ULTRAVIOLET RADIATION STABILITY %	ASTM D 4355	90%

\* REQUIREMENTS REDUCED BY 50% AFTER SIX MONTHS OF INSTALLATION.

\*\* HIGH POROSITY FABRIC MAY BE ADDED, IF NECESSARY.

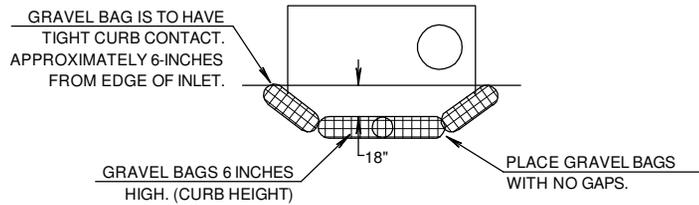
2. FOR STAKES, USE 2x4 WOOD OR EQUIVALENT METAL WITH A MINIMUM LENGTH OF 3 FEET.
3. SPACE STAKES EVENLY AROUND THE PERIMETER OF THE INLET A MAXIMUM OF 3 FEET APART, AND SECURELY DRIVE THEM INTO THE GROUND, APPROXIMATELY 18 INCHES DEEP.
4. TO PROVIDE NEEDED STABILITY TO THE INSTALLATION, FRAME WITH 2x4 WOOD STRIPS AROUND THE CREST OF THE OVERFLOW AREA AT A MAXIMUM OF 1.5 FEET ABOVE THE AREA INLET CREST.
5. PLACE THE BOTTOM 12 INCHES OF THE FABRIC IN A TRENCH AND BACKFILL THE TRENCH WITH 12-INCHES OF COMPACTED SOIL.
6. FASTEN FABRIC SECURELY BY STAPLES, OR WIRE IT TO THE STAKES AND FRAME. JOINTS MUST BE OVERLAPPED TO THE NEXT STAKE.
7. IT MAY BE NECESSARY TO BUILD A TEMPORARY DIKE ON THE DOWNSLOPE SIDE OF THE STRUCTURE TO PREVENT BYPASS FLOW.
8. SEE STANDARD SPECIFICATION, SECTION 4.4, USE REQUIREMENTS ON THIS DRAWING IF CONFLICTING REQUIREMENTS EXIST.

**B) INSPECTION AND MAINTENANCE:**

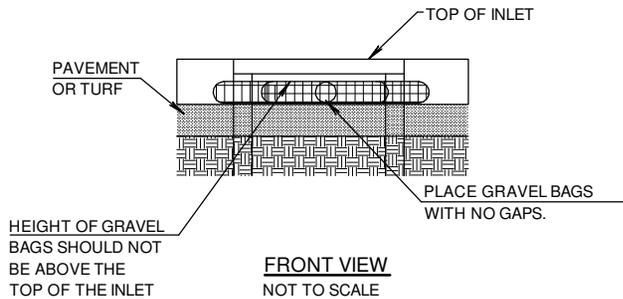
1. THE STRUCTURE SHALL BE INSPECTED AFTER EACH RAIN EVENT OF 1/2 INCH OR GREATER AND REPAIRS MADE AS NEEDED.
2. SEDIMENT SHALL BE REMOVED AND THE TRAP RESTORED TO ITS ORIGINAL DIMENSIONS WHEN THE SEDIMENT HAS ACCUMULATED TO ONE HALF THE DESIGN DEPTH OF THE TRAP.
3. STRUCTURES SHALL BE REMOVED AND THE AREA STABILIZED WHEN THE REMAINING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.
4. SEE STANDARD SPECIFICATION, SECTION 4.3 FOR SEDIMENT REMOVAL AND DISPOSAL REQUIREMENTS. USE REQUIREMENTS ON THIS DRAWING IF CONFLICTING REQUIREMENTS EXIST.

**CURB INLET PROTECTION**  
(USE WITH SUMP INLETS ONLY)

NOTE: FOR ALTERNATE CURB INLET PROTECTION METHODS, SEE STANDARD SPECIFICATION, SECTION 4.



**PLAN VIEW**  
NOT TO SCALE



**FRONT VIEW**  
NOT TO SCALE

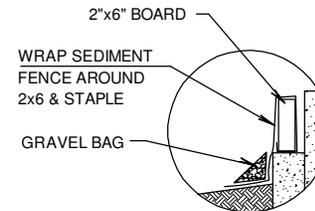
**CURB INLET PROTECTION NOTES:**

**A) INSTALLATION:**

1. SEE STANDARD SPECIFICATION, SECTION 4.12 (INLET PROTECTION) AND SECTION 4.9 (GRAVEL BAGS).
2. IMMEDIATELY FOLLOWING INLET CONSTRUCTION AND PRIOR TO CONSTRUCTION OF CURB AND INLET THROAT, PROTECT INLET OPENING BY INSTALLING 2" x 6" BOARD AND SEDIMENT FENCING ACROSS INLET OPENING IN ACCORDANCE WITH DETAIL A.

**B) INSPECTION AND MAINTENANCE:**

1. CONTRACTOR TO CLEAN OUT SEDIMENT AFTER EACH SIGNIFICANT RAINFALL. ANY SEDIMENT DEPOSITED INTO INLET SHALL BE PROMPTLY REMOVED.
2. DURING CONSTRUCTION OF RESIDENTIAL SUBDIVISIONS, THE FILTER BAG SHALL BE REPLACED BEFORE BAG MATERIAL BECOMES DEGRADED. ANY GRAVEL DEPOSITED INTO THE INLET SHALL BE PROMPTLY REMOVED.
3. SEE STANDARD SPECIFICATION, SECTION 4.3 FOR SEDIMENT REMOVAL AND DISPOSAL REQUIREMENTS.



FOR PROTECTION PRIOR TO POURING THROAT

**DETAIL A**  
NOT TO SCALE

**GENERAL NOTES**

1. CONTRACTOR TO ENSURE THAT GRAVEL IS A WELL GRADED GRAVEL WITH AT LEAST 20% PASSING A NO. 4 SIEVE

## **DESIGN GUIDE 5.0 - CULVERT INLET PROTECTION**

A. **Description:** A sediment settling device located at the inlet end of storm sewer culverts.

B. **Application:**

- 1 To prevent sediment from entering, accumulating in, and being transferred by a culvert and associated drainage system prior to permanent stabilization of a disturbed area.
- 2 To provide sediment control at culvert inlets during phases of a project where elevation and drainage patterns change, causing original control measures to be ineffective or in need of removal.

C. **Planning Considerations:**

- 1 When construction on a project reaches a stage where culverts and other storm sewer appurtenances are installed and areas are brought to plan grade, the erosion control measures used in the early stages normally need to be modified or may need to be removed altogether. At that time, there is a need to provide protection at points where runoff will leave the area via culverts and drop or curb inlets.
- 2 Similar to drop and curb inlets, culverts which are made operational prior to stabilization of the associated drainage areas can convey large amounts of sediment to natural drainage ways. In case of extreme sediment loading, the pipe or pipe system itself may clog and lose its capacity. To avoid these problems, it is necessary to prevent sediment from entering the culvert by using one of the methods noted in this guideline.

D. **Design Criteria:**

1. **Sediment Fence Culvert Inlet Protection**

- a. Sediment fence culvert inlet protection has an expected maximum usable life of three months.
- b. Use Sediment Fence (Reinforced).
- c. Use high porosity geotextile fabric.
- d. Refer to Standard Drawings ESC-5.0 (Culvert Inlet Protection), Standard Drawing ESC-13.1 (Sediment Fence – Reinforced) and Standard Specification, Section 4.4 (Sediment Fence) for additional design Criteria.

2. **Rock or Crushed Concrete Barrier Culvert Inlet Protection**

- a. Clean and reconstruct Rock or Crushed Concrete culvert inlet protection following rainfall events as necessary to ensure effectiveness.
- b. Refer to Standard Drawing ESC-5.0 (Culvert Inlet Protection) and Standard Specification, Section 4.5 (Rock or Crushed Concrete Barriers) for additional design criteria.

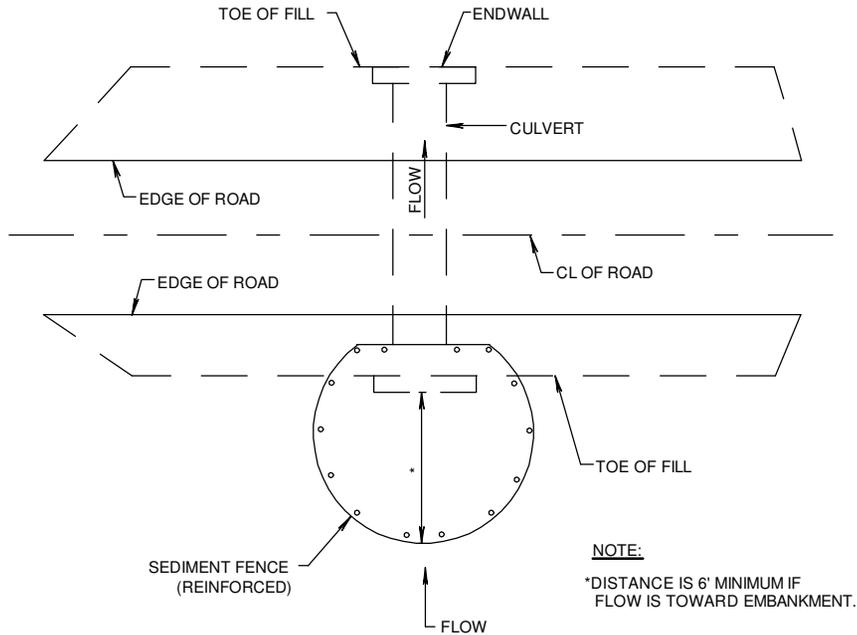
3. **Other Culvert Inlet Protection Procedures**

- a. Other procedures for accomplishing the same purpose are available. Alternative procedures shall be approved only after specific plans and details are submitted to the City for review.

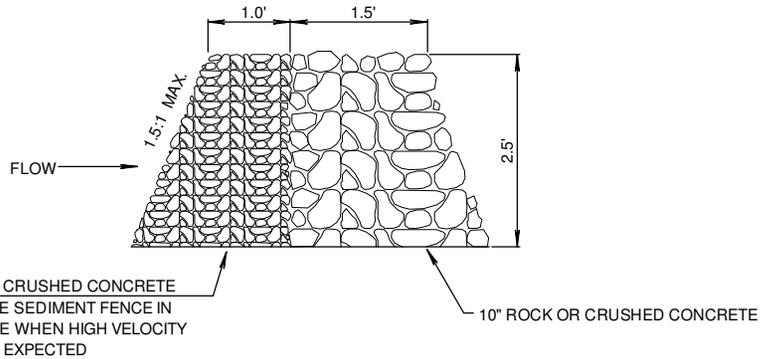
E. **Standard Drawings:** See Standard Drawings ESC-5.0 (Culvert Inlet Protection).

F. **Standard Specification:** See Standard Specification, Section 4.12 (Inlet Protection).

**SEDIMENT FENCE CULVERT INLET PROTECTION**



**OPTIONAL ROCK BARRIER**



2" ROCK OR CRUSHED CONCRETE  
TO REPLACE SEDIMENT FENCE IN  
HORSESHOE WHEN HIGH VELOCITY  
OF FLOW IS EXPECTED

**CROSS SECTION**  
NOT TO SCALE

**CULVERT INLET PROTECTION NOTES:**

**A) GENERAL NOTES:**

1. THE INLET PROTECTION DEVICE SHALL BE CONSTRUCTED IN A MANNER THAT WILL FACILITATE CLEAN-OUT AND DISPOSAL OF TRAPPED SEDIMENT AND MINIMIZE INTERFERENCE WITH CONSTRUCTION ACTIVITIES.
2. THE INLET PROTECTION DEVICES SHALL BE CONSTRUCTED IN SUCH A MANNER THAT ANY RESULTING PONDED STORMWATER WILL NOT CAUSE EXCESSIVE INCONVENIENCE OR DAMAGE TO ADJACENT AREAS OR STRUCTURES.
3. DESIGN CRITERIA MORE SPECIFIC TO EACH PARTICULAR INLET PROTECTION DEVICE AREA FOUND IN STANDARD SPECIFICATION, SECTION 4.

**B) SEDIMENT FENCE (REINFORCED) INSTALLATION NOTES:**

1. THE HEIGHT OF A SEDIMENT FENCE SHALL BE A MINIMUM OF 16 INCHES ABOVE THE ORIGINAL GROUND SURFACE AND SHALL NOT EXCEED 34 INCHES ABOVE GROUND SURFACE.
2. THE GEOTEXTILE SHALL BE PURCHASED IN A CONTINUOUS ROLL CUT TO THE LENGTH OF THE BARRIER TO AVOID THE USE OF JOINTS. WHEN JOINTS ARE UNAVOIDABLE, GEOTEXTILE SHALL BE SPLICED TOGETHER AT A SUPPORT POST, WITH A MINIMUM 6-INCH OVERLAP, AND SECURELY SEALED.
3. DIG A TRENCH AT LEAST 6 INCHES DEEP AND 4 INCHES WIDE ALONG THE FENCE ALIGNMENT.
4. DRIVE POSTS AT LEAST 24 INCHES INTO THE GROUND ON THE DOWNSLOPE SIDE OF THE TRENCH. SPACE POSTS A MAXIMUM OF 6 FEET APART.
5. EXTRA-STRENGTH SEDIMENT FENCE FABRIC SHALL BE USED. POSTS FOR THIS TYPE OF FABRIC SHALL BE PLACED A MAXIMUM OF 6 FEET APART. THE SEDIMENT FABRIC SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING MINIMUM ONE-INCH LONG HEAVY-DUTY WIRE STAPLES OR TIE WIRES, AND EIGHT INCHES OF THE FABRIC SHALL BE EXTENDED INTO THE TRENCH. THE FABRIC SHALL NOT BE STAPLED TO EXISTING TREES.
6. PLACE THE BOTTOM 1 FOOT OF FABRIC IN THE 6-INCH DEEP TRENCH, LAPPING TOWARD THE UPSLOPE SIDE. BACKFILL WITH COMPACTED EARTH, ROCK OR CRUSHED CONCRETE.
7. IF A SEDIMENT FENCE IS TO BE CONSTRUCTED ACROSS A DITCH LINE OR SWALE, IT MUST BE OF SUFFICIENT LENGTH TO ELIMINATE ENDFLOW, AND THE PLAN CONFIGURATION SHALL RESEMBLE AN ARC OR HORSESHOE WITH THE ENDS ORIENTED UPSLOPE. EXTRA-STRENGTH SEDIMENT FABRIC SHALL BE USED FOR THIS APPLICATION WITH A MAXIMUM 3-FOOT SPACING OF POSTS. ALL OTHER INSTALLATION REQUIREMENTS NOTED IN #5 APPLY.
8. TO REDUCE MAINTENANCE, EXCAVATE A SHALLOW SEDIMENT STORAGE AREA ON THE UPSLOPE SIDE OF THE FENCE. PROVIDE GOOD ACCESS IN AREAS OF HEAVY SEDIMENTATION FOR CLEAN OUT AND MAINTENANCE.
9. SEDIMENT FENCES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFUL PURPOSE BUT NOT BEFORE THE UPSLOPE AREA HAS BEEN PERMANENTLY STABILIZED.
10. SEE STANDARD SPECIFICATION, SECTION 4.3 FOR SEDIMENT REMOVAL AND DISPOSAL REQUIREMENTS.

## DESIGN GUIDE 6.0 - OUTLET STABILIZATION

- A. **Description:** Rock or Crushed Concrete outlet stabilization is constructed to control erosion at the outlet of a channel or conduit until permanent erosion control has been established or installed. Rock or crushed concrete is designed to prevent scour at stormwater outlets and minimize downstream erosion by reducing outlet velocities.
- B. **Application:** This practice applies when discharge velocity of a pipe, box culvert, diversion or other water conveyance exceeds the permissible velocity of the receiving area while exposed during construction.
- C. **Planning Considerations:** Prior to the start of construction, outlet stabilization should be designed by a registered design professional. Plans and specifications should be referred to by field personnel throughout the construction process and improvements built according to plan alignment, grade, cross section and length.
- D. **Design Criteria:**

1. **Grading:** There should be a smooth transition between the outlet stabilization structure and the receiving channel; the elevation of the rock or crushed concrete at the downstream end should be at the same elevation as the bottom of the receiving channel.
2. **Alignment:** The alignment of the rock or crushed concrete should be straight throughout its length. If a curve is required, it should be located in the upstream section of the outlet stabilization structure.
3. **Rock or Crushed Concrete:** Rock or Crushed Concrete should consist of a well-graded mixture. Larger rock or crushed concrete should predominate, with sufficient smaller sizes to fill the remaining. The diameter of the largest rock or crushed concrete size should not be larger than 1.5 times the  $d_{50}$  size determined to be necessary and as specified in Standard Specification, Section 4.5 (Rock or Crushed Concrete Barrier). The minimum size of Rock or Crushed Concrete shall be 6-inch.

4. **Rock or Crushed Concrete Dimensions:**

Thickness: Minimum thickness of material should be 1.5 times the maximum material diameter.

Length: The length of outlet protection must be designed such that erosion of the receiving material at the outlet is minimal. Minimum length shall be 6 times the conduit outside diameter or opening width, measured from the end of the end section or apron. Outlet protection must extend behind pipe outlet to the pipe / end section coupling.

Width: The width of outlet protection shall be the smaller of: a) 4 times the conduit outside diameter or opening width, or b) when the elevation of the outer limits of the outlet protection is equal to the top of the conduit opening.

5. **Rock or Crushed Concrete Quality:** Select the material from good sources and ensure that all materials are clean, and free of soil, debris and organic material. The rock or crushed concrete should be hard, angular, and chemical and weather resistant.
6. **Filter:** Install or construct a filter between the rock or crushed concrete and the subgrade to prevent undermining of the structure due to movement of fine-grained subgrade soil. The filter can consist of either properly graded sand or gravel layer, a manufactured geotextile fabric, or a combination of both.
7. **Toewalls:** Construct as needed around the perimeter.

**E. Alternative Methods:**

1. Rolled Erosion Control Products, Sediment Fence (Reinforced) and Concrete Lining may be acceptable outlet stabilization structures in some applications. Alternative methods shall be approved only after specific plans and details are submitted to the City for review.

## DESIGN GUIDE 7.0 – TEMPORARY DIVERSION

- A. **Description:** Diversions consist of an earthen berm and adjacent swale (or diversion channel) from which the berm material is constructed. The berm is constructed on the down slope side of the swale.
- B. **Application:** Diversions reduce slope length and intercept and divert stormwater runoff to stabilized outlets or sediment trapping facilities, at non-erosive velocities.
- C. **Planning Considerations:**
1. Diversions are useful tools for managing surface water flows and preventing soil erosion. On moderately sloping areas they may be placed at intervals to trap and divert sheet flow before it concentrates and causes rill and gully erosion. They may be placed at the top of cut or fill slopes to keep runoff from upland drainage areas off the slope. They can also be used to protect structures, parking lots, adjacent properties, and other special areas from erosion and flooding.
  2. It's important to establish adequate vegetation as promptly after installation to prevent erosion of the diversion structure. It's also important to stabilize the drainage area above the diversion so that sediment will not enter and accumulate in the diversion channel.
  3. Typically, these measures are installed after the final grading is complete. On cuts, diversions may be installed before work begins since work proceeds from the top to the bottom of the slope and the diversions have little chance of being covered or damaged. On fills, the work proceeds from the bottom to the top and the elevation changes daily, therefore it's not feasible to construct a diversion until the grading is completed or suspended. The filling operation should be completed as quickly as possible and the permanent slope stabilization measures installed as soon as possible, to minimize erosion.
  4. Temporary diversions may be used as a perimeter control in association with sediment traps or sediment basins on moderate to large construction sites. If installed properly in initial phases of grading, maintenance can be minimal. Cleaning of sediment-trapping facilities is typically the most significant maintenance requirement.
- D. **Design Criteria:** Diversion location shall be determined by considering outlet conditions, topography, land use, soil type, length of slope, seepage planes, and development layout. Diversions shall be engineered to ensure adequate capacity is provided in non-erosive manner. The following design criteria shall be met:
1. **Drainage Area:** The maximum recommended drainage area is 5 acres.
  2. **Height:** The height of the dike at the centerline of the inlet shall be equal to the diameter of the pipe plus 6 inches. Where the dike height is greater than 18 inches at the inlet, it shall be sloped at the rate of 3H:1V or flatter to connect with the remainder of the dike.
  3. **Side Slopes:** 2H:1V or flatter, with a minimum top width of 2 feet.
  3. **Grade:** The channel shall have a positive, non-erosive grade to a stabilized outlet.
  4. **Outlet:** The diverted runoff should be released through a stabilized outlet, slope drain, or sediment trapping measure.
- E. **Standard Drawings:** See Standard Drawing ESC-7.0 (Temporary Diversion and Slope Drain).
- F. **Standard Specification:** See Standard Specification, Section 4.10 (Temporary Diversion).

**DESIGN GUIDE 7.1 - TEMPORARY SLOPE DRAIN**

- A. **Description:** A temporary slope drain is a flexible tube or conduit extending from the top to the bottom of a cut or fill slope. A detail is located on Standard Drawing ESC-7.0, Temporary Diversion and Slope Drain.
- B. **Application:** Temporarily conveys concentrated stormwater runoff down the face of a cut or fill slope, in a conduit, without causing erosion on or below the slope.

**C. Planning Considerations:**

- 1 There is often significant lag time from the completion of cut or fill slope grading and installation of permanent drainage system. During this period, the slope is particularly vulnerable to erosion. Temporary slope drains provide protection for exposed slopes until permanent drainage structures can be installed and permanent vegetation can be established.
- 2 Temporary slope drains can be used in conjunction with diversion berms to convey runoff from the entire drainage area above a slope to the base of the slope without erosion. Temporary slope drains and diversions shall be engineered to ensure adequate capacity. The entrance section must be securely entrenched; all connections must be watertight; and the conduit must be staked securely.

**D. Design Criteria:**

- 1 **Drainage Area:** The maximum allowable drainage area per slope drain is 5 acres.
- 2 **Flexible Conduit:** Slope drain shall consist of heavy-duty, flexible material designed for this purpose. The diameter of the slope drain shall be equal over its entire length. Reinforced hold-down grommets shall be spaced at or less than 10-foot intervals. Slope drains shall be sized as listed in the table below to be adequate for a 10-year, 24-hour storm event with a runoff coefficient of 0.6. If an area has a runoff coefficient of more than 0.6, designer shall provide the proper pipe size to accommodate the excess flow.

**Table 1055-1: Size of Slope Drain**

Maximum Drainage Area (acres)	Pipe Diameter (inches)
0.5	12
1.5	18
2.5	21
3.5	24
5.0	30

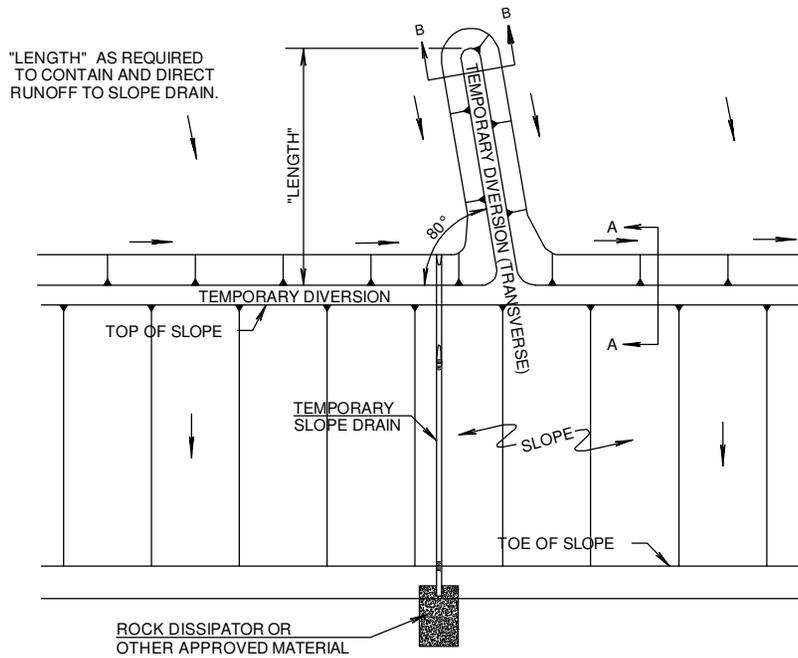
**3. Entrance Sections:**

- a. The entrance to the slope drain shall consist of a standard flared end-section with appropriate inlet protection as set forth in Design Guide 5.0, Culvert Inlet Protection. If ponding will cause a problem at the entrance and make such protection impractical, appropriate sediment-removing measures shall be taken at the outlet of the pipe. Watertight fittings shall be provided.
- b. The height of the dike at the centerline of the inlet shall be equal to the diameter of the pipe plus 6 inches. Where the dike height is greater than 18 inches at the inlet, it shall be sloped at the rate of 3H:1V or flatter to connect with the remainder of the dike.

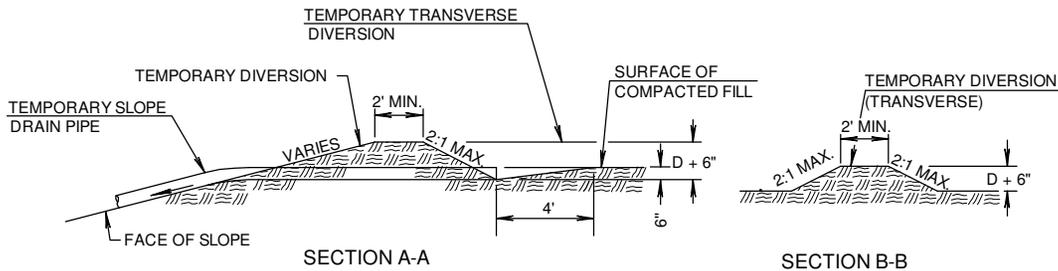
- 5. **Outlet Protection:** The outlet of the slope drain must be protected from erosion as set forth in Design Guide 6.0, Outlet Stabilization.

- E. **Standard Drawings:** See Standard Drawing ESC-7.0 (Temporary Diversion and Slope Drain).
- F. **Standard Specification:** See Standard Specification, Section 4.11 (Temporary Slope Drain).

**TEMPORARY DIVERSION AND SLOPE DRAIN**

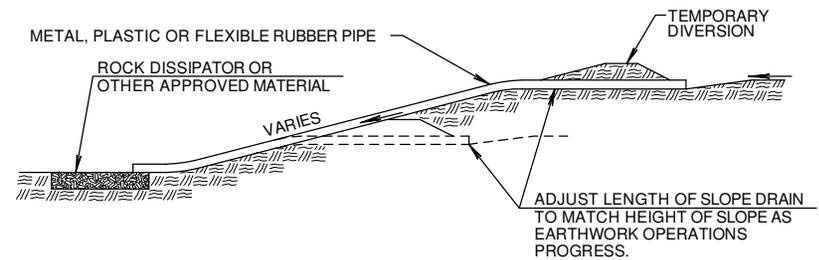


**TYPICAL PLAN VIEW**  
NO SCALE



NOTE: "D" IS THE DIAMETER OF THE PIPE

**TYPICAL PROFILE**  
NO SCALE



**TYPICAL PROFILE OF TEMPORARY SLOPE DRAIN**  
NO SCALE

**TEMPORARY DIVERSION AND SLOPE DRAIN NOTES:**

**A) INSTALLATION:**

1. TEMPORARY SLOPE DRAIN AND TEMPORARY DIVERSION MAY BE USED TO PROTECT PROJECT SLOPES.
2. THE SLOPE DRAIN SHALL BE DESIGNED TO CONVEY THE PEAK RUNOFF FOR A 10-YEAR, 24 HOUR STORM.
3. SLOPE DRAIN SECTIONS ARE TO BE SECURELY FASTENED TOGETHER AND HAVE WATERTIGHT FITTINGS.
4. DISCHARGE OF SLOPE DRAINS SHALL BE INTO STABILIZED DITCH OR AREA, OR INTO SEDIMENT BASIN.
5. PIPE SHALL BE SECURED IN PLACE WITH REINFORCED HOLD-DOWN GROMMETS, SPACED @ 10-ft OR LESS.
6. SEE STANDARD SPECIFICATION, SECTION 4.10 (TEMPORARY DIVERSIONS) AND 4.11 (TEMPORARY SLOPE DRAIN) FOR ADDITIONAL REQUIREMENTS.

**C) INSPECTION AND MAINTENANCE:**

1. SLOPE DRAINS STRUCTURE SHALL BE INSPECTED WEEKLY, AND AFTER EACH STORM EVENT OF 1/2 - INCH OR GREATER, NECESSARY REPAIRS SHALL BE MADE PROMPTLY.
2. SLOPE DRAIN IS TO REMAIN IN PLACE UNTIL THE SLOPE HAS BEEN STABILIZED.
3. SEE STANDARD SPECIFICATION, SECTION 4.3 FOR SEDIMENT REMOVAL AND DISPOSAL REQUIREMENTS.

## DESIGN GUIDE 8.0 - TEMPORARY STREAM CROSSING

- A. **Description:** A temporary stream crossing is a small stream crossing required when construction vehicles need to cross or when in-stream utility construction is necessary.
- B. **Application:** They are generally applicable to flowing streams with drainage areas less than one square mile. Structures or methodology for crossing streams with larger drainage areas should be designed by methods which more accurately define the actual hydrologic and hydraulic parameters which will affect the functioning of the structure. Crossings serve to help protect sediment from entering the stream from construction within approach areas, minimize the amount of disturbance within the stream itself, and allow vehicle access across the stream.

### 1. VEHICULAR CROSSINGS

- a. **Planning Considerations:** Temporary stream crossings are necessary to prevent construction vehicles from damaging streambanks and continually tracking sediment and other pollutants into the flow regime. They should be planned to be in service for the shortest practical period of time and to be removed as soon as their function is completed. The designer must also be aware that such structures are subject to the rules and regulations of the U.S. Army Corps of Engineers for in-stream modifications (i.e., the 404 permit).

A temporary bridge crossing is a structure made of wood, metal, or other material which provides access across a stream or waterway. It is the preferred method for temporary stream crossings. Normally, bridge construction causes the least amount of disturbance to the stream bed and banks when compared to the other types of crossings. They can also be quickly removed and reused. In addition, temporary bridges pose the least chance for interference with fish migration when compared to the other temporary access stream crossings. A temporary culvert crossing is a structure consisting of rock or crushed concrete and sections of circular pipe, pipe arches, or oval pipes of reinforced concrete, corrugated metal, or structural plate which are used to convey flowing water through the crossings. Temporary culverts are used where the channel is too wide for normal bridge construction or the anticipated loading of construction vehicles may prove unsafe for single span bridges. The rock or crushed concrete, along with the temporary culverts, can be salvaged and reused.

- b. **Design Criteria:** See Standard Specification, Section 4.15 (Temporary Stream Crossing) for design criteria.

### 2. UTILITY CROSSINGS

- a. **Planning Considerations:** Utility construction, by virtue of its sprawling, linear nature, frequently crosses and impacts live streams. There is a potential for excessive sediment loss into a stream by both the disturbance of the approach areas and by the work within the streambed and banks.

It is often difficult to decide what type of control to use at a utility stream crossing. A method such as the boring and jacking of pipe below a streambed, which would prevent disturbance within the watercourse, is a preferred method if it is practical. However, in cases where in-stream work is unavoidable, consideration must be given to providing adequate mitigation of sediment loss while minimizing the amount of encroachment and time spent working in the channel. Sometimes there is less damage to the environment by providing substantial controls for the approach areas and refraining from installing extensive measures in the stream itself. However, when the installation of the utility line within streambed and banks will take an extended period of construction time, consideration should be given to substantial in-stream controls or stream diversion in order to prevent excessive erosive damage.

Designers and plan reviewers should always make site visits to proposed crossing to help ensure the most appropriate stream crossing method is chosen. State and federal construction permits and corresponding requirements shall apply and be satisfied.

There are several methods for dealing with utility stream crossings which allow for work to be completed under dry conditions to prevent excessive sediment damage. Stream utility crossings plans and specifications shall be submitted to the City for review and approval, prior to construction.

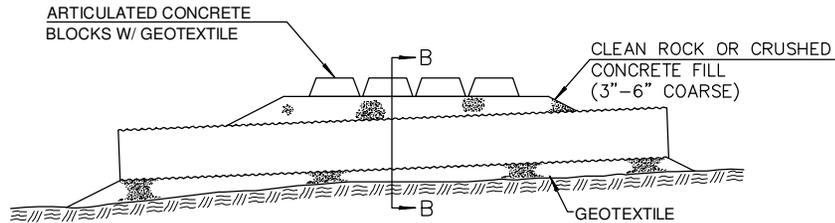
b. **Design Criteria:** See Standard Specification, Section 4.15 (Temporary Stream Crossing) for design criteria.

C. **Standard Drawings:** See Standard Drawing ESC-8.0 (Temporary Stream Crossing).

D. **Standard Specification:** See Standard Specification, Section 4.15 (Temporary Stream Crossing).

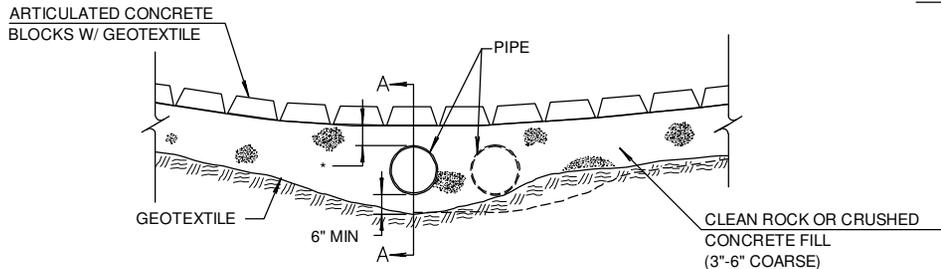
**TEMPORARY STREAM CROSSING**

(ARTICULATED CONCRETE BLOCKS)



**SECTION A-A**

NO SCALE



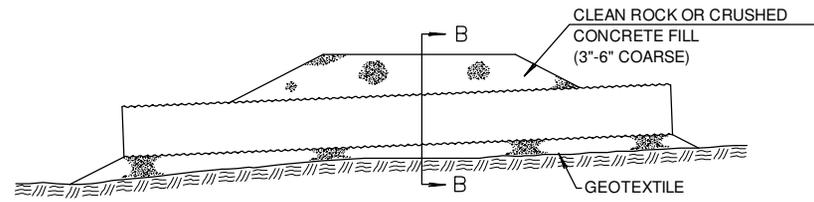
**SECTION B-B**

NO SCALE

- \* 6" MIN FOR METAL OR RCP
- \* 12" MIN FOR HDPE

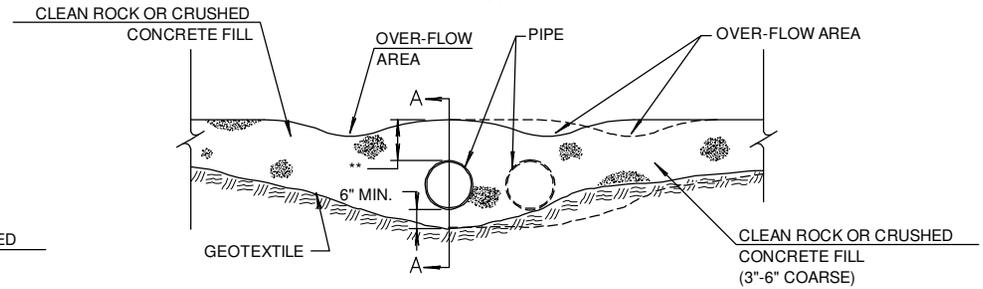
**TEMPORARY STREAM CROSSING**

(ROCK OR CRUSHED CONCRETE)



**SECTION A-A**

NO SCALE



**SECTION B-B**

NO SCALE

- \*\* 12" MIN FOR METAL OR RCP
- \*\* 18" MIN FOR HDPE

**TEMPORARY STREAM CROSSING NOTES:**

**A) INSTALLATION:**

1. QUANTITY, LENGTH, AND DIAMETER OF PIPE TO BE DETERMINED BY DESIGN CALCULATIONS.
2. CLEARING AND EXCAVATION OF THE STREAM BED AND BANKS SHALL BE KEPT TO A MINIMUM.
3. THE INVERT ELEVATION OF THE CULVERT SHALL BE INSTALLED ON THE NATURAL STREAMBED GRADE TO MINIMIZE INTERFERENCE WITH FISH MIGRATION.
4. GEOTEXTILE SHALL BE PLACED ON THE STREAMBED AND STREAMBANKS PRIOR TO PLACEMENT OF THE PIPE CULVERT AND ROCK OR CRUSHED CONCRETE. THE GEOTEXTILE SHALL COVER THE STREAMBED AND EXTEND A MINIMUM OF 6 INCHES AND A MAXIMUM OF 1 FOOT BEYOND THE END OF THE CULVERT AND BEDDING MATERIAL. FILTER CLOTH REDUCES SETTLEMENT AND IMPROVES CROSSING STABILITY.
5. THE CULVERT SHALL EXTEND A MINIMUM OF 1 FOOT BEYOND THE UPSTREAM AND DOWNSTREAM TOE OF THE ROCK OR CRUSHED CONCRETE PLACED AROUND THE CULVERT. IN NO CASE SHALL THE CULVERT EXCEED 40 FEET IN LENGTH.

6. WHEN THE CROSSING HAS SERVED ITS PURPOSE, ALL STRUCTURES INCLUDING CULVERTS, BEDDING, AND GEOTEXTILE MATERIALS SHALL BE REMOVED. REMOVAL OF THE STRUCTURE AND CLEAN-UP OF THE AREA SHALL BE ACCOMPLISHED WITHOUT CONSTRUCTION EQUIPMENT WORKING IN THE CHANNEL.
7. UPON REMOVAL OF THE STRUCTURE, THE STREAM SHALL IMMEDIATELY BE SHAPED TO ITS ORIGINAL CROSS-SECTION AND PROPERLY STABILIZED.
8. SEE STANDARD SPECIFICATION, SECTION 4.15 (TEMPORARY STREAM CROSSING) FOR ADDITIONAL DESIGN CRITERIA AND REQUIREMENTS.

**B) INSPECTION AND MAINTENANCE:**

1. CROSSING SHALL BE INSPECTED DAILY. NECESSARY REPAIRS SHALL BE MADE PROMPTLY.

## DESIGN GUIDE 9.0 – TEMPORARY SLOPE BREAK

- A. **Description:** Slope breaks consist of erosion control practices such as earth diversions, sediment fence or other approved devices, to minimize erosion and sedimentation along long slopes, if no other erosion control practice (temporary seeding, permanent seeding, hydrocover, etc.) is in place, or is not yet established. Slope breaks can include grading practices during construction to minimize long, steep slopes while establishing suitable topography for buildings, facilities, and other land uses.
- B. **Application:** Sites with long or steep disturbed slopes.
- C. **Planning Considerations:** Review the grading plan showing disturbed areas, cuts, fills, and finished elevations throughout site. Review and improve construction grading phasing plan to minimize erosion.
- D. **Design Criteria:**
1. **Scheduling Construction Activities:** Schedule construction activities in such a way that the least area is disturbed at one time.
  2. **Slope Breaks:** Use slope breaks, such as diversions, sediment fence or other devices to reduce the length of cut-and-fill slopes to limit sheet and rill erosion. Refer to the following Table, which provides suggested guidelines for spacing of slope breaks.

**Table 9.0-1:** Guidelines for Spacing Slope Breaks

Slope	Spacing (ft)
33-50%	20
25-33%	40
15-25%	60
10-15%	80
6-10%	120
3-6%	200
<3%	300

3. **Surface Runoff:** Avoid disturbing natural drainageways, if possible. At each slope break, intercept runoff and channel to storm drains or stabilized watercourses. If runoff is laden with sediment, protect drain inlets with a filter or divert water to a sediment trap or basin according to the site grading plan.
4. **Erosion Control:** Graded areas should be stabilized with mulch, vegetation, rock or crushed concrete, or other measures, as soon as work is completed or if work is interrupted for 30 or more working days.
5. **Slopes to be Vegetated:** Vegetation shall be placed on slopes of 2H:1V or flatter or 3H:1V or flatter where maintained by tractor or other equipment. Slopes should be roughened during grading operations to retain water, increase infiltration, and promote vegetative growth. Slopes should be protected from surface runoff.
6. **Borrow and Disposal Areas:** Borrow and disposal areas shall be shown on the grading plan and no closer than 50 feet to a streambank. Sediment control devices must be used on the down slope side of these areas.
7. **Outlet:** Stable channels and waterways should be provided for runoff from the disturbed area to retain sediment on site.

## DESIGN GUIDE 10.0 - TEMPORARY SEDIMENT BASIN

- A. **Description:** A temporary sediment basin is a temporary barrier or dam with a controlled stormwater release structure formed by constructing an embankment of compacted soil across a drainageway. It can detain sediment-laden runoff from disturbed areas in wet and dry storage long enough for the majority of the sediment to settle out.
- B. **Application:** They are used below disturbed areas where the total contributing drainage area is greater than or equal to 3 acres. There must be significant space and appropriate topography for the construction of a temporary impoundment. These structures are limited to a useful life of 18 months unless they are designed as permanent impoundments. Any sediment basin shall be designed by a professional Engineer and Kansas dam safety rules and regulations shall apply.
- C. **Planning Considerations:**

- 1 **Effectiveness:** The effectiveness of the basin is based on primarily two factors: the system of erosion and sediment controls above the basin and the designed shape of the basin. The sediment basin is usually the final control before stormwater discharges from the site; therefore, it should be used in conjunction with erosion control practices such as temporary seeding, mulching, diversion dikes, and other sediment control devices to reduce the amount of sediment flowing into the basin.

The shape of the basin can increase its effectiveness by increasing the distance between where runoff enters the basin and where it is discharged; this will increase the settling time for the sediment.

The sediment removal efficiency problems of the temporary sediment trap are also applicable to the sediment basin. In order to contain the majority of sediment which flows to the structure, the basin should have a permanent pool, or wet storage area, and a dry storage area which dewater over time. The volume of wet storage required to prevent short-circuiting of the basin during larger storm events must be an additional 67 cubic yards per acre of drainage area. The total storage volume of the basin at the principal spillway riser crest should therefore be 134 cubic yards per acre of drainage area.

Sediment basins, along with other perimeter controls intended to trap sediment shall be constructed as a first step in any land disturbing action and shall be made functional before upslope land disturbance takes place.

- 2 **Location:** To improve the effectiveness of the basin, it should be located to intercept the largest possible amount of runoff from the disturbed area. The best locations are generally low areas and natural drainageways below disturbed areas. Drainage into the basin can be improved by the use of diversion dikes and ditches. The basin must not be located in a live stream but should be located to trap runoff before it enters a stream. The basin should not be located where its failure could result in the loss of life or interruption of public utility service or roads.
- 3 **Multiple Use:** Sediment basins may remain in place after construction and final site stabilization are completed to serve as permanent stormwater management structures. Because the most practical location for a sediment basin is often the most practical location for a stormwater management basin, it is often desirable to utilize these structures for permanent stormwater management purposes. It should be noted that in most cases, a typical structure's outfall system will be defined during construction and post-construction periods. Care must be taken to avoid constructing an outfall system which will achieve the desired post-construction control but will not provide the requirements for construction runoff. The design for permanent ponds is beyond the scope of these standards and specifications.

#### D. Design Criteria:

Sediment Basins shall be designed by a Professional Engineer in Kansas and shall satisfy all applicable local, state and federal rules and regulations.

The embankment, reservoir, spillway and appurtenances shall be constructed as shown on plans drawings prepared by the Professional Engineer and as approved by the City.

- 1 **Maximum Drainage Area:** The maximum allowable drainage area to a temporary sediment basin shall be 100 acres. When the drainage area to any one temporary basin exceeds 50 acres, an alternative design procedure shall be used to more accurately define the specific hydrology and hydraulics of the site and the control measure. The design procedures in this document does not generate hydrographs, utilize storage volumes, or provide a routing of the design storms; for a large drainage area, this may result in an excessively large diameter riser or an oversized basin. Design considerations which are more accurate and project-specific than those in this specification are acceptable and encouraged with any size basin.
- 2 **Basin Capacity:** The design storage capacity of the basin must be at least 134 cubic yards per acre of contributing drainage area. One half of the total design volume shall be in the form of a permanent pool and the remaining half as drawdown volume. The permanent pool shall be from the low point of the basin to the elevation corresponding to one half the total storage volume. The drawdown area shall be from the elevation of the permanent pool to the crest of the principal spillway or riser pipe. Sediment should be removed from the basin when the volume of the permanent pool has been reduced by one-half. In no case shall the sediment clean out level be higher than one foot below the bottom of the dewatering device. The elevation of the sediment clean out level should be calculated and clearly marked on the plans and riser. The location of this mark on the riser normally will be under water; therefore a mark should also appear above the permanent pool a measured distance above the clean out elevation.

While attempting to attain the desired storage capacities, efforts should be made to keep embankment heights to a minimum. This precaution takes on added significance when the basin will only serve as a temporary structure or will need substantial retrofitting prior to functioning as a permanent structure. When site topography permits, the designer should give strong consideration to the use of excavation to obtain the required capacity and to possibly reduce the height of the embankment. This excavation can be performed in a manner which creates a wet storage area or which increases the storage capacity over the entire length of the basin.

- a. For a natural basin, the wet storage volume may be approximated as follows:

$$V_1 = 0.4 \times A_1 \times D_1$$

where,

$V_1$  = the wet storage volume in cubic feet

$A_1$  = the surface area of the flooded area at the invert of the dewatering outlet in square feet

$D_1$  = the maximum depth, measured from the low point in the basin to the invert of the dewatering outlet in feet

- b. For a natural basin, the dry storage volume may be approximated as follows:

$$V_2 = \{(A_1 + A_2)/2\} \times D_2$$

where,

$V_2$  = the dry storage volume in cubic feet

$A_1$  = the surface area of the flooded area at the invert of the dewatering outlet in square feet

A2 = the surface area of the flooded area at the crest of the principal spillway in square feet  
D2 = the depth measured from the invert of the dewatering outlet to the crest of the principal spillway in feet

Note 1: The volumes may be computed from more precise contour information or other suitable methods.

If the volume of the basin is inadequate or embankment height becomes excessive, use excavation to obtain the required volume.

3. **Basin Shape:** To improve sediment trapping efficiency of the basin, the effective flow length should be twice the effective flow width. This basin shape may be attained by properly selecting the site of the basin or by using excavation or baffles.

- a. The shape of the basin must be such that the length-to-width ratio is at least 2 to 1 according to the following equation:

$$\text{Length-to-Width Ratio} = L / W_e$$

where,

$W_e = A/L$  = the effective width

A = the surface area of the normal pool

L = the length of the flow path from the inflow to the outflow. If there is more than one inflow point, any inflow which carries more than 30 percent of the peak rate of inflow must meet these criteria.

- b. Baffles increase the flow length by deflecting the flow. The baffles should be placed halfway between the inflow point and the outflow. Standard Drawing ESC 10.0 shows the detail for baffle construction.

4. **Embankment Cross Section:** For embankments of less than 10 feet, the embankment must have a minimum top width of 6 feet, and the side slopes must be 2H:1V or flatter. In the case of an embankment 10 to 14 feet in height, the minimum top width shall be 8 feet and the side slopes shall be 2.5H:1V or flatter.

5. **Spillway Design:** The outlets for the basin shall consist of a principal and an emergency spillway. These outlets must pass the peak runoff expected for a 25-year storm. If a separate emergency spillway is not feasible due to site conditions or basin geometry, the principal spillway must pass the entire peak runoff expected from the 25-year storm. An attempt to provide a separate emergency spillway should always be made. Runoff computations shall be based upon bare soil conditions. The flow through the dewatering orifice cannot be utilized when calculating the 25-year storm elevation because of its potential to become clogged; therefore, available spillway storage must begin at the principal spillway riser crest.

- E. **Principal Spillway:** For maximum effectiveness, the principal spillway should consist of a vertical pipe or box of corrugated metal or reinforced concrete with a minimum diameter of 15 inches, joined by a watertight connection to a horizontal outlet pipe, or barrel extending through the embankment and outletting beyond the downstream toe of the fill.

1. **Principal Spillway Design:**

- a. If an emergency spillway is included, the principal spillway must be at least pass the peak rate of runoff from the basin drainage area for a 2-year, 24-hour storm.

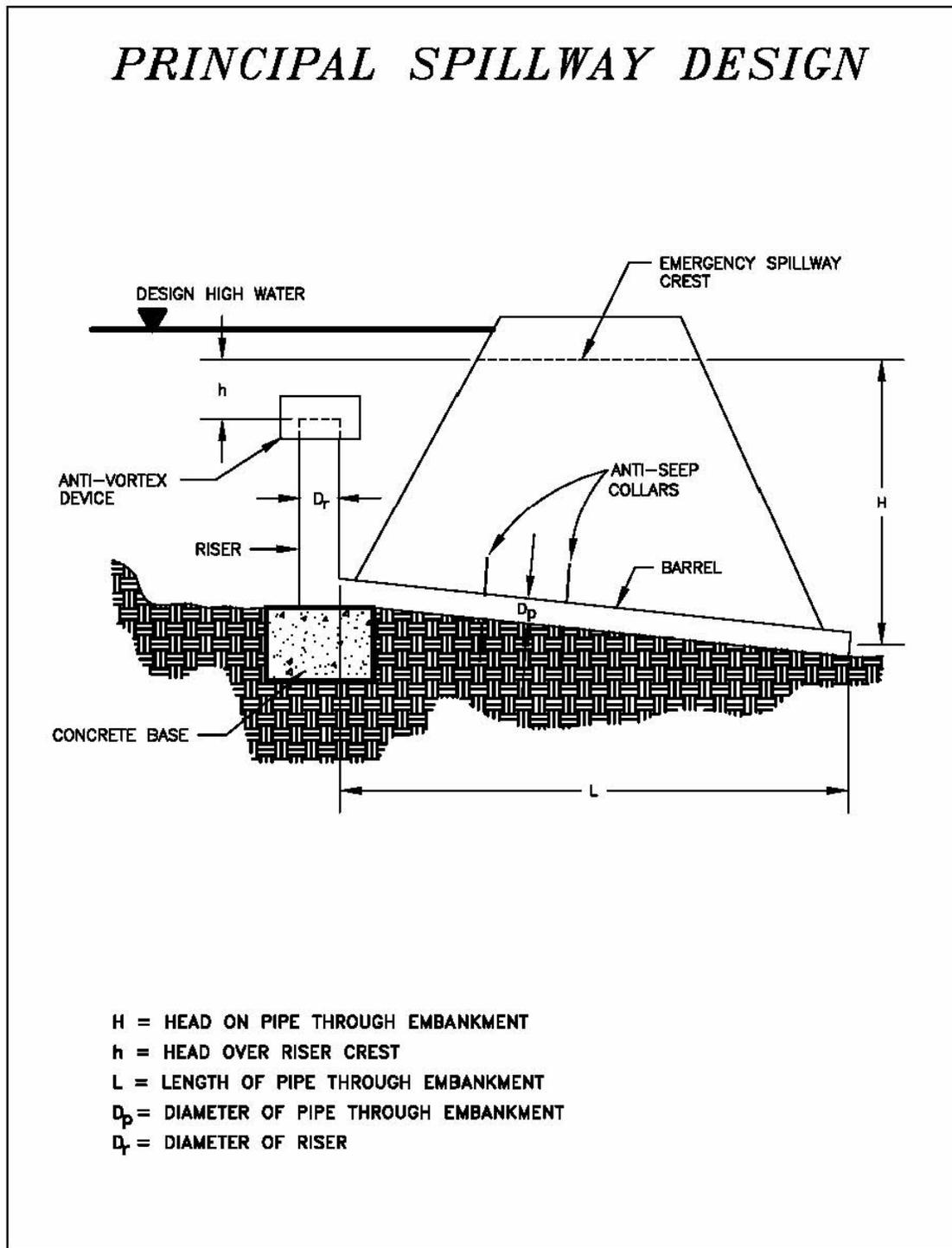
$Q_p$  = the 2-year peak rate of runoff

- b. If an emergency spillway is not included, the principal spillway must pass the peak rate of runoff from the basin drainage area for a 25 year storm.

Therefore,  $Q_p$  = the 25-year peak rate of runoff

- c. Refer to Figure 10.0-1, where  $h$  is the difference between the elevation of the crest of the principal spillway and the elevation of the crest of the emergency spillway.
- d. Determine the riser diameter by choosing the smallest riser with slightly more flow capacity than the horizontal principal spillway pipe with the available head,  $h$ .
- e. Refer to Figure 10.0-1 where  $H$  is the difference in elevation of the centerline of the outlet of the barrel and the crest of the emergency spillway.  $L$  is the length of the barrel through the embankment.

Figure 10.0-1



Source: VA. DCR, 1992

- f. Determine the appropriate barrel size which will pass the required flow volume.
- 2 **Design Elevations:** The crest of the principal spillway shall be set at the elevation corresponding to the total storage volume required. If the principal spillway is used in conjunction with an emergency spillway, this elevation shall be at least 1.0 foot below the crest of the emergency spillway. A minimum freeboard of 1.0 foot shall be provided between the design high water and the top of the embankment. See Figure 10.0-1. If no emergency spillway is used, the crest of the principal spillway shall be at least 3

feet below the top of the embankment; a minimum freeboard of 2.0 feet shall be provided between the design high water and the top of the embankment.

3. **Additional Design Elements:** The following additional design elements shall be considered, documented in plans, specifications and the attached temporary sediment basin data sheet, and submitted to the City for review and approval, prior to construction.
  - a. Principal spillway anti-vortex device
  - b. Basin dewatering device (drawdown valve)
  - c. Need for anti-seep collars
  - d. Emergency spillway capacity and stability - The emergency spillway must pass the remainder of the 25-year peak rate of runoff not carried by the principal spillway
  - e. Pedestrian safety.
4. **Temporary Sediment Basin Design Data Sheet:** The following data sheet shall be completed and submitted to the City for review and approval, prior to construction.

### TEMPORARY SEDIMENT BASIN DESIGN DATA SHEET

*(with or without emergency spillway)*

Project \_\_\_\_\_

Basin # \_\_\_\_\_ Location \_\_\_\_\_

Total area draining to basin: \_\_\_\_\_ acres.

#### Basin Volume Design

##### Wet Storage:

- 1 Minimum required volume = 67 cu. yds. X Total Drainage Area (acres).  
67 cu. yds/acre x \_\_\_\_\_ acres = \_\_\_\_\_ cu. yds.
- 2 Available basin volume = \_\_\_\_\_ cu. yds. at elevation \_\_\_\_\_.  
(From storage – elevation curve).
- 3 Excavate \_\_\_\_\_ cu. yds. to obtain required volume\*.  
\*Elevation corresponding to required volume = invert of the dewatering orifice.
- 4 Available volume before cleanout required:  
33 cu. yds/acre x \_\_\_\_\_ acres = \_\_\_\_\_ cu. yds.
- 5 Elevation corresponding to cleanout level = \_\_\_\_\_.  
(From Storage – Elevation Curve).
- 6 Distance from invert of the dewatering orifice to cleanout level = \_\_\_\_\_ ft. (Min. = 1.0 ft.)

##### Dry Storage:

- 7 Minimum required volume = 67 cu. yds. x Total Drainage Area in acres.  
67 cu. yds. X \_\_\_\_\_ acres = \_\_\_\_\_ cu. yds.

8 Total available basin volume at crest of riser\* = \_\_\_\_\_ cu. yds. at elevation \_\_\_\_\_.  
(From Storage – Elevation Curve).

\*Minimum = 134 cu. yds./acre of total drainage area.

9 Diameter of dewatering orifice = \_\_\_\_\_ in.

Preliminary Design Elevations:

11 Crest of Riser = \_\_\_\_\_

Top of Dam = \_\_\_\_\_

Design High Water = \_\_\_\_\_

Upstream Toe of Dam = \_\_\_\_\_

Basin Shape:

12  $\frac{\text{Length of Flow}}{\text{Effective Width}} = \frac{L}{We} =$  \_\_\_\_\_

If  $> 2$ , baffles are not required \_\_\_\_\_

If  $< 2$ , baffles are required \_\_\_\_\_

Runoff:

13  $Q_2 =$  \_\_\_\_\_ cfs

14  $Q_{25} =$  \_\_\_\_\_ cfs

Principal Spillway Design:

15. With emergency spillway, required spillway capacity  $Q_p = Q_2 =$  \_\_\_\_\_ cfs. (riser and barrel)

Without emergency spillway, required spillway capacity  $Q_p = Q_{25} =$  \_\_\_\_\_ cfs. (riser and barrel)

16 With emergency spillway:

Assumed available head,  $h =$  \_\_\_\_\_ ft. (Using  $Q_2$ )

$h =$  Crest of Emergency Spillway Elevation – Crest of Riser Elevation

Without Emergency spillway:

Assumed available head,  $h =$  \_\_\_\_\_ ft. (Using  $Q_2$ )

$H =$  Design High Water Elevation – Crest of Riser Elevation

17 Riser diameter,  $D_r =$  \_\_\_\_\_ in. Actual head,  $h =$  \_\_\_\_\_ ft.

Note: Avoid orifice flow conditions

18 Barrel length,  $l =$  \_\_\_\_\_ ft.  
Head,  $H$ , on barrel through embankment = \_\_\_\_\_ ft.

19 Barrel diameter = \_\_\_\_\_ in.

20 Trash rack and anti-vortex device

Diameter = \_\_\_\_\_ inches.

Height = \_\_\_\_\_ inches.

Emergency Spillway Design:

21 Required spillway capacity  $Q_e = Q_{25} - Q_p =$  \_\_\_\_\_ cfs.

22 Bottom width,  $b =$  \_\_\_\_\_ ft.; the slope of the exit channel,  $s =$  \_\_\_\_\_ foot/ foot; and the minimum length of the exit channel,  $x =$  \_\_\_\_\_ ft.

Anti-Seep Collar Design:

23 Depth of water at principal spillway crest,  $Y =$  \_\_\_\_\_ ft.

Slope of upstream face of embankment,  $Z =$  \_\_\_\_\_ : 1

Slope of principal spillway barrel,  $S_b =$  \_\_\_\_\_ %

Length of barrel in saturated zone,  $L_s =$  \_\_\_\_\_ ft.

24 Number of collars required = \_\_\_\_\_ dimensions = \_\_\_\_\_

Final Design Elevations:

25 Top of Dam = \_\_\_\_\_

Design High Water = \_\_\_\_\_

Emergency Spillway Crest = \_\_\_\_\_

Principal Spillway Crest = \_\_\_\_\_

Dewatering Orifice Invert = \_\_\_\_\_

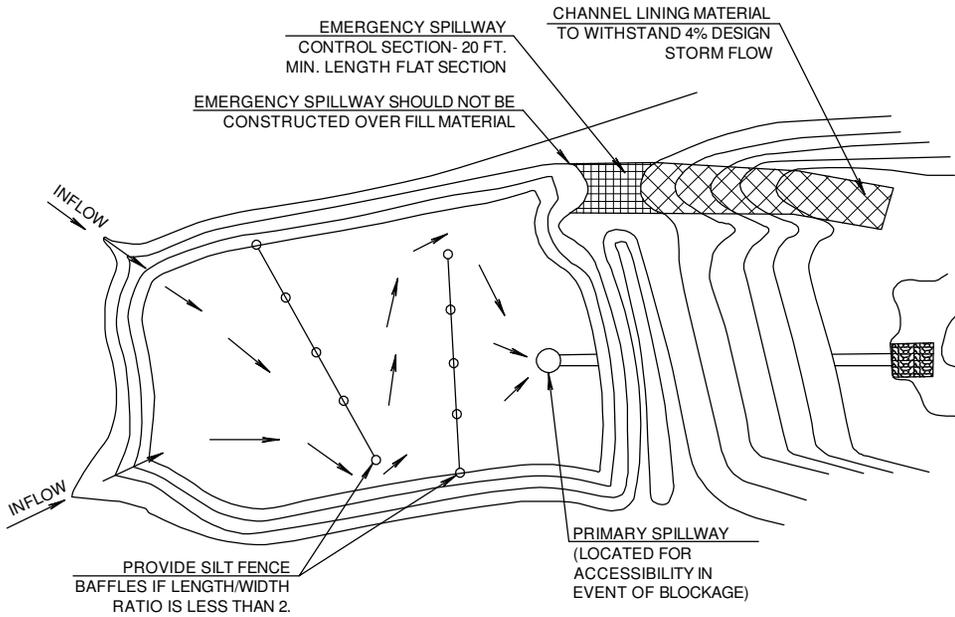
Cleanout Elevation = \_\_\_\_\_

Elevation of Upstream Toe of Dam or Excavated Bottom of "Wet Storage Area" (if excavation was performed) = \_\_\_\_\_

F. **Standard Drawings:** See Standard Drawing ESC-10.0 (Temporary Sediment Basin).

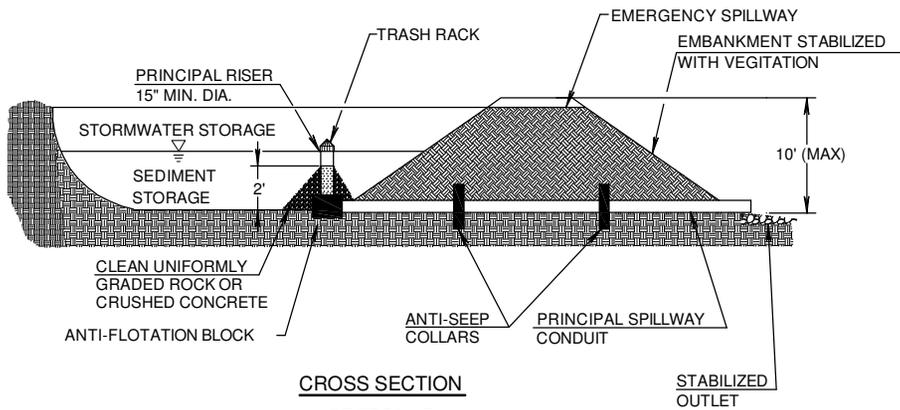
G. **Standard Specification:** See Standard Specification, Section 4.14 (Temporary Sediment Basin).

**TEMPORARY SEDIMENT BASIN**



**PLAN VIEW**

NOT TO SCALE



**CROSS SECTION**

NOT TO SCALE

**TEMPORARY SEDIMENT BASIN DESIGN DATA (REQUIRED):**

DESIGN ITEM:	BASIN#1	BASIN#2	BASIN#3	UNITS	NOTES
<b>SITE DATA:</b>					
TRIBUTARY DRAINAGE AREA TO POND				ACRES	
50% (2 yr) DESIGN FLOW:				CFS	
4% (25 yr) DESIGN FLOW:				CFS	
<b>POND DATA:</b>					
MINIMUM SEDIMENT STORAGE VOLUME				CU YD	134 CU YD/ACRE MINIMUM
BOTTOM ELEVATION:				FT	
SEDIMENT CLEANOUT ELEV.:				FT	ELEV EQUAL TO 50% OF ORIGINAL DESIGN VOLUME.
TOP OF RISER ELEV.				FT	TOP OF DRY STORAGE VOLUME
EMERGENCY SPILLWAY ELEV.:				FT	AT OR ABOVE Q-2 ELEV. 1.0 FT MIN ABOVE PRINCIPAL SPILLWAY
TOP OF DAM ELEV.				FT	1.0 FT MIN ABOVE Q-25 ELEV.
<b>BASIN SHAPE DATA:</b>					
A = AREA AT NORMAL POOL				SF	
L = LENGTH OF FLOW PATH				FT	
WE = EFFECTIVE WIDTH = AL				FT	
LENGTH TO WIDTH RATIO = L/WE					IF LENGTH-WIDTH RATIO IS LESS THAN 2, BAFFLES ARE REQUIRED
<b>PRINCIPAL SPILLWAY DATA:</b>					
RISER PIPE DIA				IN	15-INCH MIN. SIZE FOR 2 YEAR FLOW MIN.
BARREL PIPE DIA.				IN	15-INCH MIN. SIZE FOR 2 YEAR FLOW MIN.
RISER PIPE BASE SIZE				CY	SIZE TO PREVENT FLOTATION. 1.25 SAFETY FACTOR REQUIRED
<b>EMERGENCY SPILLWAY DATA:</b>					
DESIGN DEPTH IN SPILLWAY:				FT	
DESIGN VELOCITY IN SPILLWAY				FT/SEC	
LINING MATERIAL:				N/A	

**DESIGN REQUIREMENTS:**

1. THE PLAN AND PROFILES ARE SCHEMATIC IN NATURE. CONSTRUCTION PLANS MUST PROVIDE SPECIFIC SITE CONSTRUCTION ARRANGEMENTS. DETAILS GIVEN IN THOSE DRAWINGS SHALL BE USED AS APPROVED BY THE CITY.
2. IF THE POOL LENGTH TO WIDTH RATIO IS LESS THAN 2, INTERIOR SEDIMENT FENCE BAFFLES SHALL BE PROVIDED TO REDUCE SHORT-CIRCUITING OF THE BASIN.
3. EMERGENCY SPILLWAYS TO BE LOCATED IN A NON-FILL LOCATION WHEN FEASIBLE AND SHALL BE LINED WITH A NON-ERODIBLE MATERIAL SUCH AS ROCK OR CRUSHED CONCRETE.
4. SEE DESIGN GUIDE 10.0 AND STANDARD SPECIFICATION, SECTION 4.14 FOR DESIGN CRITERIA.

**MAINTENANCE/ SAFETY REQUIREMENTS:**

1. THE PERMIT HOLDER SHALL CLEAN OUT DEPOSITED SEDIMENT WHEN SEDIMENT STORAGE HAS BEEN REDUCED BY 50% OF THE ORIGINAL DESIGN STORAGE VOLUME. THE CLEANOUT LEVEL SHALL BE INDICATED ON THE RISER PIPE AS SHOWN ON THE DRAWINGS.
2. SEDIMENT BASIN SHALL BE FENCED USING CONSTRUCTION FENCE OR OTHER MATERIAL FOR SAFETY REASONS AND INCLUDE WARNING SIGNS, READING; "DANGER - "KEEP OUT".
3. SEE STANDARD SPECIFICATION, SECTION 4.14 FOR MAINTENANCE REQUIREMENTS

## DESIGN GUIDE 11.0 - TEMPORARY SEDIMENT TRAP

A. **Description:** A temporary sediment trap is a temporary ponding area formed by constructing an earthen embankment with a rock or crushed concrete outlet. It serves to detain sediment-laden runoff from small-disturbed areas long enough to allow the majority of the sediment to settle out.

B. **Application:**

- 1 Locate the trap below disturbed areas where the total contributing drainage area is less than 3 acres.
- 2 The trap will be used no longer than 18 months.
- 3 The sediment trap may be constructed either independently or in conjunction with a temporary diversion.

C. **Planning Considerations:** Sediment traps should be used only for small drainage areas. If the contributing drainage area is 3 acres or greater, a Temporary Sediment Basin should be used. Sediment traps, along with other perimeter controls intended to trap sediment shall be constructed as a first step in any land-disturbing activity and shall be made functional before upslope land disturbance takes place.

In most cases excavation will be required to attain the necessary storage volume. Also, sediment must be periodically removed from the trap to maintain the required volume. Plans should detail how excavated sediment is to be disposed of.

D. **Design Criteria:**

- 1 **Trap Capacity:** The sediment trap must have an initial storage volume of 134 cubic yards per acre of drainage area, half of which shall be in the form of a permanent pool or wet storage to provide a stable settling medium. The remaining half shall be in the form of a drawdown or dry storage which will provide extended settling time during less frequent, larger storm events. The volume of the wet storage shall be measured from the low point of the excavated area to the base of the rock or crushed concrete outlet to the crest of the rock or crushed concrete outlet overflow mechanism. Sediment should be removed from the basin when the volume of the wet storage is reduced by one-half.

For a sediment trap the wet storage volume may be approximated as follows:

$$V_1 = 0.85 \times A_1 \times D_1$$

where,

$V_1$  = the wet storage volume in cubic feet

$A_1$  = the surface area of the flooded area at the base of the rock or crushed concrete outlet in square feet.

$D_1$  = the maximum depth in feet, measured from the low point in the trap to the base of the rock or crushed concrete outlet

The dry storage volume may be approximated as follows:

$$V_2 = \{(A_1 + A_2)/2\} \times D_2$$

where,

$V_2$  = the dry storage volume in cubic feet

$A_1$  = the surface area of the flooded area at the base of the rock or crushed concrete outlet in square feet

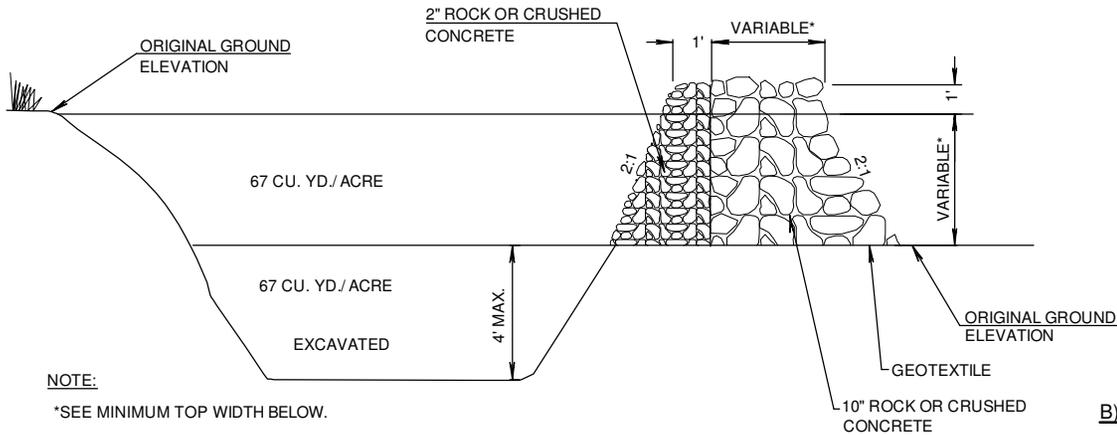
$A_2$  = the surface area of the flooded area at the crest of the rock or crushed concrete outlet overflow mechanism, in square feet

$D_2$  = the depth in feet, measured from the base of the rock or crushed concrete outlet to the crest of the rock or crushed concrete outlet

The design shall attempt provide a storage area which has a minimum 2:1 length to width ratio measured from the point of maximum runoff introduction to outlet.

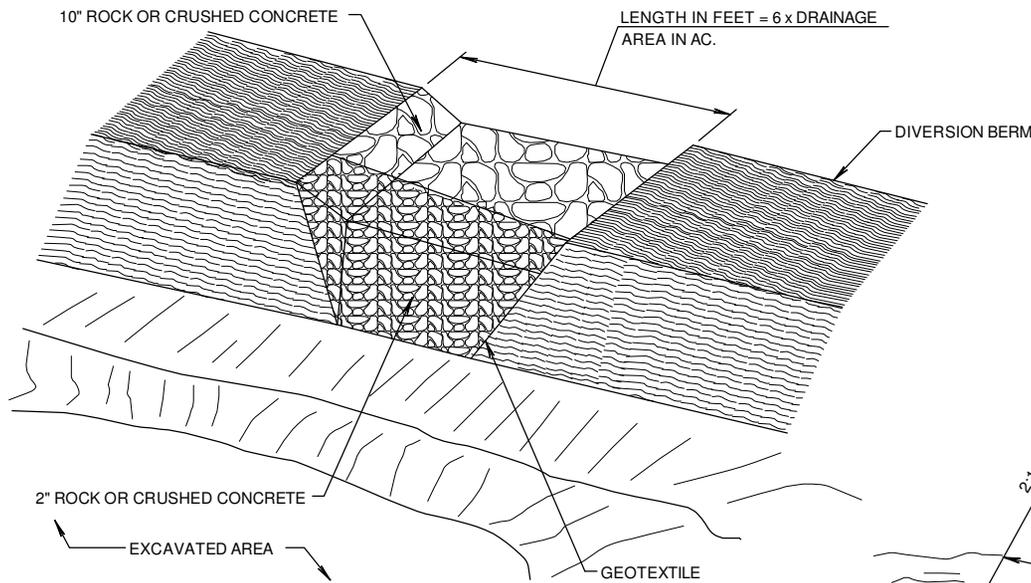
- 2 **Excavation:** Side slopes of excavated areas should be no steeper than 1H:1V. The maximum depth of excavation within the wet storage area should be 4 feet to facilitate clean-out and for site safety considerations.
  - 3 **Outlet Structure:** The outlet structure for the sediment trap shall consist of a rock or crushed concrete section of the embankment located at the low point in the basin. A combination of larger and small rock or crushed concrete shall be used to provide for filtering and detention as well as outlet stability. The smaller rock or crushed concrete, which enhances filter efficiency, shall be 2-inch, and rock or crushed concrete shall be 10-inch  $d_{50}$ . Filter cloth shall be placed at the rock or crushed concrete-soil interface to act as a separator. The minimum length of the outlet shall be 6 feet times the number of acres comprising the total area draining to the trap. The crest of the rock or crushed concrete outlet must be at least 1.0 foot below the top of the embankment to ensure that the flow will travel over the rock or crushed concrete and not the embankment.
  - 4 **Embankment Cross Section:** The maximum height of the sediment trap embankment shall be 5 feet as measured from the base of the rock or crushed concrete outlet. Minimum top widths (W) and outlet heights ( $H_o$ ) for various embankment heights (H) are shown in Standard Drawing ESC-11.0. Side slopes of the embankment shall be 2H:1V or flatter.
  - 5 **Removal:** Sediment traps must be removed after the contributing drainage area is stabilized. Restore original grade elevations and stabilize soil throughout limits of sediment trap, after removal.
- E. **Standard Drawings:** See Standard Drawing ESC-11.0 (Temporary Sediment Trap).
- F. **Standard Specification:** See Standard Specification, Sections 4.5 (Rock or Crushed Concrete Barriers) and 4.10 (Temporary Diversion).

**TEMPORARY SEDIMENT TRAP**



**CROSS SECTION OF OUTLET STRUCTURE**

NOT TO SCALE



**OUTLET STRUCTURE (PERSPECTIVE VIEW)**

NOT TO SCALE

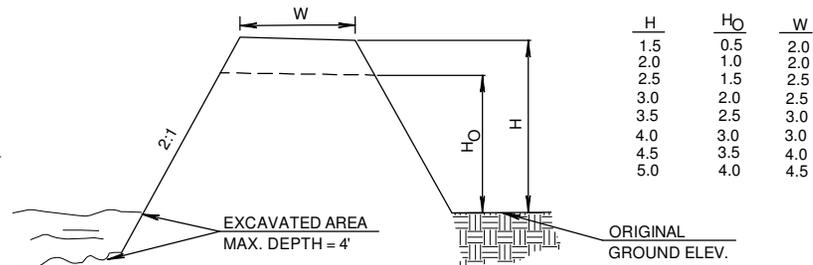
**TEMPORARY SEDIMENT TRAP NOTES:**

**A) CONSTRUCTION:**

1. THE AREA UNDER THE EMBANKMENT SHALL BE CLEARED, GRUBBED, AND STRIPPED OF ANY VEGETATION AND ROOT MAT.
2. FILL MATERIAL FOR THE EMBANKMENT SHALL BE FREE OF ROOTS OR OTHER WOODY VEGETATION, ORGANIC MATERIAL, LARGE STONES, AND OTHER OBJECTIONABLE MATERIAL. THE EMBANKMENT SHOULD BE COMPACTED IN 6-INCH LAYERS BY TRAVERSING WITH CONSTRUCTION EQUIPMENT.
3. THE EARTHEN EMBANKMENT SHALL BE SEEDED WITH TEMPORARY OR PERMANENT VEGETATION IMMEDIATELY AFTER INSTALLATION.
4. CONSTRUCTION OPERATIONS SHALL BE CARRIED OUT TO MINIMIZE EROSION AND WATER POLLUTION.
5. THE STRUCTURE SHALL BE REMOVED AND THE AREA STABILIZED WHEN THE UPSLOPE DRAINAGE AREA HAS BEEN STABILIZED.
6. ALL CUT AND FILL SLOPES SHALL BE 2H:1V OR FLATTER EXCEPT FOR EXCAVATED, WET STORAGE AREAS WHICH MAY BE AT A MAXIMUM 1H:1V GRADE.
7. SEE STANDARD SPECIFICATION, SECTION 4.5 (ROCK OR CRUSHED CONCRETE BARRIERS) AND 4.10 (TEMPORARY DIVERSIONS).

**B) INSPECTION AND MAINTENANCE:**

1. INSPECT THE TEMPORARY SEDIMENT TRAP AFTER EACH STORM EVENT OF 1/2-INCH OR GREATER.
2. REMOVE AND PROPERLY DISPOSE OF SEDIMENT WHEN IT ACCUMULATES TO ONE-HALF THE DESIGN VOLUME AS INDICATED BY THE CLEAN-OUT STAKE.
3. PERIODICALLY CHECK THE EMBANKMENT, SPILLWAY, AND OUTLET APRON FOR EROSION DAMAGE, SETTLING, SEEPAGE, OR SLUMPING ALONG THE TOE AND REPAIR IMMEDIATELY.
4. REPLACE THE OUTLET STRUCTURE GRAVEL FACING IF IT BECOMES CLOGGED.
5. INSPECT VEGETATION AND RESEED IF NECESSARY.
6. REPLACE ANY DISPLACED ROCK OR CRUSHED CONCRETED SO THAT NO REPLACEMENT ROCK IS ABOVE THE DESIGN GRADE.
7. REMOVE THE TEMPORARY SEDIMENT TRAP AFTER THE DRAINAGE AREA HAS BEEN PERMANENTLY STABILIZED, INSPECTED, AND APPROVED. DO SO BY DRAINING WATER, REMOVING THE SEDIMENT TO A DESIGNATED DISPOSAL AREA, AND GRADING THE SITE TO BLEND WITH THE SURROUNDING AREA; THEN STABILIZE.
8. REPLACE ANY DISPLACED ROCK OR CRUSHED CONCRETE SO THAT NO REPLACEMENT ROCK IS ABOVE THE DISPOSAL REQUIREMENTS.



**MINIMUM TOP WIDTH**

NOT TO SCALE

## DESIGN GUIDE 12.0 – TEMPORARY CHECK DAM

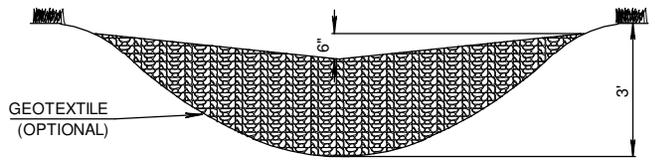
- A. **Description:** Check dams are small temporary dams constructed across a swale or drainage ditch. These can be constructed of Rock or Crushed Concrete Barriers or Sediment Fence (Reinforced) under low flow conditions. Sediment Fence may be used when contributing drainage area is 1 acre or less, or as approved by the City.
- B. **Application:** Check dams reduce the velocity of concentrated stormwater flows, thereby reducing erosion of the swale or ditch. They also trap sediment generated from adjacent areas or the ditch itself, by creating ponding areas for the runoff.
- C. **Planning Considerations:** Permanent vegetation or structural lining shall be installed as promptly as possible after flow is confined, in addition to installing check dams.

Remove sedimentation, restore plan grade elevations and reseed as necessary after check dams are removed.

Care shall be taken to remove all stone when the dam is removed, including any stone which has washed downstream. Geotextile fabric may be used under the rock for easier removal.

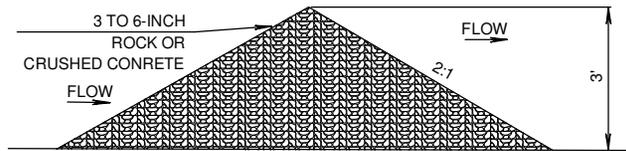
- D. **Standard Drawings:** See Standard Drawing ESC-12.0 (Temporary Check Dam).
- E. **Standard Specification:** See Standard Specification, Sections 4.4 (Sediment Fence), 4.5 (Rock or Crushed Concrete Barrier).

**TEMPORARY CHECK DAM**



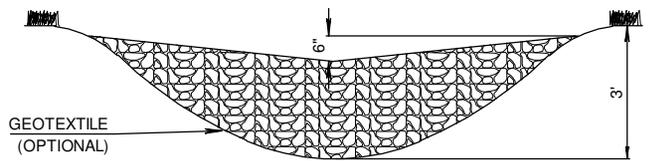
**2 ACRES OR LESS OF DRAINAGE AREA**

NOT TO SCALE



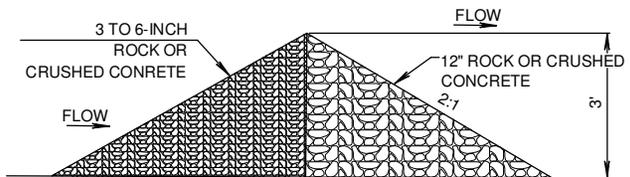
**(SIDE VIEW)**

NOT TO SCALE



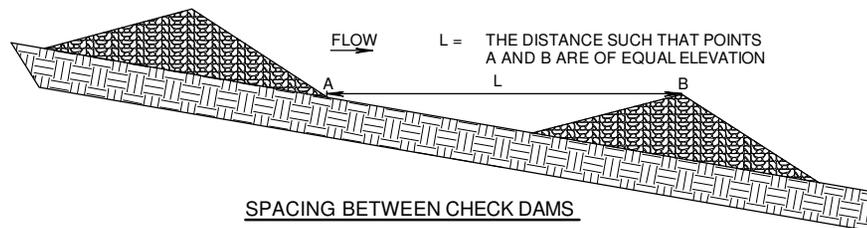
**2-10 ACRES OF DRAINAGE AREA**

NOT TO SCALE



**(SIDE VIEW)**

NOT TO SCALE



**SPACING BETWEEN CHECK DAMS**

NOT TO SCALE

**TEMPORARY CHECK DAM NOTES:**

**A) CONSTRUCTION:**

1. THE DRAINAGE AREA OF THE DITCH OR SWALE BEING PROTECTED SHALL NOT EXCEED 2 ACRES WHEN 3 TO 6 INCHES OF MATERIAL IS USED ALONE AND SHALL NOT EXCEED 10 ACRES WHEN A COMBINATION OF 12" MATERIAL AND 3 TO 6 INCH MATERIAL IS USED. AN EFFORT SHOULD BE MADE TO EXTEND THE MATERIAL TO THE TOP OF CHANNEL BANKS.
2. THE MAXIMUM HEIGHT OF THE DAM SHALL BE 3 FEET. THE CENTER OF THE CHECK DAM IS AT THE SAME ELEVATION AS THE TOP OF THE OUTER EDGES.
3. FOR ADDED STABILITY, THE BASE OF THE CHECK DAM CAN BE KEYED INTO THE SOIL APPROXIMATELY 6 INCHES.
4. THE MAXIMUM SPACING BETWEEN THE DAMS SHOULD BE SUCH THAT THE TOE OF THE UPSTREAM DAM IS AT THE SAME ELEVATION AS THE TOP OF THE DOWNSTREAM DAM.
5. MATERIAL SHOULD BE PLACED ACCORDING TO THE CONFIGURATION TO THE LEFT. HAND OR MECHANICAL PLACEMENT WILL BE NECESSARY TO ACHIEVE COMPLETE COVERAGE OF THE DITCH OR SWALE AND TO ENSURE THAT THE CENTER OF THE DAM IS LOWER THAN THE EDGES.
6. GEOTEXTILE MAY BE USED UNDER THE ROCK OR CRUSHED CONCRETE TO PROVIDE A STABLE FOUNDATION AND TO FACILITATE REMOVAL OF THE MATERIAL.

**B) INSPECTION AND MAINTENANCE:**

1. CHECK DAMS SHOULD BE CHECKED FOR SEDIMENT ACCUMULATION AFTER EACH STORM EVENT OF 1/2-INCH OR GREATER. SEDIMENT SHOULD BE REMOVED WHEN IT REACHES ONE HALF OF THE ORIGINAL HEIGHT OF THE DAM.
2. REGULAR INSPECTIONS SHOULD BE MADE TO ENSURE THAT THE CENTER OF THE DAM IS LOWER THAN THE EDGES. EROSION CAUSED BY HIGH FLOWS AROUND THE EDGES OF THE DAM SHOULD BE CORRECTED.
3. SEE STANDARD SPECIFICATION, SECTION 4.3 FOR SEDIMENT REMOVAL AND DISPOSAL REQUIREMENTS.

**C) REMOVAL OF PRACTICE:**

UNLESS THEY ARE TO BE PERMANENT CHECK DAMS SHALL BE REMOVED WHEN THEIR USEFUL LIFE HAS BEEN COMPLETED. IN TEMPORARY DITCHES AND SWALES, CHECK DAMS SHOULD BE REMOVED AND THE DITCH FILLED. IN PERMANENT STRUCTURES, CHECK DAMS SHALL BE REMOVED WHEN A PERMANENT LINING IS INSTALLED. IN THE CASE OF GRASS-LINED DITCHES, CHECK DAMS SHOULD BE REMOVED WHEN THE GRASS HAS MATURED SUFFICIENTLY TO PROTECT THE DITCH OR SWALE. THE AREA BENEATH THE CHECK DAMS SHOULD BE SEEDED AND MULCHED IMMEDIATELY AFTER THEY ARE REMOVED. THE USE OF FILTER CLOTH UNDERNEATH THE MATERIAL WILL MAKE REMOVAL OF THE MATERIAL EASIER.

**NOTES:**

1. ALTERNATE CHECK DAM MATERIAL INCLUDES SEDIMENT FENCE (REINFORCED).
2. SEDIMENT FENCE MAY BE USED WHEN CONTRIBUTING DRAINAGE AREA IS 1 ACRE OR LESS, OR AS APPROVED BY THE CITY.

## DESIGN GUIDE 13.0 - SEDIMENT FENCE

### I. STANDARD SEDIMENT FENCE

- A. **Description:** Sediment fence is a temporary sediment barrier consisting of a synthetic fabric stretched across and attached to supporting posts and entrenched or sliced in place. See Standard Drawing ESC-13.0, for details.
- B. **Application:**
- 1 To intercept and detain small amounts of sediment from disturbed areas of limited extent in order to prevent sediment from leaving the construction site.
  - 2 To decrease the velocity of sheet flows.
- C. **Planning Considerations:** Prior to start of construction, sediment fence placement should be designed by a qualified professional. Plans and specifications should be referred to by field personnel throughout the construction process.
- D. **Design Criteria:**
- 1 **Drainage Area:** Limited to ¼ acre per 100 feet of fence for sheet flow. Area is further restricted by slope steepness as shown in Table 13.0-1.
  - 2 **Location:** Fence should be built on a nearly level grade and at least 10 feet from the toe of the slope to provide a broad shallow sediment pool. Install on the contour where fence can intercept runoff as a sheet flow, not in channels, waterways, or other concentrated flow paths and not attached to existing trees.
  - 3 **Length:** Maximum of 600 feet. Flare ends of fence uphill to temporarily impound water.

**Table 13.0-1:** Typical Land Slope and Distance for Sediment Fence

Land Slope (%)	Maximum Slope Distance* above Fence (feet)
Less than 2	150
2 to 5	100

\* Follow manufacturer's recommendations for proper placing.

- 4 **Spacing of Support Posts:** 10 feet maximum for fence supported by wire; 6 feet maximum for high strength fabric without supportive wire backing.
- 5 **Trench:** Bottom 1 foot of fence must be buried minimum of 6 inches deep, per Standard Drawing ESC-13.0.
- 6 **Impounded Water Depth:** Not to exceed 1.5 feet at any point along the fence.
- 7 **Support Posts:** 4-inch diameter wood or 1.33 lb./linear foot steel, buried or driven to a depth of 24 inches with support wire; 2-inch square wood or 1.0 lb./linear foot steel without support wire. Steel posts should have projections for fastening fabric.
- 8 **Synthetic Geotextile Fabric:** Conforming to specifications in the table below and containing ultraviolet light inhibitors and stabilizers. Minimum design life of 6 months.

**Table 13.0-2:** Example Specifications for Sediment Fence Fabric

Physical Property	Minimum Requirement	Test
Filtering Efficiency	75%	ASTM 5141
Tensile Strength at 20% (maximum) elongation*: Standard strength	30 lb./ linear inch	ASTM 4632
High strength	50 lb./linear inch	ASTM 4632
Flow Rate	0.2 gal./sq.ft./minute	ASTM 5141
Ultraviolet Radiation Stability	90 %	ASTM-G-26

\* Properties are reduced by 50% after 6 months of installation.

See Standard Drawing ESC-13.0, Sediment Fence for additional details.

- 9 **Installation:** Sediment fence shall be installed using sediment fence installation machines specifically manufactured for the purpose of installing sediment fence.

**II. SEDIMENT FENCE (REINFORCED)**

- A. **Description:** A temporary barrier of Geotextile Class F over wire fence is used to intercept sediment-laden runoff from small drainage areas.
- B. **Application:** Sediment Fence (Reinforced) reduces runoff velocity and allows for the deposition of transported sediment. Limits imposed by ultraviolet light stability of the fabric will dictate the maximum period that the sediment fence may be used.
- 1 Sediment Fence (Reinforced) provides a barrier that collects and holds debris and soil, protecting sensitive areas, woods, and wetlands.
  - 2 Sediment Fence (Reinforced) can be used where the installation of a dike would destroy sensitive areas, woods, and wetlands.
  - 3 Sediment Fence (Reinforced) shall be placed as close to the contour as possible. No section of sediment fence should exceed a longitudinal grade of 5% for a distance of more than 50 feet.
- C. **Planning Considerations:** See Standard Drawing ESC-13.1, Sediment Fence (Reinforced) for additional details.
- D. **Design Criteria:** Length of the flow above a Sediment Fence (Reinforced) shall conform to the limitations in Table 13.0-3:

**Table 13.0-3:** Length of Sediment Fence (Reinforced)

Slope	Slope Steepness	Slope Length (maximum)	Sediment Fence Length (maximum)
0 – 10%	0 – 10:1	Unlimited	Unlimited
10 – 20%	10:1 – 5:1	200 feet	1,500 feet
20 – 33%	5:1 – 3:1	100 feet	1,000 feet
33 – 50%	3:1 – 2:1	100 feet	500 feet
50% +	2:1 +	50 feet	250 feet

Ends of geotextile fabric shall be overlapped, folded, and stapled to prevent sediment bypass.

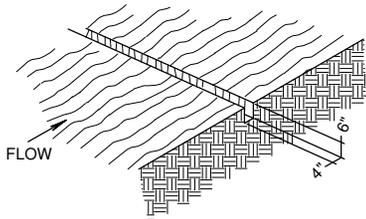
See Standard Drawing ESC-13.1, Sediment Fence (Reinforced) for additional details.

### **III. REFERENCES**

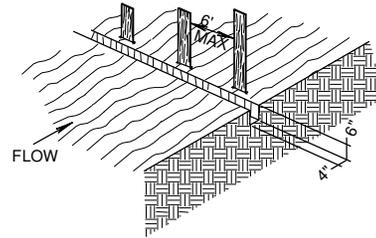
- A. **Standard Drawings:** See Standard Drawings ESC-13.0 (Sediment Fence) and ESC-13.1 (Sediment Fence – Reinforced).
- B. **Standard Specification:** See Standard Specification, Section 4.4 (Sediment Fence).

## SEDIMENT FENCE

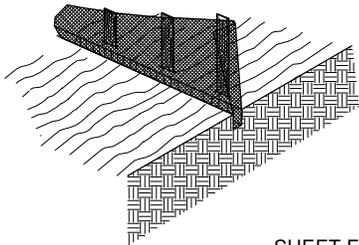
1. EXCAVATE A 6"x4" TRENCH.



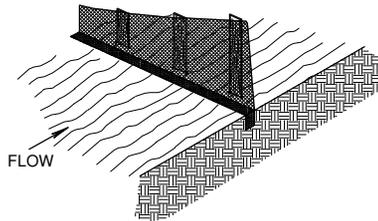
2. SET THE STAKES ALONG THE DOWN SLOPE SIDE OF THE TRENCH.



3. STAPLE GEOTEXTILE MATERIAL TO STAKES AND EXTEND IT INTO AND AROUND THE BOTTOM OF THE TRENCH.

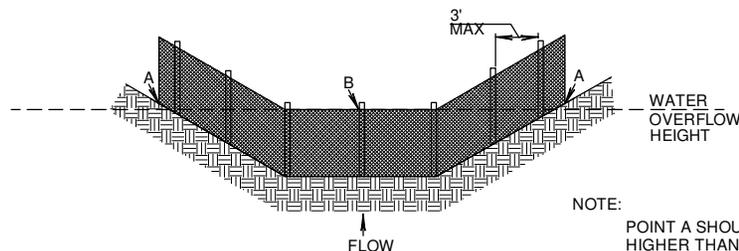


4. BACKFILL AND COMPACT THE EXCAVATED SOIL OVER THE GEOTEXTILE IN THE TRENCH.



### SHEET FLOW INSTALLATION (PERSPECTIVE VIEW)

NOT TO SCALE



### DRAINAGEWAY INSTALLATION (FRONT ELEVATION)

NOT TO SCALE

NOTE:  
POINT A SHOULD BE HIGHER THAN POINT B.

## SEDIMENT FENCE NOTES:

### A) INSTALLATION:

1. THE HEIGHT OF SEDIMENT FENCE SHALL BE A MINIMUM OF 16 INCHES ABOVE THE ORIGINAL GROUND SURFACE AND SHALL NOT EXCEED 34 INCHES ABOVE THE GROUND SURFACE.
2. THE FABRIC SHALL BE PURCHASED IN A CONTINUOUS ROLL CUT TO THE LENGTH OF THE BARRIER TO AVOID THE USE OF JOINTS. WHEN JOINTS ARE UNAVOIDABLE, FILTER CLOTH SHALL BE SECURELY SPLICED TOGETHER ONLY AT SUPPORT POSTS, WITH A MAX 6-INCH OVERLAP.
3. DIG A TRENCH AT LEAST 6 INCHES DEEP AND 4 INCHES WIDE ALONG THE FENCE ALIGNMENT.
4. DRIVE POSTS AT LEAST 24 INCHES INTO THE GROUND ON THE DOWNSLOPE SIDE OF THE TRENCH. SPACE POSTS A MAXIMUM OF 6 FEET APART.
5. EXTRA-STRENGTH SEDIMENT FENCE FABRIC SHALL BE USED. POSTS FOR THIS TYPE OF FABRIC SHALL BE PLACED A MAXIMUM OF 6 FEET APART. THE SEDIMENT FABRIC SHALL BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING A MINIMUM OF ONE INCH LONG, HEAVY-DUTY WIRE STAPLES OR TIE-WIRES, AND EIGHT INCHES OF THE FABRIC SHALL BE EXTENDED INTO THE TRENCH. THE FABRIC SHALL NOT BE STAPLED TO EXISTING TREES.
6. PLACE THE BOTTOM 1 FOOT OF FABRIC IN THE MINIMUM-OF-6-INCH DEEP TRENCH, LAPPING TOWARD THE UPSLOPE SIDE. BACKFILL WITH COMPACTED EARTH, ROCK OR CRUSHED CONCRETE.
7. IF A SEDIMENT FENCE IS TO BE CONSTRUCTED ACROSS A DITCH LINE OR SWALE, IT MUST BE OF SUFFICIENT LENGTH TO ELIMINATE ENDFLOW, AND THE PLAN CONFIGURATION SHALL RESEMBLE AN ARC OR HORSESHOE, PLACED ON A CONTOUR WITH THE ENDS ORIENTED UPSLOPE. EXTRA-STRENGTH SEDIMENT FABRIC SHALL BE USED WITH A MAXIMUM 3-FOOT SPACING OF POSTS.
8. TO REDUCE MAINTENANCE, EXCAVATE A SHALLOW SEDIMENT STORAGE AREA IN THE UPSLOPE SIDE OF THE FENCE. PROVIDE GOOD ACCESS IN AREAS OF HEAVY SEDIMENTATION FOR CLEAN OUT AND MAINTENANCE.
9. SEDIMENT FENCES SHALL BE REMOVED WHEN THEY HAVE SERVED THEIR USEFUL PURPOSE, BUT NOT BEFORE THE UPSLOPE AREA HAS ESTABLISHED PERMANENT VEGETATION.
10. SEE STANDARD SPECIFICATION, SECTION 4.4 (SEDIMENT FENCE)

### B) TROUBLESHOOTING:

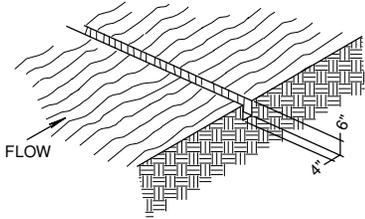
1. DETERMINE THE EXACT LOCATION OF UNDERGROUND UTILITIES, BEFORE FENCE INSTALLATION SO UTILITIES ARE NOT DISTURBED.
2. GRADE ALIGNMENT OF FENCE AS NEEDED TO PROVIDE A BROAD, NEARLY LEVEL AREA UPSTREAM OF FENCE TO ALLOW SEDIMENT COLLECTION AREA.

### C) INSPECTION AND MAINTENANCE:

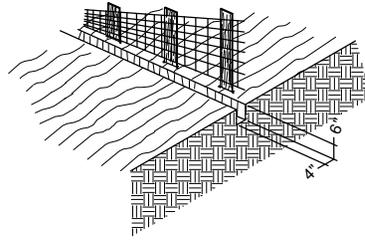
1. INSPECT SEDIMENT FENCES AT LEAST ONCE A WEEK AND AFTER EACH RAINFALL. MAKE ANY REQUIRED REPAIRS IMMEDIATELY.
2. SHOULD THE FABRIC OF A SEDIMENT FENCE COLLAPSE, TEAR, DECOMPOSE, OR BECOME INEFFECTIVE, REPLACE IT PROMPTLY.
3. REMOVE SEDIMENT DEPOSITS TO PROVIDE ADEQUATE STORAGE VOLUME FOR THE NEXT RAIN AND TO REDUCE PRESSURE ON THE FENCE. AVOID DAMAGING OR UNDERMINING THE FENCE DURING CLEANOUT. SEDIMENT ACCUMULATION SHOULD NOT EXCEED 1/2 THE HEIGHT OF THE FENCE.
4. REMOVE ALL FENCING MATERIALS AND UNSTABLE SEDIMENT DEPOSITS, AND BRING THE AREA TO GRADE AND STABILIZE IT AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY AND COMPLETELY STABILIZED.
5. MATERIAL REMOVED FROM BMP'S SHALL BE WASTED ON SITES APPROVED BY THE ENGINEER AS TO SUITABILITY, APPEARANCE, AND SITE LOCATION. DISPOSAL SITES SHALL ALSO BE ACCEPTABLE TO KANSAS DEPARTMENT OF HEALTH AND ENVIRONMENT, KANSAS DIVISION OF WATER RESOURCES, AND US ARMY CORE OF ENGINEERS.
6. SEE STANDARD SPECIFICATION, SECTION 4.3 FOR SEDIMENT REMOVAL AND DISPOSAL REQUIREMENTS.

**SEDIMENT FENCE (REINFORCED)**

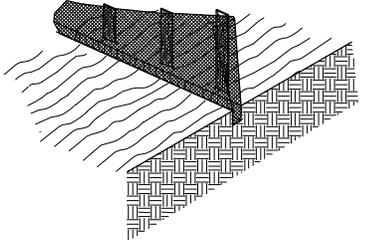
1. EXCAVATE A 6"x4" TRENCH.



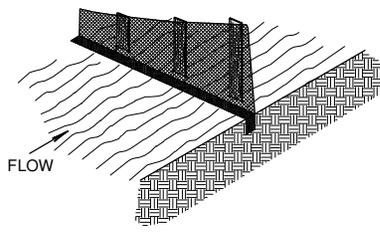
2. SET THE METAL T-POSTS OR FENCE POSTS ON THE DOWNSLOPE SIDE OF THE TRENCH. SECURE WIRE FENCING TO THE POSTS.



3. ATTACH THE GEOTEXTILE FABRIC TO THE WIRE FENCE AND EXTEND IT INTO AND AROUND THE BOTTOM OF THE TRENCH.

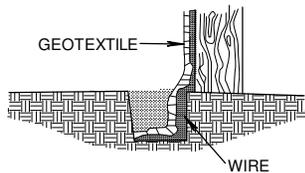


4. BACKFILL AND COMPACT THE EXCAVATED SOIL.



**EXTENSION OF FABRIC AND WIRE INTO THE TRENCH**

NOT TO SCALE



**SECTIONAL FENCE ANCHOR DETAIL**

NOT TO SCALE

**SEDIMENT FENCE (REINFORCED) NOTES:**

**A) CONSTRUCTION:**

1. FENCING SHALL BE 42-INCHES IN HEIGHT.
2. WIRE FENCE SHALL BE FASTENED SECURELY TO THE FENCE POSTS WITH WIRE TIES AND STAPLES. THE LOWER TENSION WIRE, BRACE AND TRUSS RODS, DRIVE ANCHORS, AND POST CAPS ARE NOT REQUIRED EXCEPT ON THE ENDS OF THE FENCE.
3. SEDIMENT FENCE SHALL BE FASTENED SECURELY TO THE WIRE FENCE WITH TIES SPACED EVERY 24 INCHES AT THE TOP AND MID-SECTION.
4. SEDIMENT FENCE AND WIRE SHALL BE EMBEDDED A MINIMUM OF 8-INCHES INTO THE GROUND.
5. WHEN TWO SECTIONS OF GEOTEXTILE FABRIC ADJOIN EACH OTHER, THEY SHALL BE OVERLAPPED BY 6-INCHES AND FOLDED.
6. WIRE FENCE WILL BE BETWEEN 9 AND 14 GAUGE AND SHALL HAVE A MAXIMUM MESH SPACING OF 6-INCHES.
7. SEDIMENT FENCE SHALL MEET THE FOLLOWING REQUIREMENTS FOR GEOTEXTILE CLASS F: ADDITIONAL SPECIFICATIONS ARE FOUND IN ASTM 6461.

**SEDIMENT FENCE REQUIREMENTS**

TENSION STRENGTH	50 LB/IN OR MORE	ASTM 4632
TENSION MODULUS	20 LB/IN OR MORE	ASTM 4632
FLOW RATE	0.3 GAL/FT /MINUTE OR LESS	ASTM5141
FILTERING EFFICIENCY	75% OR MORE	ASTM5141

**B) INSTALLATION:**

1. THE HEIGHT OF SEDIMENT FENCE SHALL BE A MINIMUM OF 16 INCHES ABOVE THE ORIGINAL GROUND SURFACE AND SHALL NOT EXCEED 34 INCHES ABOVE THE GROUND SURFACE.
2. THE FABRIC SHALL BE PURCHASED IN A CONTINUOUS ROLL CUT TO THE LENGTH OF THE BARRIER TO AVOID THE USE OF JOINTS. WHEN JOINTS ARE UNAVOIDABLE, FILTER CLOTH SHALL BE SPLICED TOGETHER ONLY AT SUPPORT POSTS, WITH A MIN. 6-INCH OVERLAP, AND SECURELY SEALED.
3. A TRENCH SHALL BE EXCAVATED APPROXIMATELY 4 INCHES WIDE AND 6 INCHES DEEP ON THE UPSLOPE SIDE OF THE PROPOSED LOCATION OF THE FENCE.
4. WHEN WIRE SUPPORT IS USED, STANDARD-STRENGTH FILTER CLOTH MAY BE USED. POSTS FOR THIS TYPE OF INSTALLATION SHALL BE PLACED A MAXIMUM OF 10 FEET APART. THE WIRE MESH FENCE MUST BE FASTENED SECURELY TO THE UPSLOPE SIDE OF THE POSTS USING HEAVY DUTY WIRE STAPLES AT LEAST 1 INCH LONG, TIE WIRES, OR HOG RINGS. THE WIRE SHALL EXTEND INTO THE TRENCH A MINIMUM OF 2 INCHES AND SHALL NOT EXTEND MORE THAN 34 INCHES ABOVE THE ORIGINAL GROUND SURFACE. THE STANDARD-STRENGTH FABRIC SHALL BE STAPLED OR WIRED TO THE FENCE, AND 8 INCHES OF THE FABRIC SHALL BE EXTENDED INTO THE TRENCH. THE FABRIC SHALL NOT BE STAPLED TO EXISTING TREES.
5. IF A SEDIMENT FENCE IS TO BE CONSTRUCTED ACROSS A DITCH LINE OR SWALE, IT MUST BE OF SUFFICIENT LENGTH TO ELIMINATE ENDFLOW, AND THE PLAN CONFIGURATION SHALL RESEMBLE AN ARC OR HORSESHOE WITH THE ENDS ORIENTED UPSLOPE. EXTRA-STRENGTH FILTER FABRIC SHALL BE USED FOR THIS APPLICATION WITH A MAXIMUM 3-FOOT SPACING OF POSTS.
6. THE 4 INCH BY 6 INCH TRENCH SHALL BE BACKFILLED AND THE SOIL COMPACTED OVER THE FILTER FABRIC.
7. SEE STANDARD SPECIFICATION, SECTION 4.4 (SEDIMENT FENCE)

**C) INSPECTION AND MAINTENANCE:**

1. INSPECT SEDIMENT FENCES AT LEAST ONCE A WEEK AND AFTER EACH RAINFALL. MAKE ANY REQUIRED REPAIRS IMMEDIATELY.
2. SHOULD THE FABRIC OF A SEDIMENT FENCE COLLAPSE, TEAR, DECOMPOSE, OR BECOME INEFFECTIVE, REPLACE IT PROMPTLY.
3. MAINTENANCE SHALL BE PERFORMED AND SEDIMENT BUILD-UPS REMOVED WHEN BULGES DEVELOP IN THE SEDIMENT FENCE OR WHEN SEDIMENT REACHES 50% OF THE FENCE HEIGHT. AVOID DAMAGING OR UNDERMINING THE FENCE DURING CLEAN OUT.
4. REMOVE ALL FENCING MATERIALS AND UNSTABLE SEDIMENT DEPOSITS, AND BRING THE AREA TO GRADE AND STABILIZE IT AFTER THE CONTRIBUTING DRAINAGE AREA HAS BEEN PROPERLY STABILIZED.
5. SEE STANDARD SPECIFICATION, SECTION 4.3 FOR SEDIMENT REMOVAL AND DISPOSAL REQUIREMENTS.

## **DESIGN GUIDE 14.0 – STRAW WATTLE**

- A. **Description:** Log or wattle products are tubes of open weave containment material filled with rice or wheat straw fibers and used as a small height barrier for diversion or sedimentation devices. They come in a variety of diameters and lengths.
- B. **Application:** Logs or wattles can be used as perimeter control for disturbed areas of one quarter acre or less, along contours as slope breaks, for inlet protection, for ditch checks, and for streambank protection.
- C. **Planning Considerations:** This type of sediment barrier is designed for surface flows not exceeding 1 cfs, slopes 1H:1V or flatter, and areas where sediment fence in not practicable.
- D. **Design Criteria:** Logs or wattles should be designed and used as per manufacturer's recommendations for each specific products.
- E. **Standard Specification:** See Standard Specifications, Section 4.7 (Straw Wattle).

## DESIGN GUIDE 15.0 - EROSION CONTROL BLANKET

- A. **Description:** Rolled erosion control products are protective covering netting, blankets or turf reinforcement mats (TRMs) installed on a prepared planting area of a steep slope, channel, or shoreline. They aid in controlling erosion on critical areas by absorbing the energy from raindrop impacts and providing a microclimate which protects young vegetation and promotes its establishment. TRMs are also used to raise the maximum permissible velocity and shear stress of turf grass stands in channelized areas by enabling the turf to resist the forces of erosion during storm events.
- B. **Application:** Netting, blankets, and TRMs will aid in controlling erosion on slopes steeper than 8 percent and of highly erodible soils by providing a protective cover made of straw, jute, wood, or other organic plant fiber with cotton string or polypropylene netting to hold the product in a flat form. Netting can be used alone over blown straw as an alternative to crimping or use of a tackifier.

These products can be used on short, steep slopes where erosion hazard is high and planting is likely to be too slow in providing adequate protective cover; in vegetated channels where the design velocity and shear stress of design flow exceed allowable on streambanks where moving water is likely to wash out new plantings; or in areas where the forces of wind prevent standard mulching practices from remaining in place until vegetation becomes established.

Before installation of these products, the area should be final graded to a smooth and uniform surface, free of debris. Topsoil should be incorporated if needed. Seed and fertilize as shown on the plan. The erosion control netting, blankets, and mats should be installed in accordance with the manufacturer's recommendations and specifications. All products should be anchored firmly with continuous contact to the soil surface. Product should be anchored following the manufacturer's recommended stapling pattern for each specific application. Details for blanket and mat installation can be found in Standard Drawings ESC-15.0 through ESC-15.3.

Some important factors in the choice of netting, blanket, or TRM are soil conditions, steepness of slope, length of slope, type and duration of protection required to establish desired vegetation, and probable shear stress. Consult the manufacturer's product specifications to determine the correct product for each specific application required.

- C. **Planning Considerations:** Rolled erosion control blankets and mats can be applied to problem areas to supplement vegetation in its initial establishment and to provide a safe and more natural conveyance for high velocity stormwater runoff. They are used in many applications where a structural lining would previously have been required. Care must be taken to choose the blanket or matting which is most appropriate for the specific needs of a project. Two general types of blankets and mats are discussed within this section. However, with the abundance of soil stabilization products available today, it is impossible to cover all the advantages, disadvantages, and specifications of all manufactured blankets and mats. Therefore, there is no substitute for a thorough understanding of the manufacturer's recommendations and a site visit by a designer or plan reviewer to verify a product's appropriateness.

Blankets should be used to help establish vegetation on previously disturbed slopes of 3H:1V or steeper. Since the materials which compose the soil stabilization blankets will deteriorate

over time, they should be used in permanent conveyance channels with the realization that resistance to erosion will ultimately be based on the type of vegetation planted and the existing soil characteristics. During the establishment of vegetation, blankets should not be subjected to velocities greater than 4 feet per second.

Blankets provide the following benefits in vegetative stabilization when properly applied:

1. Protection of the seed and soil from raindrop impact and subsequent displacement.
2. Thermal consistency and moisture retention for seedbed area.
3. Stronger and faster germination of grasses and legumes.
4. Planning off excess stormwater runoff.
5. Prevention of sloughing of topsoil added to steeper slopes.

TRMs consist of a non-degradable, three-dimensional polypropylene structure which may also have coconut or other organic fiber layers within it so long as the non-degradable portion of the blanket will withstand design velocities and shear stresses after the organic fibers degrade. The matting becomes entangled and penetrated by roots forming continuous anchorage for surface growth and promoting enhanced energy dissipation. They should be used on slopes 2H:1V or steeper, and in stormwater conveyance channels.

In addition to those benefits noted for blankets, TRMs provide the following benefits for vegetative stabilization and when replacing concrete and riprap channel linings:

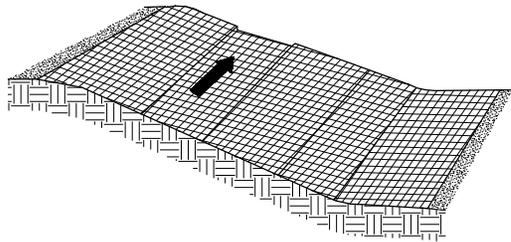
1. Cause sediment to drop out of stormwater and fill matrix with fine soils which become the growth medium for the development of roots.
2. Act with the vegetative root system to form an erosion resistant cover, which resists hydraulic lift and shear forces when embedded in the soil within stormwater channels.

Since TRMs are non-degradable, they can be used in permanent conveyance channels to withstand higher velocities and shear stresses than would normally be allowable with only soil and vegetation. Permissible velocities and shear stresses of TRM for reinforced grass-lined channels range from 10-20 fps and 6-10 psf respectively.

D. **Standard Drawings:** See Standard Drawings ESC-15.0 through ESC-15.3 (Erosion Control Blanket).

E. **Standard Specification:** See Standard Specification, Section 3.8 (Erosion Control Blanket).

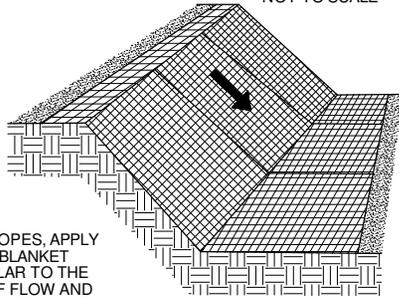
**EROSION CONTROL BLANKET (1)**



**SHALLOW SLOPE < 3:1**

NOT TO SCALE

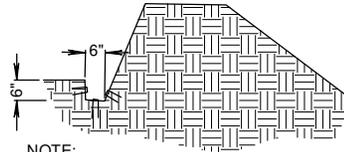
**NOTE:**  
ON SHALLOW SLOPES, PROTECTIVE EROSION CONTROL BLANKETS MAY BE APPLIED ACROSS THE SLOPE.



**STEEP SLOPE >= 3:1**

NOT TO SCALE

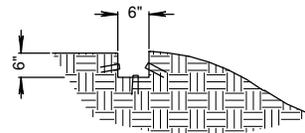
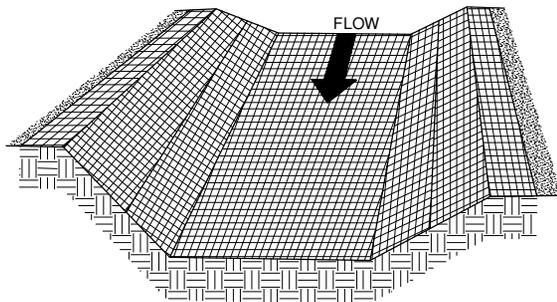
**NOTE:**  
ON STEEP SLOPES, APPLY PROTECTIVE BLANKET PERPENDICULAR TO THE DIRECTION OF FLOW AND ANCHOR SECURELY.



**NOTE:**  
WHERE THERE IS A BERM AT THE TOP OF THE SLOPE, BRING THE MATERIAL OVER THE BERM AND ANCHOR IT BEHIND THE BERM.

**SLOPE BERM**

NOT TO SCALE



**NOTE:**  
BRING MATERIAL DOWN TO A LEVEL AREA BEFORE TERMINATING THE INSTALLATION.

**TOP OF SLOPE BLANKET ANCHOR SLOT**

NOT TO SCALE

**NOTE:**  
IN DITCHES, APPLY PROTECTIVE COVERING PARALLEL TO THE DIRECTION OF FLOW. USE CHECK SLOTS AS REQUIRED. AVOID JOINING MATERIAL IN THE CENTER OF THE DITCH IF AT ALL POSSIBLE. FOLLOW BLANKET MANUFACTURER'S RECOMMENDATIONS FOR ALLOWABLE VELOCITY AND SHEAR STRESS.

**DITCH**

NOT TO SCALE

**NOTE:**

REFER TO ESC-15.1, EROSION CONTROL BLANKET (2), FOR MORE EROSION CONTROL APPLICATIONS AND NOTES.

**EROSION CONTROL BLANKET NOTES (1):**

**A) SITE PREPARATION:**

AFTER SITE HAS BEEN SHAPED AND GRADED, PREPARE A FRIABLE SEEDBED RELATIVELY FREE FROM CLODS AND ROCKS MORE THAN 1 1/2 INCHES IN DIAMETER AND ANY FOREIGN MATERIAL THAT WILL PREVENT UNIFORM CONTACT OF THE PROTECTIVE COVERING WITH THE SOIL SURFACE.

**B) PLANTING:**

LIME, FERTILIZE, AND SEED IN ACCORDANCE WITH SEEDING OR PLANTING PLAN. WHEN USING JUTE MESH ON A SEEDED AREA, APPLY APPROXIMATELY ONE HALF THE SEED AFTER LAYING THE MAT. THE PROTECTIVE COVERING CAN BE LAID OVER SPRIGGED AREAS WHERE SMALL GRASS PLANTS HAVE BEEN INSERTED INTO THE SOIL. WHERE GROUND COVERS ARE TO BE PLANTED, LAY THE PROTECTIVE COVERING FIRST AND THEN PLANT THROUGH THE MATERIAL AS PER PLANTING PLAN.

**C) LAYING AND STAPLING:**

IF INSTRUCTIONS HAVE BEEN FOLLOWED, ALL NEEDED CHECK SLOTS WILL HAVE BEEN INSTALLED, AND THE PROTECTIVE COVERING WILL BE LAID ON A FRIABLE SEEDBED FREE FROM CLODS, ROCKS, ROOTS, ETC. THAT MIGHT IMPEDE GOOD CONTACT.

1. START LAYING THE PROTECTIVE COVERING FROM THE TOP OF THE CHANNEL OR SLOPE AND UNROLL DOWN-GRADE. ALLOW TO LAY LOOSELY ON SOIL; DO NOT STRETCH.
2. UPSLOPE ENDS OF THE BLANKET SHOULD BE BURIED IN AN ANCHOR SLOT NO LESS THAN 6-INCHES DEEP.
3. TAMP EARTH FIRMLY OVER THE MATERIAL, WHEN TOP IS RELATIVELY FLAT, EXTEND BLANKET ABOUT 40 INCHES AWAY FROM SLOPE, STAPLE THE MATERIAL AT A MINIMUM OF EVERY 12 INCHES ACROSS THE TOP END.
4. EDGES OF THE MATERIAL SHALL BE STAPLED EVERY 3 FEET. WHERE MULTIPLE WIDTHS ARE LAID SIDE BY SIDE, THE ADJACENT EDGES SHALL BE OVERLAPPED A MINIMUM OF 6 INCHES AND STAPLED TOGETHER.
5. STAPLES SHALL BE PLACED DOWN THE CENTER, STAGGERED WITH THE EDGES AT 3 FOOT INTERVALS.
6. SEE STANDARD SPECIFICATION, SECTION 3.8 (EROSION CONTROL BLANKET).

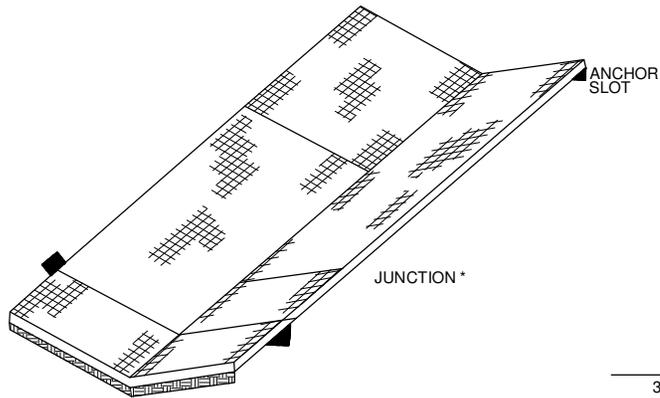
**D) TROUBLESHOOTING:**

CONSULT WITH A QUALIFIED DESIGN PROFESSIONAL, IF ANY OF THE FOLLOWING OCCUR;

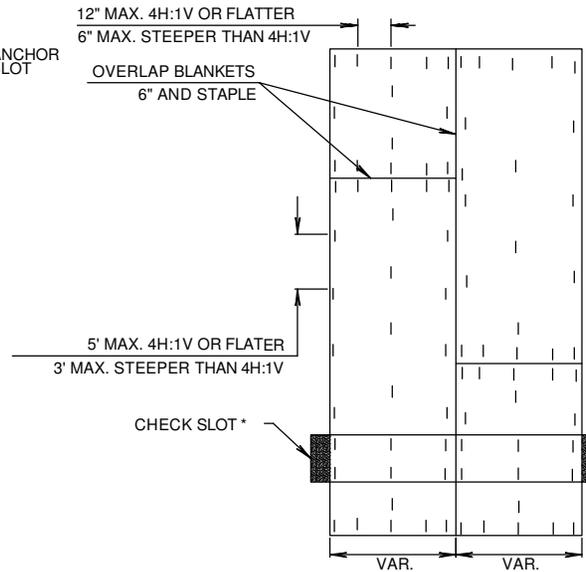
1. MOVEMENT OF THE BLANKET OR EROSION UNDER THE BLANKET IS OBSERVED.
2. VARIATIONS IN TOPOGRAPHY ON SITE INDICATE EROSION CONTROL MAT WILL NOT FUNCTION AS INTENDED; CHANGES IN PLAN MAY BE NEEDED, OR A BLANKET WITH A SHORTER OR LONGER LIFE MAY BE NEEDED.
3. DESIGN SPECIFICATIONS FOR SEED VARIETY, SEEDING DATES, OR EROSION CONTROL MATERIALS CANNOT BE MET; SUBSTITUTION MAY BE REQUIRED, UNAPPROVED SUBSTITUTIONS COULD RESULT IN FAILURE TO ESTABLISH VEGETATION.

**E) MAINTENANCE & INSPECTION**

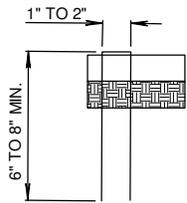
INSPECTION CONTROLS AFTER EACH RAIN EVENT OF 1/2 INCH OR GREATER, AND EVERY 7 DAYS UNTIL VEGETATION IS ESTABLISHED, FOR EROSION OR UNDERMINING BENEATH THE NETTING, BLANKETS, OR MATS. IF ANY AREA SHOWS EROSION, PULL BACK THAT PORTION OF THE MATERIAL, ADD SOIL, TAMP DOWN, AND RESEED; RESECURE THE MATERIAL IN PLACE. IF NETTING, BLANKETS OR MATS BECOME DISLOCATED OR DAMAGED, REPAIR OR REPLACE AND RESECURE IMMEDIATELY.



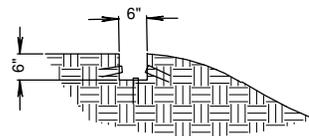
**NOTE:**  
\* JUNCTION: OVERLAP TOP BLANKET 6 INCHES MINIMUM AND STAPLE EVERY 6 INCHES ACROSS



**NOTE:**  
\* CHECK SLOTS AT 50' INTERVALS; NOT REQUIRED WITH ALL COMBINATION BLANKETS



**NOTE:**  
STAPLE FORMED FROM NO. 11 STEEL WIRE.  
MIN. 8" STAPLE LENGTH FOR SANDY SOIL. MIN. 6" STAPLE LENGTH FOR OTHER SOIL.



**EROSION CONTROL BLANKET  
INSTALLATION FOR CHANNELS**

**EROSION CONTROL BLANKET NOTES (2):**

**F) STAPLES:**

STAPLES FOR ANCHORING BLANKET SHALL BE NO. 11-GAUGE WIRE OR HEAVIER. THEIR LENGTH SHALL BE A MINIMUM OF 6 INCHES. A LARGER STAPLE WITH A LENGTH OF UP TO 12 INCHES SHALL BE USED ON LOOSE, SANDY, OR UNSTABLE SOILS.

**G) JOINING PROTECTIVE COVERINGS:**

OVERLAP THE END PREVIOUS ROLL A MINIMUM OF 6 INCHES AND STAPLE. STAPLE ACROSS THE END OF THE ROLL JUST BELOW THE ANCHOR SLOT AND ACROSS THE MATERIAL EVERY 6 INCHES.

**H) TERMINAL END:**

AT THE POINT AT WHICH THE MATERIAL IS DISCONTINUED, OR WHERE THE PROTECTIVE COVERING MEETS A STRUCTURE OF SOME TYPE, STAPLE A MINIMUM OF EVERY 12 INCHES.

**I) FINAL CHECK:**

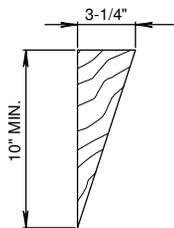
THIS INSTALLATION CRITERIA MUST BE ADHERED TO:

1. ALL DISTURBED AREAS ARE SEEDED.
2. PROTECTIVE BLANKET IS IN UNIFORM CONTACT WITH THE SOIL.
3. ALL LAP JOINTS ARE SECURE.
4. ALL STAPLES ARE DRIVEN FLUSH WITH THE GROUND.

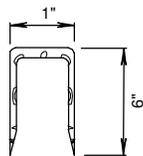
**NOTE:**

APPROXIMATELY 200 STAPLES ARE REQUIRED PER 100 SQ. YDS. OF MATERIAL ROLL. ANCHOR SLOTS, JUNCTION SLOTS, AND CHECK SLOTS TO BE BURIED 6" TO 12" DEEP.

**STAKES, STAPLES, AND PINS**

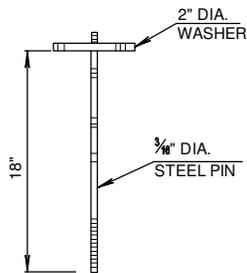


**1. STAKE**  
SEE NOTE 1



11 GAUGE STEEL 6"x1"x6"  
STAPLE

**2. STAPLE**  
SEE NOTE 2



**3. PIN**  
SEE NOTE 3

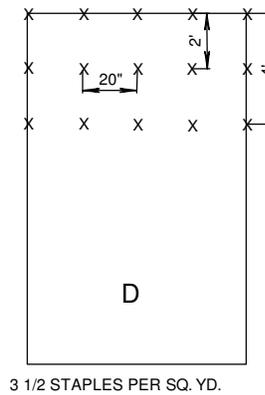
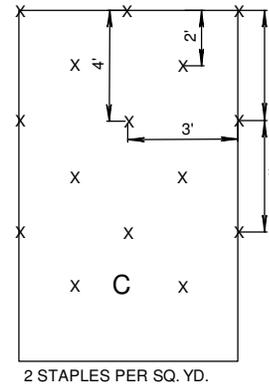
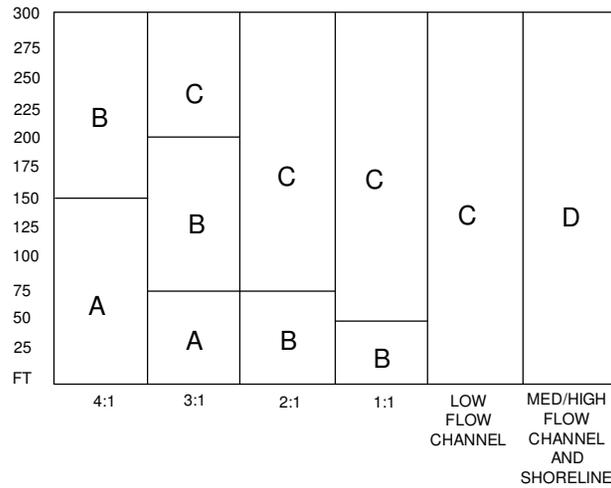
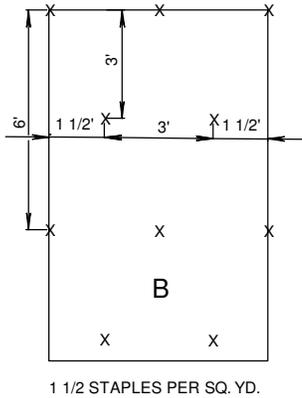
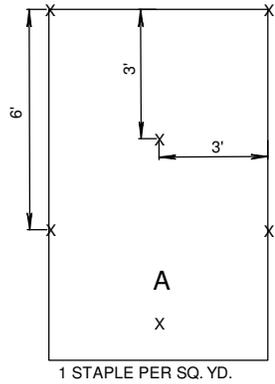
**STAKES, STAPLES, AND PINS NOTES:**  
**GENERAL NOTES:**

1. STAKES SHALL BE 1x4 TRIANGULAR SURVEY STAKES A MINIMUM OF 10" LONG.
2. STAPLES SHALL BE 11-GAUGE STEEL A MINIMUM OF 1" WIDE BY 6" LONG. A 2"x8" STAPLE MAY BE REQUIRED IN CERTAIN SOIL CONDITIONS.
3. STEEL PINS SHALL BE 3/16 DIAMETER BY 18" LONG WITH A 2" DIAMETER WASHER ON TOP (SEE ILLUSTRATIONS).
4. ANCHORING METHODS AND RECOMMENDATIONS VARY BY MANUFACTURERS. THE EXPECTATION OF HIGH VELOCITIES SHOULD DICTATE THE USE OF MORE SUBSTANTIAL ANCHORING.

**STAKES, STAPLES, AND PINS FOR  
INSTALLATION OF ROLLED EROSION  
CONTROL PRODUCTS**

NOT TO SCALE

STAPLE PATTERNS FOR ROLLED EROSION CONTROL PRODUCTS



A) NOTES:

1. FOR OPTIMUM RESULTS, THESE RECOMMENDED STAPLE PATTERN GUIDES MUST BE FOLLOWED UNLESS OTHERWISE DICTATED BY THE MANUFACTURER. SUGGESTED ANCHORING METHODS VARY BY MANUFACTURER. THIS CHART SHOWS HOW SLOPE LENGTHS AND GRADIENTS AFFECT STAPLING PATTERNS.

**GENERAL STAPLE PATTERN GUIDE AND RECOMMENDATIONS FOR ROLLED EROSION CONTROL PRODUCTS**

NOT TO SCALE

## DESIGN GUIDE 16.0 – TURBIDITY CURTAIN

- A. **Description:** A turbidity curtain is a floating geotextile material which minimizes sediment transport from a disturbed area adjacent to or within a body of water. It provides sediment protection for a watercourse from up-slope land disturbance or from dredging or filling within the watercourse.
- B. **Application:** It is applicable to watercourses where intrusion by construction activities and subsequent sediment movement is unavoidable.
- C. **Planning Considerations:** Soil loss into a watercourse results in long-term suspension of sediment. In time, the suspended sediment may travel long distances and affect wide-spread areas. A turbidity curtain is designed to deflect and contain sediment within a limited area and provide enough residence time so that soil particles will fall out of suspension and not travel to other areas.

Turbidity curtain types must be selected based on the flow conditions within the water body, whether it be a flowing channel, lake, or pond. The specifications contained within this practice pertain to minimal and moderate flow conditions where the velocity of flow may reach 5 feet per second or a current may reach approximately 3 knots. For situations where there are greater flow velocities or currents, a qualified engineer and product manufacturer should be consulted.

Consideration must also be given to the direction of water movement in channel flow situations. Turbidity curtains are not designed to act as water impoundment dams and cannot be expected to stop the flow of a significant volume of water. They are designed and installed to trap sediment, not to halt the movement of the water itself. In most situations turbidity curtains should not be installed across channel flows.

In moving water, provisions must be made to allow the volume of water contained within the curtain to change. In addition to allowing for slack in the curtain to increase and decrease, water must be allowed to flow through the curtain if the curtain is to remain in roughly the same spot and maintain the same shape. Normally this is achieved by constructing part of the curtain from a heavy woven filter fabric. The fabric allows the water to pass through the curtain but retains the sediment pollutants. Consideration should be given to the volume of water that must pass through the fabric and sediment particle size when specifying fabric permeability.

Sediment which has been deflected and settled out by the curtain may be removed if so directed by the on-site inspector or the plan-approving authority. However, consideration must be given to whether this will create more of a sediment problem by resuspending particles or accidental dumping of material by the equipment involved. It is recommended that the soil particles trapped by a turbidity curtain only be removed if there has been a significant change in the original contours of the affected area of the watercourse. Regardless of the decision made, soil particles should always be allowed to settle for a minimum of 6-12 hours prior to their removal by equipment or prior to removal of a turbidity curtain.

It is imperative that the other sediment controls be used to keep sediment out of the watercourse in every erosion control plan. However, when proximity to the watercourse makes successfully mitigating sediment loss impossible, the use of the turbidity curtain during land disturbance is essential.

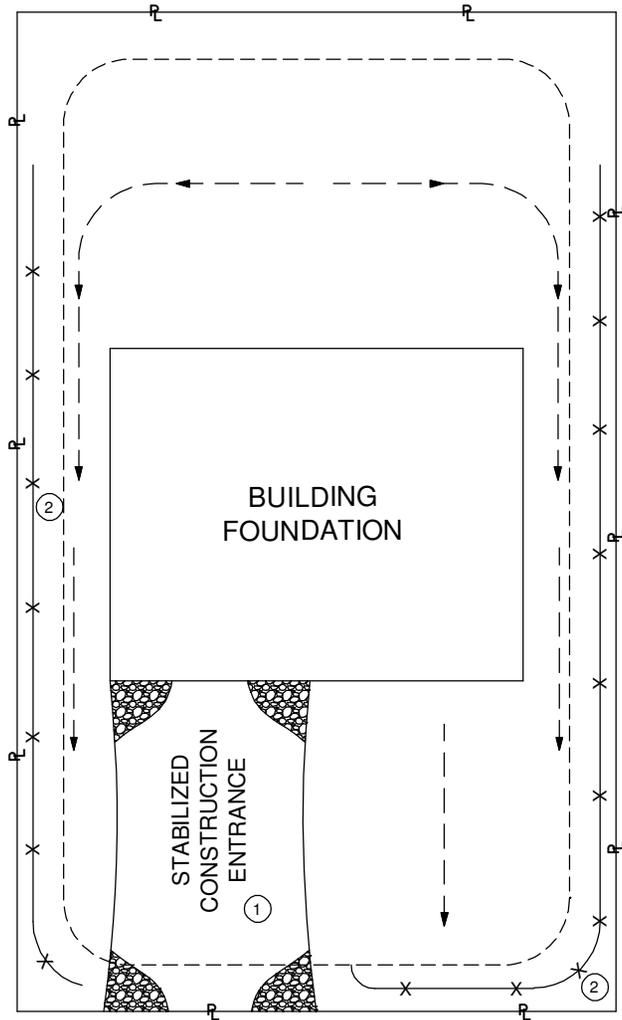
### D. Design Criteria:

1. Turbidity curtains should extend the entire depth of the watercourse whenever the watercourse is not subject to significant wind and wave forces.
2. In wind and wave action situations, the curtain should never be so long as to touch the bottom. A minimum 1-foot gap should exist between the weighted lower end of the skirt and the bottom of the channel. Movement of the lower skirt over the bottom due to wind and wave action on the flotation system may fan and stir sediment already settled out.

3. In wind and wave action situations, it is seldom practical to extend a turbidity curtain depth lower than 10 to 12 feet below the surface, even in deep water. Curtains which are installed deeper than this will be subject to very large loads with a consequent strain on curtain materials and the mooring system. In addition, a curtain installed in such a manner can billow up towards the surface under the pressure of the moving water which will result in an effective depth which is significantly less than the skirt depth.
4. Turbidity curtains should be located perpendicular to the direction of flow of a moving body of water. Turbidity curtains should not be placed across the main flow of a significant body of moving water.
5. When sizing the length of the floating curtain, allow an additional 10-20% variance in the straight line measurements. This will allow for measuring errors, make installing easier and reduce stress from potential wave action during high winds.
9. An attempt should be made to avoid an excessive amount of joints in the curtain; keep a minimum continuous span of 50 feet between joints.
10. For stability reasons, keep a maximum span of 100 feet between joints or anchor or stake locations.
11. The ends of the curtain, both floating upper and weighted lower, should extend well into the shoreline, especially if high water conditions are expected. The ends should be secured firmly to the shoreline, preferably to rigid bodies such as trees or piles, to fully enclose the area where sediment may enter the water.
12. When there is a specific need to extend the curtain to the bottom of the watercourse in moving water conditions, a heavy woven pervious filter fabric may be substituted for the normally recommended impervious geotextile. This creates a flow-through medium which significantly reduces the pressure on tile curtain and will help to keep it in the same relative location and shape during the rise and fall of water.
13. The number and spacing of external anchors may vary depending on current velocities and potential wind and wave action; manufacturer's recommendations should be followed.

E. **Standard Specification:** Standard Specification, Section 4.16 (Turbidity Curtain).

**INDIVIDUAL BUILDING LOT LAYOUT**  
(LESS THAN ONE ACRE)



**GENERAL INSTALLATION/CONSTRUCTION SEQUENCE:**

- ①. STABILIZED CONSTRUCTION ENTRANCE (SEE STANDARD DRAWING ESC-3.0, TEMPORARY CONSTRUCTION ENTRANCE)
- ②. SEDIMENT BARRIERS (SEE STANDARD DRAWING ESC-14.0, SEDIMENT FENCE)
  - PLACE WHERE STORMWATER RUNOFF LEAVES THE SITE.
  - INSPECT AND MAINTAIN CONTROLS.
3. EXCAVATE AND BACKFILL FOUNDATION
  - SPOIL PILE MUST REMAIN A MINIMUM OF 5 FT. FROM BACK OF CURB AND NOT EXTEND BEYOND PROPERTY LINE.
4. CONSTRUCTION ACTIVITIES
  - MAINTAIN AND REPAIR ALL CONTROLS UNTIL FINAL CERTIFICATE OF OCCUPANCY IS ISSUED.
5. FINAL GRADING AND SOD OR SEED PLACEMENT (SEE DESIGN GUIDE 1.0 & 2.0 AS WELL AS STANDARD SPECIFICATION, SECTION 3.3)
6. PERIMETER CONTROLS REMOVED
  - REMOVE AFTER PERMANENT GROUND COVER IS OBTAINED AT A DENSITY SUFFICIENT TO CONTROL EROSION.

**CONCENTRATED FLOW:**

1. PROVIDE CHECKS (ROCK OR CRUSHED CONCRETE, STRAW BALES, ETC.) OR EROSION PROTECTION (EROSION CONTROL BLANKET, SOD, ETC.) FOR CONCENTRATED FLOW AREAS. (SEE STANDARD DRAWING ESC-12.0, TEMPORARY CHECK DAM; ESC 13.0, STRAW BALE BARRIER OR ESC 16.0-16.3, EROSION CONTROL BLANKET)
2. PROVIDE SOIL PROTECTION AND ENERGY DISSIPATION AT GUTTER DOWN SPOUTS IF THEY ARE IN PLACE PRIOR TO FULL VEGETATIVE COVER OVER THE AREA.

**DISCLAIMER:**

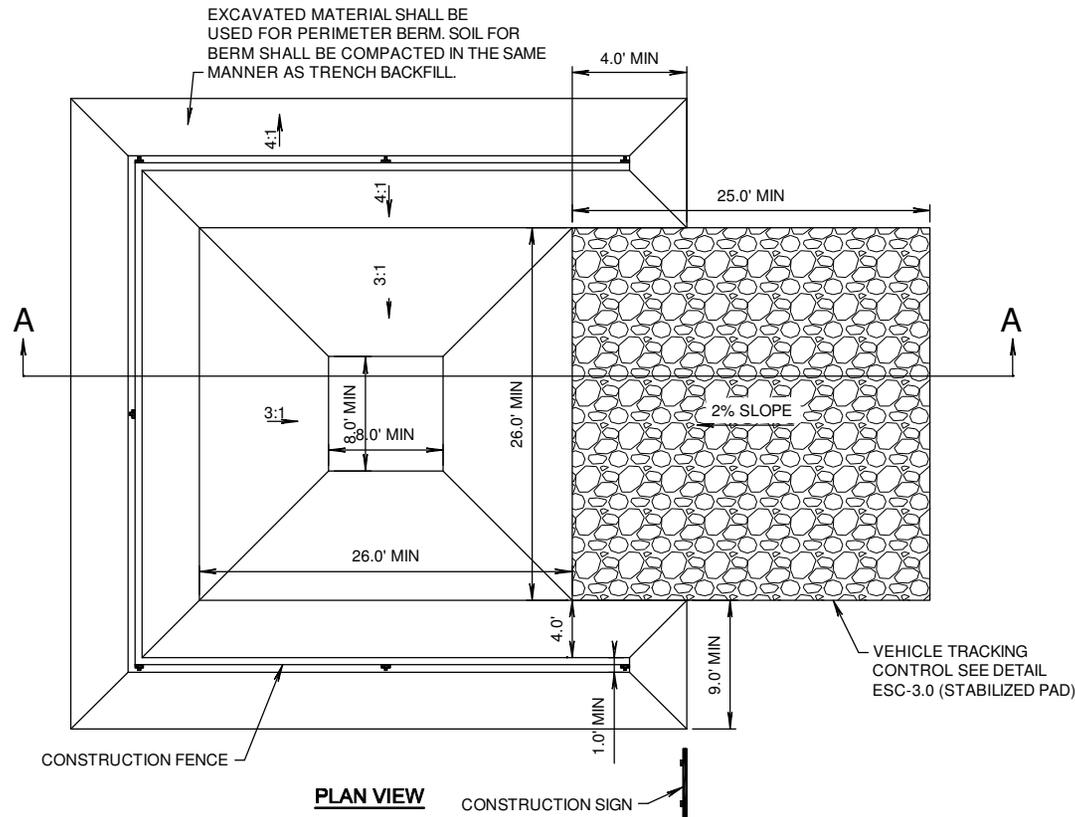
THIS STANDARD DRAWING IS INTENDED AS A GUIDELINE AND IF MORE EROSION AND SEDIMENT CONTROL MEASURES ARE NEEDED, THIS PLAN MUST BE MODIFIED ACCORDINGLY. THE CITY CAN MANDATE ADDITIONAL CONTROLS AS NECESSARY. THE LOT OWNER ASSUMES RESPONSIBILITY FOR EXISTING CONTROL MEASURES ON THE PROPERTY AND MUST PRESERVE THEM UNTIL THE SITE IS FULLY STABILIZED.

**LEGEND:**

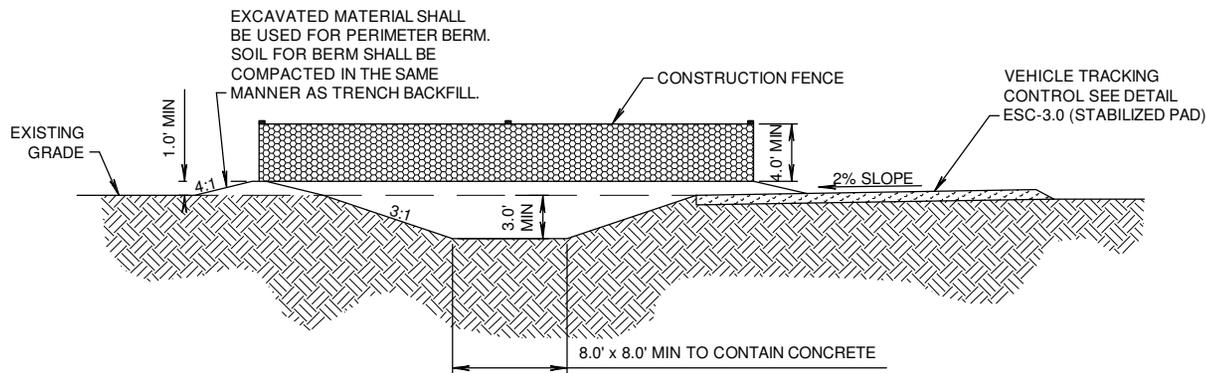
- P — PROPERTY LINE
- x — SEDIMENT BARRIER
- - - - - LIMITS OF DISTURBANCE
- ← - - - - DIRECTION OF SURFACE WATER RUNOFF

## DESIGN GUIDE 18.0 – CONCRETE WASHOUT

- A. **Description:** A designated area on the construction site that is used for disposal of liquid and solid wastes from concrete usage during construction. The purpose of this is to control concrete wastes to prevent both on-site and off-site pollution.
- B. **Application:** A Concrete Washout is used to dispose of all concrete wastes on the construction site to prevent both on-site and off-site pollution. Concrete Washout and Maintenance shall be done during all concrete construction.
- C. **Planning Considerations:** Concrete washout wastewater is corrosive and toxic. The pH of concrete can be over 12 which is the same as many household cleaners. These toxins are dangerous to the environment. The toxins in concrete can make it difficult for plant growth. Restoration of the washout site and surrounding area may require removal and replacement of topsoil to achieve proper plant growth. Concrete washout water may be considered to be a hazardous waste due to the high pH (characteristic hazard waste due to corrosiveness). Disposal shall meet the City's regulations for disposal of concrete and concrete waste. If larger one day pours are scheduled, multiple facilities may be required or constant maintenance will be necessary throughout the day.
- D. **Design Criteria:**
1. **Concrete Washout Geometry** – See Standard Drawing ESC-18.0, Concrete Washout for Concrete Washout geometry.
  2. **Location** – A Concrete Washout shall be placed in an area that allows for easy access on the construction site and in an area that can be maintained and utilized during any and all concrete operations during construction.
- E. **Standard Drawing:** See Standard Drawing ESC-18.0, Concrete Washout.
- F. **Standard Specification:** Standard Specification, Section 4.13 (Stabilized Pad), 4.17 (Concrete Washout).



**PLAN VIEW**



**SECTION A-A**

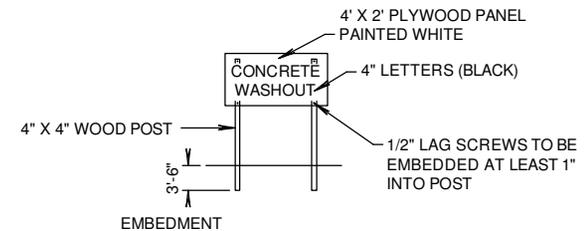
**CONCRETE WASHOUT NOTES:**

**A) INSTALLATION NOTES:**

1. CONCRETE WASHOUT AREAS SHALL BE INSTALLED PRIOR TO ANY CONCRETE PLACEMENT ON SITE.
2. CONCRETE WASHOUT AREA SHALL INCLUDE A FLAT SUBSURFACE PIT THAT IS AT LEAST 8.0'X8.0'. THE SLOPES LEADING OUT OF THE SUBSURFACE PIT SHALL BE 3:1. THE DEPTH OF THE PIT SHALL BE AT LEAST 3.0'. THE BERM SURROUNDING THE SIDES AND BACK OF THE CONCRETE WASHOUT AREA SHALL HAVE A HEIGHT OF 1.0'. THE VEHICLE TRACKING PAD SHALL BE SLOPED 2% TOWARDS THE CONCRETE WASHOUT AREA. A CONSTRUCTION FENCE SHALL BE INSTALLED ALONG THE TOP OF THE PERIMETER BERM PER THE DETAIL.
3. VEHICLE TRACKING CONTROL (SEE DETAIL VTC) IS REQUIRED AT THE ACCESS POINT TO ALL CONCRETE WASHOUT AREAS.
4. A CURB STEP (SEE DETAIL CS) SHALL BE IMPLEMENTED IF A CURB EXISTS AT THE ACCESS POINT TO THE CONCRETE WASHOUT AREA.
5. HIGHLY VISIBLE SIGNS SHALL BE PLACED AT THE CONSTRUCTION SITE ENTRANCE, WASHOUT AREA AND ELSEWHERE AS NECESSARY TO CLEARLY INDICATE THE LOCATION(S) OF THE CONCRETE WASHOUT AREA(S) TO OPERATORS OF CONCRETE TRUCKS AND PUMP RIGS.
6. A ONE-PIECE IMPERVIOUS LINER MAY BE REQUIRED ALONG THE BOTTOM AND SIDES OF THE SUBSURFACE PIT AT THE DISCRETION OF THE CITY'S INSPECTOR.

**B) INSPECTION AND MAINTENANCE:**

1. THE EROSION CONTROL SUPERVISOR SHALL INSPECT THE CONCRETE WASHOUT AREA AT THE FOLLOWING INTERVALS:
  - AFTER INITIAL INSTALLATION.
  - AT LEAST DAILY WHILE THE CONCRETE WASHOUT AREA IS PRESENT ON SITE.
2. CONCRETE WASHOUT MATERIALS SHALL BE REMOVED ONCE THE MATERIALS HAVE REACHED A DEPTH OF 2.0'.
3. CONCRETE WASHOUT AREAS SHALL BE ENLARGED AS NECESSARY TO MAINTAIN CAPACITY FOR WASTED CONCRETE.
4. CONCRETE WASHOUT WATER, WASTED PIECES OF CONCRETE AND ALL OTHER DEBRIS IN THE SUBSURFACE PIT SHALL BE TRANSPORTED FROM THE JOB SITE IN A WATER-TIGHT CONTAINER AND DISPOSED OF PROPERLY.
5. CONCRETE WASHOUT AREAS SHALL REMAIN IN PLACE UNTIL ALL CONCRETE FOR THE PROJECT IS PLACED.
6. WHEN CONCRETE WASHOUT AREAS ARE REMOVED, EXCAVATIONS SHALL BE FILLED WITH SUITABLE COMPACTED BACKFILL AND TOPSOIL, ANY DISTURBED AREAS ASSOCIATED WITH THE INSTALLATION, MAINTENANCE, AND/OR REMOVAL OF THE CONCRETE WASHOUT AREAS SHALL BE ROUGHENED, SEEDED, MULCHED, AND CRIMPED PER THE CITY'S SPECIFICATIONS.



**CONSTRUCTION SIGN**

# **STANDARD SPECIFICATIONS**

# **STANDARD SPECIFICATIONS**

## **1. GENERAL REQUIREMENTS**

- 1.1 - Summary
- 1.2 - Contractor's Responsibility
- 1.3 - Compliance with Permits
- 1.4 - Projects Not Requiring a Permit
- 1.5 - Stormwater Pollution Prevention Plan (SWPPP)
- 1.6 - Contractor Amendments to the SWPPP
- 1.7 - Contractor Schedule
- 1.8 - Alternate Methods or Materials
- 1.9 - Superintendent Training Required
- 1.10 - Duration of Contractor's Responsibility
- 1.11 - Installation of Controls
- 1.12 - Maintenance
- 1.13 - Removal
- 1.14 - Inspections
- 1.15 - Records
- 1.16 - Site Access for Inspections
- 1.17 - Maximum Areas of Disturbance at One Time
- 1.18 - Measures Where Construction has Ceased
- 1.19 - Duration Limits for Select Activities
- 1.20 - Construction near Rivers, Streams, and Waterbodies
- 1.21 - Culverts, Ditches and Storm Sewers

## **2. CHEMICAL AND WASTE CONTROLS**

- 2.1 - Summary
- 2.2 - Solid, Liquid, and Hazardous Wastes
- 2.3 - Sanitary Wastes
- 2.4 - Leak Prevention
- 2.5 - Concrete Washout
- 2.6 - Chemical Handling and Storage
- 2.7 - Herbicides, Pesticides and Fertilizers
- 2.8 - Spill Clean-up and Management
- 2.9 - Spill Reporting

## **3. EROSION CONTROLS**

- 3.1 - Summary
- 3.2 - Materials
- 3.3 - Permanent Seeding and Sodding
- 3.4 - Temporary Seeding
- 3.5 - Mulch Cover
- 3.6 - Hydrocover (Standard)
- 3.7 - Hydrocover (Specialty Mix)
- 3.8 - Erosion Control Blanket
- 3.9 - Surface Roughening
- 3.10 - Dust Control

#### **4. SEDIMENT CONTROLS AND DIVERSIONS**

- 4.1 - Summary
- 4.2 - Materials
- 4.3 - Sediment Removal and Disposal
- 4.4 - Sediment Fence
- 4.5 - Rock or Crushed Concrete Barriers
- 4.6 - Open-Flow Ditch Check
- 4.7 - Straw Wattle
- 4.8 - Foam Dike
- 4.9 - Gravel Bags
- 4.10 - Temporary Diversion
- 4.11 - Temporary Slope Drain
- 4.12 - Inlet Protection
- 4.13 - Stabilized Pad
- 4.14 - Temporary Sediment Basin
- 4.15 - Temporary Stream Crossing
- 4.16 - Turbidity Curtains
- 4.17 - Concrete Washout

#### **5. MEASUREMENTS AND PAYMENTS**

- 5.1 - Summary
- 5.2 - General
- 5.3 - Measurement
- 5.4 - Items not listed in the Proposal
- 5.5 - Measurement and Payment Summary Table

## 1. GENERAL REQUIREMENTS

- 1.1 **Summary:** This section describes general requirements to prevent or minimize the pollution of rivers, streams, lakes, and wetlands caused by runoff from the construction zone. Such pollution includes sediment that may migrate offsite through the action of wind, water, or traffic, as well as chemical spills or other refuse from the site.
- 1.2 **Contractor's Responsibility:** The Contractor shall take all measures necessary to prevent the transport of sediment or pollutants from the project limits or into bodies of water that are intended for protection.
- 1.3 **Compliance with NPDES Permits:** The Owner shall obtain a National Pollutant Discharge Elimination System (NPDES) permit from Kansas Department of Health and Environment (KDHE), as required by the KDHE General Permit for Stormwater Runoff from Construction Activities. Owners of construction activities which disturb a cumulative total of one (1.0) or more acres or that are part of a larger common plan of development or sale which will disturb a cumulative total of one or more acres are required to obtain a NPDES permit.

The Owner shall provide the Contractor with a Stormwater Pollution Prevention Plan (SWPPP) which has been prepared by a Professional Engineer. The Contractor shall comply with all requirements of such permits and the SWPPP, and shall enforce compliance with such requirements by all Subcontractors. The Contractor and all Subcontractors shall certify in writing on the forms required by the permit that they understand and will comply with such permits. A copy of the approved NPDES permit shall be submitted to the City for their records prior to construction.

- 1.4 **Projects Not Requiring a Permit:** If neither NPDES permit nor other local water pollution control permits are required for a project, the City may waive certain documentation and record-keeping provisions of this specification. The Contractor is required to install such measures for erosion and pollution control as may be called for in the plan or required by the City.
- 1.5 **Stormwater Pollution Prevention Plan (SWPPP):** The Stormwater Pollution Prevention Plan (SWPPP) outlines methods and controls to be used to prevent stormwater pollution from the construction activities.

The SWPPP consists of the following elements:

- (a) Title Page – Project Name, Location, Prepared By, Prepared For, Date, etc.
- (b) Overview of Project
- (c) Construction Site Description – Nature of Activity, Sequence of Construction Activities, Area of Disturbance, Proposed Runoff Coefficients for Site, Existing Soil & Storm Water Drainage Information, Site Map (drainage patterns, approximate slopes, areas of soil disturbance, controls, surface waters, storm water discharge locations), Name of Receiving Stream
- (d) Best Management Practices (BMPs) – Erosion & Sediment Control BMPs (stabilization and structural), Stormwater Management Controls (stormwater pollution controls, erosion controls), Other Controls (waste, excess concrete & wash water, hazardous materials, sanitary waste), Timing of Control Measures & Removal, Additional State or Local Requirements
- (e) Inventory of Materials & Substances to be On-Site during Construction (soil, rock/crushed concrete, paint, concrete, lime, fly ash, fertilizers, solvents, toxicants, etc.)
- (f) Inspection & Maintenance Procedures – Maintenance, Inspection Frequency, Inspection Procedures, Procedures for Non-Compliance
- (g) Non-Storm Water Discharge – Water line flushing, pavement washing, etc.
- (h) Description of any Permanent Stormwater Management Features
- (i) Owner, Contractor, and Subcontractors Certifications
- (j) SWPPP Certification
- (k) NPDES permit documentation (NOI from KDHE)

- (l) Inspection and maintenance forms
- (m) Applicable Plan Drawings and Specifications

All elements of the project bid documents relating to erosion and pollution control are considered part of the SWPPP, either by direct inclusion or by reference, including plan sheets, specifications, special provisions, quantity tabulations, bid sheets, and contract documents. A copy of all NPDES and other water pollution related permits and permit applications are also part of the SWPPP. This specification is an integral part of the SWPPP.

- 1.6 **Contractor Amendments to the SWPPP:** Prior to beginning work, the Contractor shall review the SWPPP in detail and provide the Engineer with written recommendations for amendments to improve the effectiveness of the SWPPP or to bring it into better alignment with the Contractor's intended method of operations. The Contractor shall also advise the Engineer of any omissions or deficiencies they find in the SWPPP. During the progress of the job, the Contractor shall continue to monitor the effectiveness and performance of the control measures used and propose additional amendments as needed. No amendment shall be incorporated unless approved by the Engineer, and a log of such amendments shall be made by the Contractor. A copy of the SWPPP and all amendments shall be retained by the Contractor onsite and ready for inspection without notice.
- 1.7 **Contractor Schedule:** The Contractor shall provide the Engineer with a detailed schedule of work prior to beginning, which shall include information on timing, duration, and sequencing of erosion and sediment control measures and construction phasing. Once approved, such schedule shall become a part of the SWPPP, and changes to the schedule shall require amendment to the SWPPP.
- 1.8 **Alternate Methods or Materials:** The Contractor may propose alternative methods or materials for any of the specific erosion and sediment controls given in the SWPPP, provided that such methods provide equal or improved measures of control, as determined by the Engineer. If agreed to by the Contractor and Engineer, such alternates may be paid for at the contract unit price and quantity of the items being replaced. If such modification is not acceptable to either Contractor or Engineer, the alternate methods or materials shall be handled in accordance with the applicable provision of the Contract for changes in work or extra work.
- 1.9 **Superintendent Training Required:** The Contractor's resident superintendent shall have no less than 8 hours of formal training on erosion and sediment control within the last 24 months. Such training shall include the principles of erosion and sediment control, technical information on typical and/or innovative controls, and the contents of these specifications and related Standard Drawings and Design Criteria. The training must be taught by a professional engineer or other professional considered qualified by applicable regulatory agencies to prepare a SWPPP. Documentation of training shall be submitted to the Engineer upon request, prior to beginning work.
- 1.10 **Duration of Contractor's Responsibility:** The Contractor is responsible for water pollution control and permit compliance from the issuance of Notice to Proceed until final completion of the work and during any subsequent maintenance bond period. The Contractor will be released from responsibility for erosion and sediment control for any portion of the job for which a Notice of Termination has been submitted and accepted by the local permit authority, provided that the Contractor does not subsequently do work in such areas that create new disturbances. The notice of termination will not be submitted by the Owner until all permit requirements are met, which includes the requirement that final stabilization be achieved. Vegetation must have a density of at least 75% of the density of the undisturbed areas of the site.
- 1.11 **Installation of Controls:** The Contractor shall obey all requirements for chemical and waste controls specified in Subsection 2 of this Section. Contractor shall provide all specific erosion and sediment controls required by the SWPPP in accordance with the requirements of Subsections 3 and 4. If the SWPPP calls out items or controls not included in this specification, refer to the project special provisions and plans for

requirements. Controls must be installed prior to or during the construction phase during which they are needed, not as a restoration or post-construction item.

- 1.12 **Maintenance:** The Contractor shall maintain the integrity of the temporary erosion and sediment control devices as long as they are in place and necessary. Devices not functioning properly shall be corrected or replaced. Accumulated sediments shall be removed promptly as detailed in Subsection 4.
- 1.13 **Removal:** Control measures shall be completely removed from the site when they are no longer needed, unless they are approved by the Engineer to remain in place for permanent stabilization or biodegradation (i.e. erosion control blankets).
- 1.14 **Inspections:** The Contractor shall inspect the construction site within twenty-four hours of a storm with precipitation of 0.5 inches or greater. In addition, regular inspections shall be made at least once every fourteen (14) days during active phases of construction, and no less than once per month during all other times. All installed practices shall be checked for proper installation, operation, and maintenance. Locations where stormwater runoff leaves the site shall be inspected for evidence of erosion or sediment deposition. Deficiencies shall be noted in a report and corrected in accordance with the City's Construction Site Stormwater Enforcement Policy.

A report of each inspection shall be made and contain the following minimum information: inspector's name, date of inspection, effectiveness of the practices, actions taken or necessary to correct deficiencies, and listing of areas where construction operations have permanently or temporarily stopped. The inspection report shall be signed by the Superintendent or their designee. Site inspection reports shall be maintained onsite with the SWPPP.

- 1.15 **Records:** The Contractor shall maintain all permit required records during the job and shall transmit all necessary records to the Engineer at the completion of the work, including all Contractor and Subcontractor certifications, site inspection records, and other records requested by the Engineer.
- 1.16 **Site Access for Inspections:** The Contractor shall allow authorized personnel with proper credentials from jurisdictional federal, state, or local agencies, to enter the construction site to obtain samples of discharge water, to inspect and copy required records, and to inspect installed practices or equipment.
- 1.17 **Maximum Areas of Disturbance at One Time:** The surface area of erodible earth exposed shall be limited to the Contractor's capability and progress in keeping with the approved schedule. Existing vegetation will be preserved or retained as long as practical and the time period for soil areas to be without permanent surface or vegetative cover shall be minimized. The maximum surface area of erodible earth exposed at one time will not exceed ten (10) acres unless approved in writing by the Engineer or otherwise provided for in the plans. The Contractor shall pay close attention to the grading and disturbance limits indicated on the plan or authorized by the Engineer.
- 1.18 **Measures Where Construction has Ceased:** Soil stabilizing erosion control practices as detailed in Subsection 3 shall be implemented within 14 calendar days after construction activities have temporarily or permanently ceased on any portion of the site. Exceptions to this requirement are as follows: (a) If implementation of erosion controls is precluded by snow cover, such measures shall be taken as soon as practical after snowmelt, or (b) a waiver to this requirement is justified and approved by the Engineer in writing, in which case sediment controls detailed in Subsection 4 must be maintained and a specific deadline for installing erosion controls be established.
- 1.19 **Duration Limits for Select Activities:** For certain items of work, the plans or standard sequences may contain specific time limits for the maximum duration of exposure, typically stated as "Item A construction shall have a maximum exposure time of X days." Where such limits are specified, the time will be measured

from the date in which stabilized ground cover is first disturbed in the work area until the date that permanent or temporary stabilization is applied. At the Contractor's request, the count of days may be suspended for any interim period during which temporary stabilization is in place and adequately maintained. Contractor shall be responsible for documenting the elapsed time on all such work, typically by noting the elapsed time in their inspection logs, taking time-stamped photographs, and/or by marking the area with a wooden stake documenting beginning and ending dates. The Engineer may grant extensions of time requested by the Contractor when justified.

**1.20 Construction near Rivers, Streams, and Waterbodies:** Construction operations in or near rivers, streams, and other water impoundments will be restricted to those areas essential for construction. Unless otherwise provided for in the plans, a minimum 50 feet buffer of undisturbed vegetation will be maintained between construction operations and defined drainage courses. Where such buffers are not provided, work will not be initiated until all materials and equipment necessary to complete the work are on site and such operations will be completed as quickly as possible once the work has begun. When no longer required, all falsework, pilings, temporary crossings, and other obstructions will be promptly removed. Contractor shall not cross live streams with equipment but shall use temporary stream crossing as detailed in the plans.

**1.21 Culverts: Ditches and Storm Sewers.** Construction of major elements of the proposed storm sewer or other drainage systems shall be coordinated to minimize the duration of time over which stormwater would run through temporary, erodible channels. Unless otherwise indicated on the plans, construction of the major elements of the system shall be among the first activities on the project. Once begun, construction will proceed expeditiously to completion, including placement of all final headwalls, end structures, rock/crushed concrete and other end treatments. Temporary or permanent ditches which are graded on the project shall either be stabilized or have temporary sediment controls installed within seven (7) days of their grading.

## 2. CHEMICAL AND WASTE CONTROLS

- 2.1 **Summary:** This section describes specific requirements to control non-sediment related pollutant discharges from chemicals and wastes from the site, including requirements for chemical handling, spill prevention, spill response, and waste disposal.
- 2.2 **Solid, Liquid, and Hazardous Wastes:** All trash shall be placed in dumpsters or trash barrels provided by the Contractor and accumulated trash shall be hauled offsite and properly disposed. Floating debris found in any waterbody on or immediately adjacent to construction shall be removed immediately, regardless of source. Hazardous wastes shall be stored, transported offsite, and disposed of properly.
- 2.3 **Sanitary Wastes:** Sanitary facilities must be made available and their use enforced by the Contractor.
- 2.4 **Leak Prevention:** All equipment used onsite shall be free of leaks, receive regular preventative maintenance, and be inspected daily to reduce chance of leakage. No fueling, servicing, maintenance, or repair of equipment shall be done within 50 feet of a stream, drainage-way, lake, storm sewer inlet or other water body. Onsite fuel tanks shall be in good condition, free of leaks or drips, painted brightly for visibility, monitored daily and shall sit within a secondary containment tank or earthen berm.
- 2.5 **Concrete Washout:** Refer to Section 4.17.
- 2.6 **Chemical Handling and Storage:** Chemicals or materials capable of causing pollution may only be stored onsite in their original container. Materials stored outside must be in closed and sealed water-proof containers and located outside of drainage ways or areas subject to flooding. Manufacturer's data regarding proper use and storage, potential impacts to the environment if released, spill response, and federally-defined reportable quantities for spill reporting shall be maintained by the field superintendent onsite at all times. Locks and other means to prevent or reduce vandalism shall be used.
- 2.7 **Herbicides, Pesticides and Fertilizers:** Herbicides, pesticides and fertilizers used as part of the work shall be applied in accordance with manufacturer recommendations. Direct spray into water bodies is prohibited. Such chemicals shall not be used if rain is forecast within 24 hours, unless they're approved for wet weather application.
- 2.8 **Spill Clean-up and Management:** If safe, Contractor shall immediately stop and contain spills or leaks with an appropriate device, earthen berm, sawdust, sand, kitty litter, rags or other absorbents. Manufacturer recommendations shall be followed. Leaks from broken hoses shall be immediately contained with hose clamps, plugs, or drained into leak-proof containers. Contractor shall have tools, equipment, and supplies necessary for spill response onsite and ready for immediate use at all times. Contractor personnel shall be trained to properly respond to a leak or spill. All spills shall be cleaned up and disposed of in accordance with applicable federal, state, and local regulations. Local hazardous materials response units shall be called if assistance stopping or containing spill or leaks is needed.
- 2.9 **Spill Reporting:** All spills in excess of reportable quantities shall be reported to the appropriate federal, state, and local agencies within 24 hours of their occurrence. The Contractor shall maintain a listing of all such agencies onsite within the SWPPP and in easy reference for onsite personnel. Spills that pose an immediate threat to public safety or contamination of a water body shall be reported immediately to designated first response authorities.

### 3. EROSION CONTROLS

**Referenced Standards:** The following standards are referenced in this section. The latest version of these standards shall be used:

Texas Department of Transportation (TxDOT)

Approved Products List (APL) for Erosion Control. Based on testing and standards cited in the report “TXDOT / TTI Hydraulics, Sedimentation and Erosion Control Laboratory: Field Performance Testing of Selected Erosion Control Products”. List available by writing the Texas Department of Transportation, Maintenance Division, Vegetation Management Section, 125 East 11<sup>th</sup> Street, Austin TX 78701 -2483 or by download from: [http://www.dot.state.tx.us/services/maintenance/erosion\\_control.htm](http://www.dot.state.tx.us/services/maintenance/erosion_control.htm)

3.1 **Summary:** This section describes specific requirements for installation and maintenance of temporary measures to stabilize onsite soils and prevent erosion during construction.

3.2 **Materials:** Materials used for erosion controls shall meet the requirements of the following Subsections. Unless otherwise specified herein, the Contractor shall submit, for each material used, a certification prepared by the manufacturer which states that the materials meets all the requirements of this specification. The manufacturer must also provide supporting documentation and testing results to validate this certification, if requested by the Engineer. Manufacturer’s instructions for installation of materials (when applicable) will be available onsite whenever work is occurring and a copy shall be submitted to the Engineer upon request.

3.3 **Permanent Seeding and Sodding:** Final stabilization with vegetation by either permanent seeding or sodding is the most effective form of erosion control and should be achieved as early in the construction process as possible.

A. Construction Requirements: Contractor shall schedule work so that permanent seeding is conducted as early as practical in the construction process. Multiple mobilizations of seeding or sodding operations will be appropriate on most construction sites. Seed and equipment shall meet all requirements of the City.

B. Seed mixes are listed below. Actual weight of seed shall be adjusted for purity and germination rate to provide the minimum weight of pure, live seed (PLS) listed.

Bermuda.....	25lbs/acre
Buffalo.....	65lbs/acre
Fescue.....	32lbs/acre
Fertilizer (16-20-0).....	200lbs/acre
Fertilizer (10-20-10).....	200lbs/acre
Mulching	

C. Sodding types are listed below.

Bermuda, Buffalo, Fescue

D. Mulch used for permanent seeding shall meet the same requirements as “Mulch Cover” in Subsection 3.5. Mulch is required unless erosion control blankets are being used instead.

E. Out-of-Season Special Provision: The Engineer may require permanent seeding to be conducted outside of the allowed season. The Contractor may request approval to conduct permanent seeding outside of the allowed season. The Contractor shall be responsible for the establishment of a vigorous and healthy seed or sod cover.

F. Maintenance: Mulch shall be replaced or repaired as needed during germination and early growth. Bare spots shall be patched, by hand seeding if necessary. Vehicle and personnel traffic shall be minimized in areas seeded.

**3.4 Temporary Seeding:** Interim stabilization with annual vegetation to provide temporary cover to minimize erosion. This item only covers seeding installed by conventional drilling.

A. Materials: Seed shall meet all requirements of the City.

Fertilizer is not required.

Mulch used for temporary seeding shall meet the same requirements as “mulch cover” in Subsection 3.5. Mulch is required unless erosion control blankets are being used instead.

Seed mixes are listed below. Actual weight of seed shall be adjusted for purity and germination rate to provide the minimum weight of pure, live seed (PLS) listed.

Ryegrass Seed.....	55lbs/acre
Fertilizer (16-20-0).....	330lbs/acre
Fertilizer (10-20-10).....	330lbs/acre
Mulching	

B. Construction Requirements: Preparation, planting and all other construction requirements shall meet all requirements of the City. For this item, seeding shall be drilled (for Hydraulic application method, see Subsection 3.6). Prior to application, the soil shall be tilled to a depth of at least 2 inches and smoothed to eliminate gullies, depressions, or large clods. Roller compaction of the seedbed is not required. Within 24 hours of seeding, mulch or erosion control blankets shall be applied. When mulch is used, it shall be applied in accordance with the same requirements given for “Mulch Cover” in Subsection 3.5. When erosion control blankets are used, they shall be installed in accordance with the requirements Subsection 3.8. The Contractor shall initially water all areas of temporary seeding at least one-quarter inch as soon as the mulch is laid. Additional watering may be necessary for plant germination and adequate growth to provide cover. Contractor shall schedule work so as to provide temporary seeding as early as practical in the construction process. Contractor shall maintain a readiness to perform temporary seeding frequently during the progress of the project. No more than 7 calendar days may elapse between the Engineer’s request for temporary seeding and its application. Multiple mobilizations to seed areas as construction progresses shall be expected.

C. Maintenance: Mulch shall be replaced or repaired as needed during germination and early growth. Bare spots shall be patched, by hand seeding if necessary. Vehicle and personnel traffic shall be minimized in areas seeded.

**3.5 Mulch Cover:** Mulch applied without seeding to protect the soil surface from raindrop impact and reduce wind erosion and dust. Mulch Cover (without seed) is generally used when ground cover is required and temporary or permanent seeding is not feasible.

A. Materials: Mulch shall be vegetative type only, consisting of cereal straw from stalks of oats, rye, wheat, barley or prairie hay and shall be free of prohibited and noxious weed seeds.

B. Construction: Prior to applying mulch, the soil shall be tilled to a depth of 2 inches to eliminate hard crust and allow rainwater intercepted by mulch to infiltrate the soil. The surface will be smoothed to eliminate gullies, depressions, or large clods.

Mulch shall be applied at the rate of 1.5 tons/acre (3,000 lbs/acre) and be anchored into the soil a minimum

depth of 3 inches by use of a heavy disc harrow, set nearly straight, or a similar approved tool. Discs of the anchoring tool shall be set approximately 9 inches apart. Anchoring shall be accomplished by not more than two passes of the tool. If approved by the Engineer, a tackifier may be applied to the mulch to anchor it instead of using the disc harrow.

C. Maintenance: Mulch cover shall be replaced or repaired as needed. Bare spots shall be filled in, by hand if necessary. Vehicle and personnel traffic shall be minimized in areas mulched.

3.6 **Hydrocover (Standard):** Hydraulic application of a standardized mixture of fiber mulch, tackifier, and temporary seed to provide temporary cover.

A. Materials:

1. Cellulose Fiber Mulch: Shall be on the Approved Products List for Erosion Control by TxDOT. All fibers used shall correspond to the prequalified list for the appropriate soil type. Dry weight shall be based on "air-dry weight" that does not contain more than 10% moisture. The manufacturer's packaging shall indicate air-dry weight for each package of mulch. The fibers shall be colored green with a non-toxic dye.
2. Tackifier: Shall be food-grade hydrolyzed guar gum powder. It shall be mixed with the cellulose fibers based on the manufacturer's recommendations, but in no case at a proportion less than 3% of the dry weight of the cellulose fiber mulch.
3. Water: Shall be clean, potable water mixed at a rate suitable for the equipment being used, typically 100 gallons per every 30 to 50 pounds dry weight of cellulose fiber.
4. Seed: Shall be Type T-1 or T-2 seed as specified in Section 3.4. Seed shall be mixed to provide no less than the seeding rate provided.
5. Fertilizer: Not required.
6. Equipment: The hydrocover operation shall be accomplished with hydraulic sprayers suitable for mixing, spreading and projecting the mixture.

B. Construction Requirements: The cellulose fiber mulch shall be added to the hydraulic seeder after proportionate amounts of seed, tackifier, and water have been mixed. These ingredients shall be mixed to form a slurry and applied at the rate indicated above. It shall be applied to make a uniform coverage of the soil surface. Prior to application, the soil shall be tilled to a depth of at least 2 inches and smoothed to eliminate gullies, depressions, or large clods.

Hydrocover shall be applied at a rate of 2,000 pounds dry weight of cellulose fiber per acre (0.41 pounds per square yard), unless otherwise specified by the Engineer. Once applied, the area shall be allowed to dry and vehicle and personnel traffic shall be kept off the stabilized area. Water shall be applied as needed for seed germination and plant growth.

Contractor shall maintain a readiness to provide hydrocover frequently during the progress of the project. No more than 7 calendar days may elapse between the Engineer's request for hydrocover and its application. Multiple mobilizations of hydrocover operations should be expected.

C. Maintenance: Areas which are disturbed by construction shall be patched with additional application of slurry at the next available mobilization of equipment at no additional cost. Small areas of poor coverage may be stabilized through erosion control blankets, mulch for cover, straw wattle protection or other measures, at no additional cost.

**3.7 Hydrocover (Specialty Mix):** Hydraulic application of specialized mixtures of fiber mulch, tackifiers, seed and other additives to provide temporary cover.

- A. Materials: When specialty mixtures are used, the particular mix design and ingredient requirements shall be given in the plans or special provisions. Such specialty mixtures may include additives for improved seed germination, mixtures of special polymer tackifiers and heavier rates of cellulose fiber to produce a more continuous cover (i.e. "Bonded Fiber Matrix"), or mixtures that contain polyacrylamides that chemically stabilize the underlying soils (i.e. "Stabilized Fiber Matrix"). Seed, additives and equipment shall conform to the requirements of standard hydrocover, as well as any additional requirements specified in the plans, special provisions or by the manufacturer of the specialty mix.
- B. Construction and Maintenance Requirements: All construction and maintenance requirements shall be the same as for standard hydrocover, except as modified by the plans or the manufacturer's recommendation for the specialty mix.

**3.8 Erosion Control Blanket:** Blankets or mats of natural, synthetic, or composite materials that can be rolled onto bare earth and anchored in place to provide temporary or permanent cover and/or to stabilize bare earth or channels subject to overland or concentrated surface flow.

- A. Materials: Erosion control blankets of the class and type specified in the contract shall be on the Approved Products List for Erosion Control by TxDOT. Blankets are categorized by expected use and application, as follows:

Class 1: For use as Cover and Slope Protection from overland Flow:

- Type A: On slopes 1:3 or flatter with clay soils.
- Type B: On slopes 1:3 or flatter with sandy soils.
- Type C: On slopes steeper than 1:3 with clay soils.
- Type D: On slopes steeper than 1:3 with sandy soils.

Class 2: For use as Flexible Channel Liner under concentrated flow:

- Type E: For shear stresses below 2 lb/sq. ft.
- Type F: For shear stresses below 4 lb/sq. ft.
- Type G: For shear stresses below 6 lbs/sq. ft.
- Type H: For shear stresses below 8 lb/ sq. ft.
- Type I: For shear stresses below 10 lb/ sq. ft.
- Type J: For shear stresses below 12 lb/ sq. ft.

Only 100% synthetic materials are allowed for Type H, I, or J blankets

- B. Construction Requirements: The Contractor shall install erosion control blankets in the locations shown in the plans or as directed by the Engineer. Soil or seedbed preparation must be complete prior to the placement of blankets. Blankets shall be installed in a directional manner, anchored, lapped, and stapled as recommended by the manufacturer.
- C. Maintenance: Areas of torn or degraded blanket shall be repaired or replaced, unless such degradation is within the accepted tolerances for temporary blankets. Edges or seams which are loose or frayed shall be secured with additional staples. Bare patches of vegetation shall be reseeded.

**3.9 Surface Roughening:** At the end of every working day, the sloped face of any new excavation or embankment shall be roughened by operating tracked machinery up and down the slope to leave horizontal depressions in the slope face. As few passes of the machinery as possible should be made to minimize compaction. At no time shall slopes be bladed or scraped to produce a smooth hard surface.

Any rough graded slope that is not yet ready for seeding or other treatment and which will not be disturbed by ongoing construction for a period of 7 days or more shall be roughened by grooving it with a disc, tiller, spring harrow or other suitable implement. Such grooves shall be located traverse to the slope face and shall not be less than 3 inches deep nor spaced more than 15 inches apart. The requirement to roughen slopes by tracking or grooving shall apply to all slopes steeper than 6:1 horizontal to vertical.

3.10 **Dust Control:** Contractor shall take effective measures to prevent blowing dust. Adequate moisture content shall be maintained in all exposed soils by application of water or, in areas to be subsequently paved, by application of asphalt emulsion. When dust produced by operations such as sand blasting, grinding and sawing of concrete or masonry will create a public nuisance, contractor shall perform work under water spray or utilize an alternate construction method.

#### 4. SEDIMENT CONTROLS AND DIVERSIONS

**Referenced Standards:** The following standards are referenced directly in this section. The latest version of these standards shall be used.

AASHTO

M 288 Geotextile Specification for Highway Applications

ASTM

D 3786 - Test Method for Hydraulic Bursting Strength of Textile Fabrics –Diaphragm Bursting Strength Tester Method

D 4355 - Test Method for Deterioration of Geotextiles by Exposure to Light, Moisture and Heat in a Xenon Arc Type Apparatus

- 4.1 **Summary:** This section describes specific requirements for installation and maintenance of temporary measures to detain, filter, or cause settlement of sediment from runoff, as well as measures used to temporarily direct or divert runoff onsite or at the site perimeter.
- 4.2 **Materials:** Materials used for sediment controls and diversions shall meet the requirements of the following Subsections. Unless otherwise specified herein, the Contractor shall submit a certification prepared by the manufacturer for each material used which states that the materials meets all the requirements of this specification. The manufacturer must also provide supporting documentation and testing results to validate this certification, if requested by the Engineer. Manufacturer’s instructions for installation of materials (when applicable) will be available onsite whenever work is occurring and a copy shall be submitted to the Engineer upon request.
- 4.3 **Sediment Removal and Disposal:** Removal of accumulated, settled sediment from behind barriers, traps, or within basins.
- A. Materials: None
- B. Construction Requirements: Accumulated sediment shall be removed when it exceeds the volumes specified for any particular measure or when ordered by the Engineer. Sediments removed shall be mixed with other onsite materials and incorporated into project fills, spread loosely across the site, or hauled offsite as necessary. Sediments may not form an identifiable layer or seam in any fill. Sediments hauled offsite shall be dewatered first or hauled in a water tight truck. Sediments shall be located and compacted in a way which minimizes the likelihood of being re-suspended in future rainfalls. Removal shall be performed by machine or hand work, whichever is most feasible.
- 4.4 **Sediment Fence:** A temporary barrier of synthetic fabric embedded in the ground and supported by posts and in some cases wire fencing, used to divert water or to maintain a trap for settlement.

A. Materials:

1. Geotextile Fabric: Shall meet the requirements of AASHTO M 288, which include requirements for elongation, grab strength, permittivity, apparent opening size, and ultraviolet stability. The geotextile supplied shall meet the quality requirements given in AASHTO M 288 for the geotextile specified in plan drawings.
2. Posts: Posts shall be wood with a 1 1/2” nominal dimension or shall be steel posts of U, T, L, or C shape, weighing 1.33 lbs per foot minimum. Only steel posts may be used on wire-supported fence. Fence pre-fabricated with posts is not allowed due to difficulty of proper installation.
3. Wire Reinforcement: When used, shall be woven-wire fencing with a minimum wire gage between 9

and 14 and a maximum mesh spacing of 6 inches in all directions.

**B. Construction Requirements:** Install fence as shown on the Standard Drawing.

Installation shall either by standard trench or through the use of a specialized machine capable of inserting the fence securely into the ground with a slicing method and firmly compacting the slice closed. The slicing-machine method is preferred for all locations where the machine can reasonably be used. Sediment fence must be firmly anchored to the ground, well compacted, free of rips and tears, and standing securely upright. Joints in Sediment fence must overlap to prevent leakage. Existing trees shall not be used as stakes, and trenches for Sediment fence shall avoid damaging the root zone of trees to be saved. Provide wire support for fence when specified on the plans or by the Engineer. Wire support is generally used when controlling large areas or to discourage accidental damage by vehicles.

Sediment fence shall be located generally as shown in the plans, but adjusted to conform to the actual contours and based on the usage, as follows:

1. When used to capture overland flow, install along the contour to provide maximum storage volume without overtopping, with ends turning to run up-slope a short distance to prevent bypassing. Additional volume may be created by excavating depressions on the upstream side of the fence.
2. When used for ditch checks, extend the ends up the side slope of ditch sufficiently to prevent bypass around the end posts.
3. When used to divert and direct water, install to create a smoothly descending flow line.
4. When used at the toe of an embankment, offset Sediment fence by several feet to provide Sediment storage capacity.
5. When used as perimeter control of a site or stockpile, loose fill or stockpiled earth shall not be placed or allowed to fall directly against the Sediment fence. Sediment fence shall not support a stockpile.

**C. Maintenance:** Remove Sediment deposits when they exceed 1/3 the height of the fence. Replace all broken, ripped, degraded, or damaged sections of fence immediately with new fencing, including adequate overlap at ends to prevent leakage.

**4.5 Rock or Crushed Concrete Barriers:** Small temporary rock or crushed concrete dams used to form sediment traps or used as ditch checks in ditches with large flows. Barriers may also be used to redirect water when other measures are not sufficient.

**A. Materials:** Rock or Crushed Concrete shall be clean and free of deleterious substances, including earth, chert, cracks, seams, soapstone, shale or other easily disintegrated materials. Rock or Crushed Concrete shall come from a primary run and be screened to remove the easily separated fines. It shall meet the gradation requirements below for the nominal size specified:

1. 2-inch Rock or Crushed Concrete: A majority of the particles larger than 1.5 inches in diameter and none larger than 3 inches. Total Rock or Crushed Concrete and fines smaller than 1/2 inch shall not exceed 2 % by weight.
2. 4-inch Rock or Crushed Concrete: A majority of the particles larger than 4 inches in diameter and none larger than 6 inches. Total Rock or Crushed Concrete and fines smaller than 1" shall not exceed 2 % by weight.
3. 6-inch Rock or Crushed Concrete: A majority of the particles larger than 6 inches in diameter and none larger than 9 inches. Total Rock or Crushed Concrete and fines smaller than 1" shall not exceed 2 % by weight.
4. 12-inch Rock or Crushed Concrete: A majority of the particles larger than 12 inches in diameter and none larger than 18 inches. Total Rock or Crushed Concrete and fines smaller than 1" shall not exceed 2 % by weight.
5. The Engineer may approve modifications to these gradations to accommodate readily available

stockpiles from local quarries.

B. Construction Requirements: Rock or Crushed Concrete barriers shall be placed as shown on the plans or Standard Details. When shown, depressions shall be excavated on the upstream side of the barriers to increase available storage volume and create a sediment trap. All rock or crushed concrete shall be removed from the site at the completion of work, unless suitable onsite disposal is authorized by the Engineer.

C. Maintenance: Remove Sediment when it accumulates 1/2 the height of the barrier. Reshape or replace the rock or crushed concrete where settlements or isolated breaches occur.

**4.6 Open-Flow Ditch Check:** A-frame ditch-checks with an open weave that allows significant flow through while lowering velocities sufficiently to cause settlement.

A. Materials:

1. Frame: Structure made of strands of high-density polyethylene woven to produce rectangular openings. Frames made of metal or other plastics having equivalent strength and durability may be used. Opening sizes may vary across the frame, with generally smaller openings clustered at the bottom to screen materials and larger openings at the top to facilitate overflow. Openings shall comprise a minimum of 35% of the cross sectional area of the frame. Frames shall be fabricated in triangular "A-frame" shape with a flange at both ends on the bottom to facilitate anchoring into the soil.
2. Anchors: As recommended by the manufacturer.
3. Erosion Control Blanket: Shall be Class 2, Type F as specified in Subsection 3.8, unless an alternate type is indicated on the plans.

B. Construction Requirements: Prepare channel or ditch by forming the shape and grade and compacting the subgrade. Apply any soil additives, fertilizer, seed, or erosion control blankets as required before installing ditch check. Install ditch check and underlying erosion control blanket as shown in the Standard Drawing.

C. Maintenance: Remove Sediment when it accumulates 1/2 the height of the ditch check. If units are damaged or dislodged during the sediment removal process, repair and re-establish continuity.

**4.7 Straw Wattle:** Circular tubes of netting filled with straw fibers and used as a small height barrier for diversion of water or settlement.

A. Materials: Wattles shall consist of a rice or wheat straw fibers as filler within a containment netting. Filler shall be certified as weed free in accordance with state standards. Fibers must have an average length greater than 3 inches. Containment netting shall be high-density polyethylene and ethyl vinyl acetate and shall contain ultraviolet inhibitors. The strand thickness shall be no less than 0.030 inches, the knot thickness no less than 0.055 inches and the netting weight no less than 0.35 ounces per foot. The entire wattle unit shall be sufficiently durable to withstand weather, construction, and installation conditions for no less than 3 months, including multiple movements and reinstallations. Wattles shall have a 9-inch diameter (1-inch tolerance) and a minimum unit weight of 1.4 lbs/ft. Wood or steel posts of sufficient strength withstand installation and weather shall be used for anchoring.

B. Construction Requirements: Wattles shall be located as shown on the plans or as directed by the Engineer. Individual units shall be installed in accordance with manufacturer's recommendations and the Standard Drawings. Units shall be laid end to end and abutted firmly or overlapped against the next consecutive unit.

C. Maintenance: Remove Sediment when it accumulates to 1/2 the height of the wattle. Repair torn, ripped,

or degraded segments. Avoid driving over wattles and repair any segments damaged by vehicles. Correct shifts in wattle alignment. Repair rills or gullies upslope of the wattle and any undercutting that may occur. Units that do not satisfy the durability requirement shall be replaced at no extra cost.

**4.8 Foam Dike:** Foam strips wrapped in geotextile fabric and used as a small height barrier for diversion of water or settlement.

A. **Materials:** Foam dikes shall have an inner material of plastic foam with an outer covering of geotextile fabric fitted snugly. Plastic shall be urethane or other material approved by the Engineer and shall be durable, weather resistant, and flexible. The foam core shall have a triangular or rectangular cross section that is stable when placed, and shall provide for a minimum of 7" height barrier height above grade. Geotextile shall meet the same requirements as given for Sediment fence in this specification. The geotextile shall have flaps that extend a minimum of 3 feet beyond the base of the inner material in each transverse direction. The entire foam dike unit shall be sufficiently durable to withstand weather, construction, and installation conditions for no less than 3 months. The foam dike shall be anchored by staples.

B. **Construction Requirements:** Foam dikes units shall be located as shown on the plans or directed by the Engineer. Units shall be installed in accordance with manufacturer's recommendations and the Standard Drawings. Units shall be laid end to end and abutted firmly to the next consecutive unit.

C. **Maintenance:** Remove Sediment when it accumulates 1/2 the height of the foam dike. Repair torn, ripped, or degraded segments. Avoid driving over foam dikes and repair any segments damaged by vehicles. Units that do not satisfy the durability requirement shall be replaced at no extra cost.

**4.9 Gravel Bags:** Small gravel-filled durable bags that are placed, stacked, or piled to form temporary diversions, barriers, or ditch checks.

A. **Materials:** Bags shall be woven polypropylene, polyethylene, or polyamide fabric or burlap having a minimum unit weight of 4 ounces per square yard. The Mullen burst strength shall exceed 300 psi per ASTM D3786 and shall have ultraviolet stability exceeding 70% per ASTM D4355. Bags shall be filled with clean, coarse gravel with a minimum of 20% by weight of no. 4 sieve particle size and be securely sealed. Bags may be of any size suitable for hand placement and carrying. A typical bag size is 18-inches long, 12-inches wide, and 3- inches thick with a weight of 30-35 pounds when loosely filled.

B. **Construction Requirements:** Bags shall be placed tightly together with no gaps between individual bags or adjacent curbs, walls or other surfaces against which they are placed.

C. **Maintenance:** Sediment that is stopped by and stored behind the bag shall be removed after every rainfall.

**4.10 Temporary Diversion:** Earthen berm and adjacent swale temporarily graded and compacted to provide a diversion or to trap small areas of overland flow. Temporary Diversions can be used in conjunction with slope drains at the top of slopes to prevent sheet flow down the slope.

A. **Materials:** Temporary diversions shall consist of any soil material from within the project limits that is capable of being compacted.

B. **Construction Requirements:** Temporary diversions shall be constructed to the dimensions shown in the Standard Drawings. The diversion shall be wheel compacted with one pass minimum over the entire width of the berm. Material for the berm should be drawn from the swale (or diversion channel) excavated adjacent to the berm on the upslope side, so as to further establish the drainageway.

C. **Maintenance:** Diversions shall be re-shaped and re-compacted as necessary to maintain their function.

Breaches in the berm shall be repaired promptly.

**4.11 Temporary Slope Drain:** A flexible tubing or conduit used to convey concentrated water from the top of a slope down to the toe and thereby preventing erosion over the slope face.

A. Materials: Temporary slope drains shall be metal, plastic, or flexible rubber pipe having a minimum 12 inch diameter. Pipe walls shall be impermeable and not slotted. Preformed elbows will be provided where sharp grade changes are needed. Standard flared end sections as approved by the Engineer shall be provided at both the inlet and outlet. Rock or crushed concrete for energy dissipation at the outlet shall meet the material requirements for "Rock or Crushed Concrete Barrier".

B. Construction Requirements: Temporary slope drains shall be constructed as shown in the Standard Details. Water shall be directed towards the inlets by the use of temporary berms, Sediment fence, gravel bags, or other barrier systems shown on the plans or approved by the Engineer. The drain will discharge onto a stabilized feature to prevent scour.

C. Maintenance: Sediment ponded at the inlet that would disrupt smooth flow shall be removed promptly. Outlet conditions shall be repaired if scour is observed. Leaking or damaged sections of pipe shall be repaired immediately. Berms or fences directing water to the inlet shall be monitored for continuity and effectiveness and repaired or modified appropriately.

**4.12 Inlet Protection:** Any one of a variety of devices or procedures used to allow water to enter a stormwater inlet while filtering or temporarily impeding the flow sufficiently to reduce the quantity of sediment entering the inlet.

A. Materials: When used, Wattles, Foam Dike, Sediment Fence, Rock or Crushed Concrete and Gravel Bags shall meet the material requirements in the respective Subsection of these Standard Specifications. All other material specifications are as shown in the Standard Details or on the plans.

B. Construction Requirements: Unless otherwise indicated by the Engineer, any of the inlet protection systems given in the Standard Details or plans may be used where appropriate. The project plans may limit the use of particular inlet treatments or specify greater detail on their use. The appropriate details for a given inlet will change during the progress of the job and adjustments shall be made as inlet construction progresses. Each inlet shall be protected continuously from initial construction until final stabilization.

When surrounding conditions are such that protection of an inlet would lead to an increased risk of flooding adjacent structures or streets, the barriers shall be adjusted or eliminated to avoid such impacts. In those cases, the amount of sediment that enters the inlet shall be minimized using other protection methods, such as temporary seeding or mulch cover.

The general cases of inlet protection and the performance expected from each are as follows:

1. All Inlets at Sump Conditions: Inlets at sump conditions must remain accessible for flow at all times. Small barriers, depressions and/or filters are used to screen larger sediments and initiate settlement of the water prior to it entering the inlet by creating a ponding zone. Generally, stormwater will enter the inlet via weir flow over the top of the barrier. Such water is generally the least-sediment laden as it is decanted from the top of the ponded area.

2. **Street Inlets on Grade:** On-grade inlets must be converted into localized sump condition by installing a barrier downstream and around the inlet, with sufficient height to produce ponding, while a barrier, depression, and/or filter in front of the inlet induces settlement of solids. Bypassing of water at the on-grade inlet shall not be allowed and the inlet must remain open to accept flow without causing excessive flooding.
3. **Selected Inlets Closed to Flow:** In select locations, inlets may be designated on the plans as “closed to flow.” In those situations, the objective is to provide sufficient blockage of permanent and temporary openings to prevent entry of stormwater into the inlet. Such locations will be clearly indicated on the plans, and the closed condition for flow may be designated for only a portion of the construction period. The Contractor shall notify the Engineer if they believe that the closure of such inlets would result in an increased risk of flooding or downstream erosion, and such concerns shall be resolved before closing an inlet to flow.

C. **Maintenance:** Sediment will be removed from each inlet after every rainfall event that exceeds 1/2" or which results in a visible accumulation of sediment. Particular attention will be paid to prevent blockage of inlets or cases where re-suspension of captured sediment is likely. Specific maintenance issues unique to each inlet protection type shall be as outlined in the appropriate Standard Drawing or Subsection of this specification.

4.13 **Stabilized Pad:** A stabilized layer of large rock or crushed concrete located in areas of high traffic and at the construction entrance, intended to prevent mud and Sediment from becoming embedded in tires or tracked offsite and to protect the site from rutting.

A. **Materials:** Rock or crushed concrete shall meet the requirements for 4-inch rock used in rock or crushed concrete barriers, as specified in Subsection 4.5.

B. **Construction Requirements:** Stabilized pads for temporary construction entrances or other uses shall be constructed where shown on the plans or directed by the Engineer. Contractor will avoid locating entrances on steep slopes or at curves on public roads. Where possible, entrances and pads will be located where permanent roads will eventually be constructed. All existing vegetation and other unsuitable material shall be removed from the foundation area. The area shall be graded and crowned for positive drainage. The existing subgrade shall be compacted by three passes of heavy vehicles. The rock or crushed concrete shall be placed and compacted by another three passes of heavy vehicles. Surface drainage runoff shall be diverted from the pad to a sediment trap formed by a rock or crushed concrete barrier, as described in Subsection 4.5.

C. **Maintenance:** Reshape pad as needed for drainage and runoff control. Top dress with clean rock or crushed concrete as needed.

4.14 **Temporary Sediment Basin:** A temporary reservoir, embankment and outlet works constructed across a drainageway to intercept sediment-laden runoff from large areas (generally in excess of 5 acres) and provide retention time sufficient to settle out a majority of solids. Sediment Basins shall be designed by a Professional Engineer in Kansas and shall satisfy all applicable local, state and federal rules and regulations.

The embankment, reservoir, spillway and appurtenances shall be constructed as shown on plan drawings prepared by the Professional Engineer and as approved by the City.

Care shall be taken to ensure that the stream crossing does not cause flooding of adjacent homes, buildings, or other structures.

A. Materials: Materials used in the sediment basin shall conform to the requirements given in the plans drawings.

B. Construction Requirements: All clearing, grubbing, demolition, excavation, embankment, compaction, or other grading necessary to construct the sediment basin shall be done in accordance with City General Surface Improvements Handbook, and the plan drawings.

Where the plans indicate that a temporary sediment basin is to be converted into a permanent basin, pond, or other stormwater facility, the construction, use, and removal or alterations shall be coordinated to result in the final facility with minimal disruption to the sitework, downstream channel, or future facility.

The construction of the sediment basin shall be carried out in a manner that does not create sediment problems downstream. The embankment and emergency spillway shall be stabilized with temporary or permanent vegetation immediately after installation of the basin.

Construction warning fence and signs shall be installed around the perimeter of the pond. Additional fencing shall be installed as indicated on the plans.

C. Maintenance: Check temporary sediment basins after periods of significant runoff. Remove sediment and restore the basin to its original dimensions when sediment accumulates to one-half the design depth. Check the embankment, spillways, and outlet for erosion damage, and inspect the embankment for piping and settlement. Make all necessary repairs immediately. Remove all trash and other debris from the riser and pool area.

**4.15 Temporary Stream Crossing:** A temporary culvert or bridge crossing for construction access or a utility crossing constructed in a creek, river, or stream.

A. Materials: Materials used in the stream crossing shall conform to the requirements given herein and in the Standard Drawing.

B. Construction Requirements: All clearing, grubbing, demolition, excavation, embankment, compaction, or other grading necessary to construct the stream crossing shall be done in accordance with the Standard Drawings, unless more stringent requirements are provided for in the project plans or specifications.

The culvert, backfill, haul road, approaches, and appurtenances shall be constructed as shown on the plans and in the Standard Drawing. Culvert sizing, number, and orientation shall be as indicated in the plans. Care shall be taken to ensure that the stream crossing does not cause flooding of adjacent homes, buildings, or other structures. Concerns about adequacy of culvert sizing should be brought to the immediate attention of the Engineer and no installation made until such concerns are resolved.

The temporary stream crossing shall be at right angles to the stream. Where approach conditions dictate, the crossing may vary 15 degrees from perpendicular.

The centerline of both roadway approaches shall coincide with the crossing alignment centerline for a minimum distance of 50 feet from each bank of the stream being crossed. If physical or right-of-way restraints preclude the 50-foot minimum, a shorter distance may be provided. All fill materials associated with the roadway approach shall be limited to a maximum height of 2 feet above the existing floodplain elevation.

A diversion shall be constructed across the roadway on both roadway approaches a maximum of 50 feet on either side of the top of the stream bank, to prevent roadway surface runoff from directly entering the stream. Design criteria for this diverting structure shall be in accordance with Subsection 4.10, Temporary

Diversions. If the roadway approach is constructed with a reverse grade away from the stream, a separate diverting structure is not required.

1. Temporary Culvert Crossing

- a. Where culverts are installed, 3 to 6-inch coarse rock/crushed concrete or larger will be used to form the crossing. The depth of rock/crushed concrete cover over the culvert shall be equal to one-half the diameter of the culvert or 12 inches, whichever is greater.
- b. If the structure will remain in place for up to 14 days, the culvert shall be large enough to convey the flow from a 2-year storm without appreciably altering the stream flow characteristics. If the structure will remain in place 14 days to 1 year, the culvert shall be large enough to convey the flow from a 10-year storm. In this case, the hydrologic calculation and subsequent culvert size must be determined for the specific watershed characteristics. If the crossing must remain in place over 1 year, it must be designed as a permanent structure by a qualified professional.
- c. Multiple culverts may be used in place of one large culvert if they have equivalent capacity. The minimum-sized culvert that may be used is 18 inches.
- d. All culverts shall be strong enough to support their cross sectioned area under maximum expected loads.
- e. The length of the culvert shall be adequate to extend the full width of the crossing, including side slopes.
- f. The approaches to the structure shall consist of pads constructed of 3 to 6-inch rock/crushed concrete that are a minimum of 6 inches thick and at least as wide as the structure:
- g. See Standard Drawing ESC-1060 for additional details.

2. Temporary Bridge Crossing

- a. Structures may be designed in various configurations. However, the materials used to construct the bridge must be able to withstand the anticipated loading of the construction traffic.
- b. Appropriate perimeter controls such as sediment fence or turbidity curtains must be employed when necessary along banks of stream parallel to the same.
- c. All crossings shall have one traffic lane. The minimum width shall be 12 feet with a maximum width of 20 feet.

C. Maintenance: Check temporary stream crossings after periods of significant runoff. Remove blockages to the inlet section and repair any scoured or damaged sections. If a temporary crossing requires excessive maintenance, replacement with a larger culvert or alternate design may be necessary.

4.16 **Turbidity Curtains:** Floating barriers of synthetic fabric curtain suspended in the water and held in a vertical position, used in lakes and perennial rivers to slow, contain or direct the flow from disturbed areas allowing solids to settle out before spreading into the surrounding water.

A. Materials: All components shall conform to the requirements given for the specific turbidity curtain system specified in the plans.

B. Construction Requirements: Shall conform to the manufacturer's recommendations for the curtain system specified in the plans and additional requirements as may be listed in the plans. A manufacturer's representative shall be onsite during installation of the system.

C. Maintenance: Anchor lines shall be kept secure and properly positioned. Fabric, cable, and other appurtenances shall be repaired immediately as needed and in accordance with manufacturer's instructions.

**4.17 Concrete Washout:** Concrete wash or rinse water from concrete mixing equipment, tools and/or ready-mix trucks, concrete pump trucks, tools, etc, may not be discharged into or be allowed to run directly into any existing water body, storm inlet, alley or street. One or more locations for concrete wash out shall be designated on site, such that discharges during concrete washout will be contained in a small area where waste concrete can solidify in place and excess water can evaporate.

A. **Materials:** All components shall conform to the requirements given for the specific concrete washout system specified in the plans.

B. **Construction Requirements:** Shall conform to the manufacturer's recommendations for the concrete washout system specified in the plans and additional requirements as may be listed in the plans. The Erosion Control Supervisor shall inspect the concrete washout area after initial installation and at least daily while the concrete washout area is present on site.

C. **Maintenance:** Concrete washout materials shall be removed once the materials have reached a depth of 2.0'. Concrete washout areas shall be enlarged as necessary to maintain capacity for wasted concrete. Concrete washout water, wasted pieces of concrete and all other debris in the subsurface pit shall be transported from the construction site in a water-tight container and disposed of properly. When concrete washout areas are removed, excavations shall be filled with suitable compacted backfill and topsoil, any disturbed areas associated with the installation, maintenance, and/or removal of the concrete washout areas shall be roughened, seeded, mulched and crimped per the City's specifications.

**5. MEASUREMENTS AND PAYMENTS**

- 5.1 **Summary:** This Subsection includes the method of measurement and the basis of payment, for furnishing all labor, equipment, tools and materials and for the performance of all related work necessary to complete any work covered in this Sections 2, 3, and 4.
- 5.2 **General:** Unless specifically altered by Contract Special Provisions, the methods of measurement and payment shall be as specified in each Subsection herein, and as listed in the Proposal.
- 5.3 **Measurement:** The work shall be measured for payment as specified in each applicable Subsection and verified by the Engineer. The method of measurement and computations used in determination of quantities of work performed will be those methods generally recognized as conforming to good engineering practice.
- 5.4 **Items not listed in the Proposal:** There shall be no measurement or separate payment for any item of work not specifically identified and listed in the Proposal. All costs pertaining thereto shall be included in the cost of the other items included in the Proposal.

**5.5 Measurement and Payment Summary Table:**

<b>Item Description</b>	<b>Ref. Section</b>	<b>Method of Measurement</b>	<b>Basis of Payment</b>
Solid, Liquid, and Hazardous Wastes	2.2	No measurement	Subsidiary to other items
Sanitary Wastes	2.3	No measurement	Subsidiary to other items
Leak Prevention	2.4	No measurement	Subsidiary to other items
Concrete Washout	2.5	No measurement	Subsidiary to concrete items
Chemical Handling and Storage	2.6	No measurement	Subsidiary to other items
Herbicides, Pesticides and Fertilizers	2.7	No measurement	Subsidiary to other items
Spill Clean-up and Management	2.8	No measurement	Subsidiary to other items
Spill Reporting	2.9	No measurement	Subsidiary to other items
Permanent Seeding	3.3	0.01 acre	Unit Bid Price
Permanent Sodding	3.3	1 sq. yd.	Unit Bid Price
Mulch Cover	3.5	0.01 acre	Unit Bid Price
Hydrocover (Standard)	3.6	1 lbs dry-weight of fiber	Unit Bid Price
Hydrocover (Specialty Mix)	3.7	1 lbs dry-weight of fiber	Unit Bid Price
Erosion Control Blanket	3.8	1 sq. yd. of sloped area	Unit Bid Price
Surface Roughening	3.9	No measurement	Subsidiary to other items
Dust Control	3.10	No measurement	Subsidiary to other items
Sediment Removal and Disposal	4.3	1 cu. yd.	Unit Bid Price
Sediment Fence	4.4	1 lin. ft.	Unit Bid Price

Rock or Crushed Concrete Barrier	4.5	0.1 ton	Unit Bid Price
Open-Flow Ditch Check	4.6	1 lin. ft.	Unit Bid Price
Straw Wattle	4.7	1 lin. ft.	Unit Bid Price
Foam Dike	4.8	1 lin. ft.	Unit Bid Price
Gravel Bags	4.9	Each bag	Unit Bid Price
Temporary Diversion	4.10	1 lin. ft.	Unit Bid Price
Temporary Slope Drain	4.11	1 lin. ft.	Unit Bid Price
Inlet Protection	4.12	Each inlet	Unit Bid Price
Stabilized Stone Pad	4.13	0.1 ton	Unit Bid Price
Temporary Sediment Basin	4.14	Each basin	Unit Bid Price
Temporary Stream Crossing	4.15	No measurement	Lump Sum
Turbidity Curtains	4.16	1 lin. ft.	Unit Bid Price
Concrete Washout	4.17	No measurement	Subsidiary to other items

# **SWPPP TEMPLATE**

**STORM WATER POLLUTION  
PREVENTION PLAN**

**For**

**GREAT BEND, KANSAS**

**CONSTRUCTION ACTIVITIES**

**At**

**[PROJECT NAME]**

**[Site Address]**

**[City, State Zip Code]**

**Prepared for:**

**[Owner/Operator Name]**

**[Owner/Operator Address]**

**[Owner/Operator City, State Zip Code]**

**Prepared by:**

**[Preparer Name]**

**[Prepare Business]**

**[Preparer Address]**

**[Preparer City, State Zip Code]**

**[Preparer Phone No.]**

**[Month, Year]**

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## **SECTION 1**

Notice of Intent (NOI)  
Owner's Certification and Delegation  
Contractor's Certification and Delegation  
Sub-Contractor Certifications  
Professional Engineer's Certification

**Insert NOTICE OF INTENT (NOI) Submitted to KDHE.**

**NOI along with instructions can be found on the web at:**

**<http://www.kdheks.gov/stormwater/>**

**Click on “Construction Stormwater Program”**

**STORM WATER POLLUTION PREVENTION PLAN**

**PROJECT NAME**

**Project Owner**

**Site Address**

**City, State Zip Code**

**OWNER'S CERTIFICATION and DELEGATION**

I certify under penalty of law, that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gathered and evaluated the information submitted. Based on my inquiry of the person or persons who manage the system, or those persons directly responsible for gathering the information submitted is, to the best of my knowledge and belief, true, accurate, and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fine and imprisonment for known violations.

Project Owner: \_\_\_\_\_

Authorized Representative: \_\_\_\_\_

Title: \_\_\_\_\_

Address: \_\_\_\_\_

Signature, Date: \_\_\_\_\_

As Project Owner, I have delegated the following individual to monitor Storm Water Prevention Plan (SWPPP) compliance:

Owner Representative: \_\_\_\_\_

Title: \_\_\_\_\_

Signature, Date: \_\_\_\_\_

Phone: \_\_\_\_\_

**STORM WATER POLLUTION PREVENTION PLAN**

**PROJECT NAME**

**Project Owner**

**Site Address**

**City, State Zip Code**

**CONTRACTOR'S CERTIFICATION and DELEGATION**

I certify under penalty of law, that I understand the terms and conditions of the National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP) that authorizes the storm water discharges associated with industrial activity from the construction site identified as part of this Certification. I understand that I am legally required under the Clean Water Act, to ensure compliance with the terms and conditions of NPDES storm water CGP and this Storm Water Pollution Prevention Plan (SWPPP).

I understand that I am fully responsible for all subcontractors who perform work activities on the construction site, to comply with all provisions and requirements of the NPDES storm water CGP and this SWPPP.

Contractor : \_\_\_\_\_

Authorized Representative: \_\_\_\_\_

Title: \_\_\_\_\_

Address: \_\_\_\_\_

Signature, Date: \_\_\_\_\_

As Contractor, I have delegated SWPPP compliance and inspection responsibilities to the following individual for the duration of construction activities for which this company is under contract with this project.

Contractor SWPPP Representative: \_\_\_\_\_

Title: \_\_\_\_\_

Signature, Date: \_\_\_\_\_

Phone: \_\_\_\_\_

**STORM WATER POLLUTION PREVENTION PLAN**

**PROJECT NAME**

**Project Owner**

**Site Address**

**City, State Zip Code**

**SUB-CONTRACTOR CERTIFICATION**

I certify under penalty of law, that I understand the terms and conditions of the National Pollutant Discharge Elimination System (NPDES) Construction General Permit (CGP) that authorizes the storm water discharges associated with industrial activity from the construction site identified as part of this Certification. I understand that I am legally required under the Clean Water Act, to ensure compliance with the terms and conditions of NPDES storm water CGP and this Storm Water Pollution Prevention Plan (SWPPP).

**Contractor:** \_\_\_\_\_

**Sub-Contractor:** \_\_\_\_\_

Authorized Representative: \_\_\_\_\_

Title: \_\_\_\_\_

Signature, Date: \_\_\_\_\_

Phone: \_\_\_\_\_

**Sub-Contractor:** \_\_\_\_\_

Authorized Representative: \_\_\_\_\_

Title: \_\_\_\_\_

Signature, Date: \_\_\_\_\_

Phone: \_\_\_\_\_

**Sub-Contractor:** \_\_\_\_\_

Authorized Representative: \_\_\_\_\_

Title: \_\_\_\_\_

Signature, Date: \_\_\_\_\_

Phone: \_\_\_\_\_

**STORM WATER POLLUTION PREVENTION PLAN**

**PROJECT NAME**

**Project Owner**

**Site Address**

**City, State Zip Code**

**PROFESSIONAL ENGINEER'S CERTIFICATION**

I certify this Storm Water Pollution Prevention Plan (SWPPP) has been prepared in accordance with good engineering practice and the Clean Water Act.

Company: \_\_\_\_\_

Professional Engineer: \_\_\_\_\_

Address: \_\_\_\_\_

Phone: \_\_\_\_\_

**P.E. Seal**

(Signed and Dated)

## **SECTION 2**

Storm Water Pollution Prevention Plan (SWPPP)

**STORM WATER POLLUTION PREVENTION PLAN**

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**PROJECT AND SITE DESCRIPTION:**

PROJECT NAME AND LOCATION

PROJECT NAME  
PROJECT LOCATION

Total Site Area: XXXX Acres      Estimated Disturbed Area: XXX Acres

OWNER'S NAME AND ADDRESS

Owner Name  
Address

DESCRIPTION

This project will consist of site construction to accommodate (describe project scope) Soil disturbing activities will primarily include:

MODIFY AS NECESSARY

1. Construction of temporary construction exit points
2. Construction of temporary sediment basin and storm water retention pond
3. Site grading and installation of material laydown area
4. Installation of storm sewer pipes, inlets and subsurface retention/detention pond
5. Construction of dry and wet utilities
6. Construction of site retaining walls
7. Construction of curb and gutter, drives, and parking areas
8. Construction of landscape irrigation system

The estimated time for completion of the construction project is XXX calendar days.

RUNOFF COEFFICIENT, SOILS, AND RAINFALL INFORMATION

The initial coefficient of runoff for the pre-construction site is "c" = 0.XX  
The current site consists of: (describe project site).

The post-construction coefficient of runoff for the site will be "c" = 0.XX  
The site is XXX acres of which XXX acres will be disturbed by construction activities.

Calculation of "c" value for post-construction site, site weighted average:  
 $c = \{(ac)(\text{"c"})+(ac)(\text{"c"})+(ac)(\text{"c"})\}/\text{total site acres} = 0.XX$

The site has soils, which are classified by the USDA Soil Conservation Service as ..... These soils are described as .....

The site is in ..... County, which receives a maximum of X to X inches of rainfall annually with the highest amounts of rainfall received in the months of \_\_\_\_\_ through \_\_\_\_\_.

## STORM WATER POLLUTION PREVENTION PLAN

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### NAME OF RECEIVING WATERS

Runoff from the project site is discharged into .....[Describe whether city storm drain, stream, river, etc. as well as ultimate receiving river (Arkansas River, ie.)]

### CONTROLS:

#### EROSION AND SEDIMENT CONTROLS

##### 1. Stabilization Practices

Stabilization practices for this site include:

- A. [Land clearing activities shall be done only in areas where earthwork will be performed and shall progress, as earthwork is needed.]
- B. [Frequent watering of disturbed areas to minimize dust during construction.]
- C. [Installation of interim Best Management Practices (BMPs) to reduce overland flow lengths].
- D. [Permanent or Temporary Seeding of disturbed areas when earthwork completed.]

##### 2. Structural Practices

Structural practices for this site include but are not limited to the following range of BMPs. Construction details of BMPs are included on the Temporary Erosion Control Sheets:

- A. [Inlet protection and outlet protection using silt fences, sand bags, etc.]
- B. [Perimeter protection using silt fences.]
- C. [Facility wide sediment basin.]
- D. [Stabilized construction exit points and sufficient staging area for construction materials.]
- E. [Containment of the on-site sanitation facility to prevent uncontrolled waste discharges during pumping and cleaning activities.]
- F. [Other structural BMPs installed and maintained by the Contractor, as warranted by site conditions.]

## **STORM WATER POLLUTION PREVENTION PLAN**

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### 3. Sequence of Major Activities

The Contractor will be responsible for implementing the following erosion control and storm water management control structures. All structural practices shall be maintained through the course of the construction and shall be sequenced according to activities in the field. The Contractor may designate these tasks to certain subcontractors as he sees fit, but the ultimate responsibility for implementing these controls and ensuring their proper functioning remains with the Contractor. Refer to TESCPS contained in this SWPPP for details. The order of activities will be as follows and shall be documented on the Record of Stabilization and Construction Activities Form:

- A. [Construct temporary construction exits].
- B. [Install perimeter silt fences and other BMPs].
- C. [Perform grading].
- D. [Frequent watering of the disturbed areas to minimize dust].
- E. [Disturbed areas of the site where construction activity has ceased for more than 14 days shall be stabilized].
- F. [Install BMPs at the locations of all grate inlets, curb inlets, and at the ends of all exposed storm sewer pipes].
- G. [Carry out final grading and gravel and/or asphalt placement].
- H. [Remove BMPs only after all paving is complete and exposed surfaces are stabilized].
- I. [Remove temporary construction exits].

## **STORM WATER POLLUTION PREVENTION PLAN**

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### **OTHER CONTROLS:**

Management of materials and practices, outside of soil disturbing activities, shall be the responsibility of the Contractor. Such activities shall include, but not be limited to, the items shown below.

1. Waste Disposal

[All waste materials will be collected and stored in securely lidded metal dumpsters rented from local waste haulers. The dumpster will meet all local and state solid waste management regulations. All waste and construction debris from the site will be deposited in the dumpsters. The dumpster will be emptied on a periodical basis. No construction waste materials will be buried onsite].

2. Sanitary Waste

[All sanitary waste will be collected from the portable units on a frequent, periodical basis by a licensed sanitary waste management contractor].

3. Concrete Waste From Concrete Trucks

[Excess concrete and concrete wash water shall be returned to the concrete plant or deposited at a designated containment area on site, constructed in a manner to prevent run-off from entering the street, storm water drainage systems or waterways. Wash water may not be deposited in streets, curbs, gutters, storm drains, or waterways].

4. Hazardous Substances and Hazardous Waste

[All hazardous waste materials will be disposed of in the manner specified by local or state regulation or by the manufacturer. The contractor's site personnel will be instructed in these practices and the contractor's Site Manager will be responsible for seeing that these practices are followed].

## **STORM WATER POLLUTION PREVENTION PLAN**

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### **MAINTENANCE/INSPECTION PROCEDURES:**

#### Erosion and Sediment Control and Stabilization Measures Maintenance and Inspection Practices

- A. The following inspection and maintenance practices will be used to maintain erosion and sediment controls and stabilization measures to be performed by the Contractor.
1. All control measures will be inspected at least every 14 days and within 24 hours following a 0.5 inches rainfall event.
  2. All measures will be maintained in good working order; if repairs are found to be necessary, they will be initiated within 24 hours of report.
  3. Built up sediment will be removed from silt fence when it has reached one-third the height of the fence.
  4. Silt fences will be inspected for depth of sediment, tears, etc., to see if the fabric is securely attached to the fence posts, and to see that the fence posts are securely in the ground.
  5. The sediment basin, if present, will be inspected for depth of sediment, and built up sediment will be removed when it reaches 10 percent of the design capacity.
  6. Temporary and permanent seeding and all other stabilization measures will be inspected for bare spots, washouts, and healthy growth.
  7. A maintenance inspection report will be made after each inspection. Copies of the Inspection Report Forms to be completed by the inspector are included in this SWPPP under SECTION 4.
  8. The Contractor will be responsible for selecting and training the individuals who will be responsible for these inspections, maintenance and repair activities, and filling out inspection and maintenance reports.
  9. Personnel selected for the inspection and maintenance responsibilities will receive training from the Contractor. Documentation of this personnel training will be kept in the Contractor's SWPPP Folder.
  10. Disturbed areas and materials storage areas will be inspected for evidence of or potential for pollutants entering storm water systems.
  11. Report to **U.S. Environmental Protection Agency** within 24 hours any noncompliance with the SWPPP that will endanger public health or the environment.

#### Inspection and Maintenance Report Forms

These Inspection Report Forms shall be readily accessible to governmental inspection officials and the Owner for review upon request. Copies of the reports shall be provided to any of these persons, upon request, via mail or facsimile transmission. Inspection and maintenance report forms are to be maintained by the permittee for three (3) years following the final stabilization of the site and the date on the Notice of Termination (NOT).

#### Other Record-Keeping Requirements

The Contractor shall provide copies of the completed forms and any reports filed with regulatory agencies if reportable quantities of hazardous materials are spilled.

## **STORM WATER POLLUTION PREVENTION PLAN**

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### **SUMMARY OF EROSION AND SEDIMENT CONTROL AND STABILIZATION MEASURES MAINTENANCE/INSPECTION PROCEDURES**

- All control measures will be inspected at least every 14 days and within 24 hours following a rainfall event of 0.5 inches.
- All measures will be maintained in good working order; if a repair is necessary, it will be initiated within 24 hours of report.
- Built-up sediment will be removed from silt fences when it has reached one-third the height of the fence.
- Silt fences will be inspected for depth of sediment, tears, to see if the fabric is securely attached to the fence posts, and to see that the fence posts are firmly in the ground.
- Sediment basins, if present, will be inspected for depth of sediment, and built-up sediment will be removed when it reaches 10% of the design capacity or at the end of the job.
- Diversion dikes, if present, will be inspected and any breaches promptly repaired.
- Temporary and permanent seeding and planting and other stabilization measures will be inspected for bare spots, washouts, and healthy growth.
- A maintenance inspection report will be made after each inspection. A copy of the Inspection Report Forms to be used is included in this SWPPP under SECTION 4.
- The Contractor will select the individuals who will be responsible for inspections, maintenance and repair activities, and filling out the inspection and maintenance reports.
- Personnel selected for inspection and maintenance responsibilities will receive training from the Contractor. They will be trained in all the inspection and maintenance practices necessary for keeping the erosion and sediment controls used onsite in good working order.
- Disturbed areas and materials storage areas will be inspected for evidence of or potential for pollutants entering storm water systems.
- Report to U.S. Environmental Protection Agency within 24 hours any noncompliance with the SWPPP that will endanger public health or the environment. Follow up with a written report within 5 days of the noncompliance event.

## STORM WATER POLLUTION PREVENTION PLAN

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### CONSTRUCTION/IMPLEMENTATION CHECKLIST

1. Maintain Records of Construction Activities, including:
  - Dates when major grading activities occur
  - Dates when construction activities temporarily cease on a portion of the site
  - Dates when construction activities permanently cease on a portion of the site
  - Dates when stabilization measures are initiated on the site
  - Dates of rainfall and the amount of rainfall
  - Dates and descriptions of the character and amount of any spills of hazardous materials
  - Records of reports filed with regulatory agencies if reportable quantities of hazardous materials spilled
2. Prepare Inspection Reports summarizing:
  - Name of inspector
  - Qualifications of inspector
  - Measures/areas inspected
  - Observed conditions
  - Changes necessary to the SWPPP
3. Report Releases of Reportable Quantities of Oil or Hazardous Materials (if they occur):
  - Notify National Response Center (1-800-424-8802) immediately
  - Notify the Kansas Department of Health and Environment.
  - Notify permitting authority in writing within 14 days
  - Modify the pollution prevention plan to include:
    - the date of release
    - circumstances leading to the release
    - steps taken to prevent reoccurrence of the release
4. Modify Pollution Prevention Plan as necessary to:
  - Comply with the minimum permit requirements when notified by **U.S. Environmental Protection Agency** or Kansas Dept. of Health and Environment that the plan does not comply
  - Address a change in design, construction operation, or maintenance, which has an effect on the potential for discharge of pollutants
  - Prevent reoccurrence of reportable quantity releases of a hazardous material or oil

## **STORM WATER POLLUTION PREVENTION PLAN**

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### **SPILL PREVENTION CONTROL AND COUNTERMEASURES PLAN (SPCC):**

#### **MATERIALS COVERED**

The following materials or substances with known hazardous properties are expected to be present onsite during construction:

Concrete	Cleaning solvents	Soil stabilization additives
Detergents	Petroleum based products	Concrete additives
Paints	Pesticides	Fertilizers
Paint solvents	Acids	

#### **MATERIAL MANAGEMENT PRACTICES**

The following are the material management practices that will be used to reduce the risk of spills or other accidental exposure of materials and substances to storm water runoff.

##### **1. Good Housekeeping**

The following good housekeeping practices will be followed onsite during the construction project.

- A. An effort will be made to store only enough products required to do the job.
- B. All materials stored onsite will be stored in a neat, orderly manner and, if possible, under a roof or other enclosure.
- C. Products will be kept in their original containers with the original manufacturer's label in legible condition.
- D. Substances will not be mixed with one another unless recommended by the manufacturer.
- E. Whenever possible, all of a product will be used up before disposing of the container.
- F. Manufacturer's recommendations for proper use and disposal will be followed.
- G. The Contractor will be responsible for daily inspections to ensure proper use and disposal of materials.
- H. If surplus product must be disposed of, manufacturer's or local/state/federal recommended methods for proper disposal will be followed.
- I. All of the product in a container will be used before the container is disposed of. All such containers will be triple-rinsed with water prior to disposal. The rinse water used in these containers will be disposed of in a manner in compliance with state and federal regulations and will not be allowed to mix with storm water discharges.

## **STORM WATER POLLUTION PREVENTION PLAN**

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### 2. Spill Prevention Practices

In addition to the good housekeeping, the following practices will be followed for spill prevention and cleanup.

- A. Manufacturer's recommended methods for spill cleanup will be clearly posted and site personnel will be trained regarding these procedures and the location of the information and cleanup supplies.
- B. Materials and equipment necessary for spill cleanup will be kept in the material storage area onsite in spill control and containment kit (containing, for example, absorbent such as kitty litter or sawdust, acid neutralizing powder, brooms, dust pans, mops, rags, gloves, goggles, plastic and metal trash containers, etc.).
- C. All spills will be cleaned up immediately after discovery.
- D. The spill area will be kept well ventilated and personnel will wear appropriate protective clothing to prevent injury from contact with the hazardous substances.

### **CONTROL OF ALLOWABLE NON-STORMWATER DISCHARGES:**

Certain types of discharges are allowable under the U.S. Environmental Protection Agency General Permit for Construction Activity, and it is the intent of this SWPPP to allow such discharges. These types of discharges will be allowed under the conditions that no pollutants will be allowed to come in contact with the water prior to or after its discharge. The control measures, which have been outlined previously in this SWPPP, will be strictly followed to ensure that no contamination of these non-storm water discharges takes place. The following allowable non-storm water discharges that may occur from the job site include:

- A. Discharges from fire fighting activities.
- B. Fire hydrant flushing (see note below).
- C. Waters used to wash vehicles or control dust in order to minimize offsite sediment tracking.
- D. Potable water sources such as waterline flushing (see note below), irrigation drainage from watering vegetation, routine exterior building washdown (without detergents present). (See Note below)
- E. Pavement wash waters where spills or leaks of hazardous materials have not occurred or detergents have not been used.
- F. Springs and other uncontaminated groundwater, including dewatering ground water infiltration.
- G. Foundation or footing drains where no contamination with process materials such as solvents is present

## **SECTION 3**

Temporary Erosion and Sedimentation Control Plan Sheets (TESCPS)

**INSERT EROSION AND SEDIMENTATION CONTROL  
PLANS AND SPECIFICATIONS**

## **SECTION 4**

Inspection Report Form  
Record of Stabilization and Major Activities Form  
SWPPP Modification Report Form  
Project Rainfall Log Form

**STORM WATER POLLUTION PREVENTION PLAN**

**PROJECT NAME**

**Project Owner**

**Site Address**

**City, State Zip Code**

**INSPECTION REPORT FORM**

Inspection Date: \_\_\_\_\_

Inspector: \_\_\_\_\_

Does Inspector have Required Training?    Y    N

Date & Amount of Last Rainfall: \_\_\_\_\_

**Condition of:**

Construction Entrances:	Acceptable	Not Acceptable	N/A
Drop Inlet Protection:	Acceptable	Not Acceptable	N/A
Curb Inlet Protection:	Acceptable	Not Acceptable	N/A
Culvert Inlet Protection:	Acceptable	Not Acceptable	N/A
Outlet Stabilization:	Acceptable	Not Acceptable	N/A
Diversions & Slope Drains:	Acceptable	Not Acceptable	N/A
Stream Crossings:	Acceptable	Not Acceptable	N/A
Slope Breaks:	Acceptable	Not Acceptable	N/A
Sediment Basins:	Acceptable	Not Acceptable	N/A
Sediment Traps:	Acceptable	Not Acceptable	N/A
Check Dams:	Acceptable	Not Acceptable	N/A
Erosion Control Blankets:	Acceptable	Not Acceptable	N/A
Temporary Seeding:	Acceptable	Not Acceptable	N/A
Permanent Seeding:	Acceptable	Not Acceptable	N/A
Surface Roughening:	Acceptable	Not Acceptable	N/A
Dust Control:	Acceptable	Not Acceptable	N/A

**Maintenance Required for Deficiencies Identified:**

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**To Be Completed By:** \_\_\_\_\_

**On or Before:** \_\_\_\_\_, 20\_\_

These reports shall be kept on file as part of the Storm Water Pollution Prevention Plan for at least three (3) years from the date of completion and submission of the Final Stabilization Certification/Termination Checklist and Notice of Termination (NOT). A copy of the SWPPP shall be available at all times during construction, on the construction site, or pre-approved off-site location.

**STORMWATER POLLUTION PREVENTION PLAN**

**PROJECT NAME**

**Project Owner**

**Site Address**

**City, State Zip Code**

**RECORD OF STABILIZATION AND MAJOR ACTIVITIES FORM**

A record of dates when major grading activities occur, when construction activities temporarily or permanently cease on a portion of the site, and when stabilization measures are initiated shall be maintained until final site stabilization is achieved and the Notice of Termination is filed.

**MAJOR GRADING, CONSTRUCTION, OR STABILIZATION ACTIVITIES**

Description of Activity: \_\_\_\_\_

Location: \_\_\_\_\_

Contractor: \_\_\_\_\_

Begin Date: \_\_\_\_\_ End Date: \_\_\_\_\_

Stabilization Method: \_\_\_\_\_ Application Date: \_\_\_\_\_

Description of Activity: \_\_\_\_\_

Location: \_\_\_\_\_

Contractor: \_\_\_\_\_

Begin Date: \_\_\_\_\_ End Date: \_\_\_\_\_

Stabilization Method: \_\_\_\_\_ Application Date: \_\_\_\_\_

Description of Activity: \_\_\_\_\_

Location: \_\_\_\_\_

Contractor: \_\_\_\_\_

Begin Date: \_\_\_\_\_ End Date: \_\_\_\_\_

Stabilization Method: \_\_\_\_\_ Application Date: \_\_\_\_\_

Description of Activity: \_\_\_\_\_

Location: \_\_\_\_\_

Contractor: \_\_\_\_\_

Begin Date: \_\_\_\_\_ End Date: \_\_\_\_\_

Stabilization Method: \_\_\_\_\_ Application Date: \_\_\_\_\_

Description of Activity: \_\_\_\_\_

Location: \_\_\_\_\_

Contractor: \_\_\_\_\_

Begin Date: \_\_\_\_\_ End Date: \_\_\_\_\_

Stabilization Method: \_\_\_\_\_ Application Date: \_\_\_\_\_

**STORMWATER POLLUTION PREVENTION PLAN**

**PROJECT NAME**

**Project Owner**

**Site Address**

**City, State Zip Code**

**SWPPP MODIFICATION REPORT FORM**

Date Submitted: \_\_\_\_\_

<b>Submit To:</b> CITY City Engineer
<b>Address:</b>
<b>Telephone:</b>
<b>Facsimile:</b>
<b>Sent Via:</b> <input type="checkbox"/> Facsimile <input type="checkbox"/> Courier <input type="checkbox"/> US Mail

Authorized Author: \_\_\_\_\_ Title: \_\_\_\_\_

Company: \_\_\_\_\_ Project Role: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Modifications Required to the STORMWATER POLLUTION PREVENTION PLAN: \_\_\_\_\_

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Reasons for Modifications: \_\_\_\_\_

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## **SECTION 5**

Final Stabilization Certification Checklist and Contractor's Certification  
Notice of Termination (NOT)

**STORMWATER POLLUTION PREVENTION PLAN**

**PROJECT NAME**

**Project Owner**

**Site Address**

**City, State Zip Code**

**FINAL STABILIZATION CERTIFICATION CHECKLIST  
AND CONTRACTOR'S CERTIFICATION**

- All soil disturbing activities are complete.
- Temporary Erosion and Sediment Control Measures have been removed or will be removed at the appropriate time.
- All areas of the Construction Site not otherwise covered by a permanent pavement or structure have been stabilized with a uniform perennial vegetative cover with a density of 75% or equivalent measures have been employed.

**CONTRACTOR'S CERTIFICATION:**

“I certify under penalty of law that all storm water discharges associated with industrial activity from the identified project that are authorized by NPDES General Permit have been eliminated and that all disturbed areas and soils at the construction site have achieved Final Stabilization and all temporary erosion and sediment control measures have been removed or will be removed at the appropriate time.”

Printed Name: \_\_\_\_\_

Signature: \_\_\_\_\_ Date: \_\_\_\_\_

Title: \_\_\_\_\_

Company Name: \_\_\_\_\_

**Insert NOTICE OF TERMINATION (NOT) Submitted to KDHE.**

**NOT along with instructions can be found on the web at:**

**<http://www.kdheks.gov/stormwater/>**

**Click on “Construction Stormwater Program”**

## **SECTION 6**

Attachments

Record Keeping Documentation of the SWPP

# **CITY ORDINANCE**