KANSAS DEPARTMENT OF TRANSPORTATION

TEMPORARY EROSION CONTROL MANUAL

SECTION 5 SEDIMENT STORAGE BASINS

Version	Version Date	Notes
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Kansas Department of Transportation

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SECTION 5 SEDIMENT STORAGE BASINS

SEDIMENT BASIN

Purpose and Operation

A sediment basin is a barrier, embankment, or excavated area with a controlled stormwater release structure formed by constructing an embankment of compacted earth fill to collect runoff before it discharges from a project site. This practice applies where erosion control measures are insufficient to prevent offsite sedimentation. In addition, sediment basins are required for each drainage area with 10 or more acres disturbed at one time. The purpose of a sediment basin is to detain sediment-laden runoff from disturbed areas in "wet" or "dry" storage long enough for most of the sediment to settle out.

To view KDOTs Standard Drawings for sediment basins select the following link which shows the detailed drawings with relevant design information: Landscape Standard LA 852H. This file can also be found on KDOTs KART webpage with a free account.

For further specifications regarding the sediment basin refer to KDOTs Standard Specifications Section 902 – Temporary Erosion and Sediment Control. See additional Special Provisions for KDOTs Standard Specifications (Division 900).

Design

Design Considerations

Prior to the start of construction, sediment basins should be designed by a registered design professional. Plans and specifications should be referred to by field personnel throughout the construction process. The sediment basin should be built according to planned grades and dimensions.

Placement

The best location to construct a sediment basin is in a low area or natural drainage way. These basins should not be in protected waterways. The location of the basin should not be in an area where it can pose a threat to public safety. The placement of the basin should also not be where public roads or utilities would be disturbed if ponding were to occur.

Embankment

The maximum embankment height from the downstream tow to crest is 15'. The minimum top width is 6'; maximum slope of embankment face is 2.5:1. The embankment crest elevation will include 5% of the embankment height for settling. The embankment shall have cover approved for steep slopes. The fill material of the embankment shall be stable moist soil.

Volume

The required volume for a sediment basin is 3,600 cubic feet per acre of contributing drainage area. This specific drainage area can include offsite areas that flow into the basin unless the offsite flows are diverted from the disturbed area. The storage volume is calculated up to the rim elevation of the principal spillway overflow riser.

- A portion of the total volume is allotted for sediment storage. The General Permit restricts the sediment storage volume to 20% of the total.

According to the KDHE CSGP Definitions and Acronyms package, alternative storage volumes may also be approved for areas in Western Kansas where the 2-year, 30-minute rainfall event is less than 1.3".

If this design is approved the minimum runoff coefficient for disturbed areas shall be 0.77 and undisturbed area runoff coefficients must be documented and justified.

Surface Area

The surface area of the primary spillway of the sediment basin needs to meet at least one of the following requirements:

- The minimum surface area shall be 1,000 square feet per acre of drainage area, or
- Flow length from the major inlet to primary spillway shall be twice the average top width of the pond, or where A is the surface area at the top of the riser and L is the distance from entry of the largest flow volume to the riser. The flow length may be increased by use of wire backed silt fence or other baffle. If baffles are required, they shall be arranged to not interfere with silt removal.

$$L \geq (2*A)^{0.5}$$

Skimmer Dewatering Device

The skimmer dewatering device shall be included in the design and will need to be sized to provide a drawdown time of 2 to 5 days. This device serves to release cleaner water from the surface rather than the bottom of a sedimentation basin. The dewatering device also occurs at a constant rate.

To view KDOTs Standard Drawings for the skimmer dewatering device, select the following link which shows the detailed drawings with relevant design information: Landscape Standard LA 852H. This file can also be found on KDOTs KART webpage with a free account.

- All PVC pipes used for this device are to be schedule 40.
- HDPE flexible drainpipes are to be attached to the pond outlet structure with water-tight connections.
- The orifice shall be sized to provide a drawdown time of 2 to 5 days and will need to be approved by the Engineer or Designer.
- Other skimmer designs may be used that also dewater from the surface at a constant rate and they must be approved by the Engineer or Designer.

Principal Spillway

The principal spillway shall consist of a conduit, riser pipe with a trash rack, and an anti-flotation block. The conduit shall go under the embankment and exit at a stabilized outlet. Refer to the drawings linked above to see a standard configuration of the principal spillway for a sediment basin. The riser shall be held in place with an anchor or large foundation to avoid the device from becoming buoyant. Anti-seep devices are also recommended to be used on the principal spillway conduit. One device option includes anti-seep collars around the outlet conduit, and they should project 1'-3' from the pipe. Engineer or Designer to specify what type of anti-seep device to be used.

Emergency Spillway

The emergency spillway shall be constructed in a location that will not cause erosion to the embankment. It shall be trapezoidal in shape and have side slopes that are 3:1 or steeper. It should also be level and at least 20' long with a minimum width of 10'.

Erosion Control

Erosion control measures also need to be followed for the construction of the sediment basin. It is important to vegetate and stabilize the area as soon as construction is complete. Refer to the

Stabilization Section of this manual for guidance on different stabilization measures. Use temporary diversion structures to prevent surface water from running into disturbed areas. Sediment-laden runoff should be diverted to the upper end of the sediment pool to improve trap effectiveness.

Installation

Proper Installation Method

- Follow the appropriate placement criteria that were mentioned in the previous section.
- Locate all the utilities on site where construction is occurring.
- Place any fencing or warning signs around the constructed area if trespassing is going to be likely.
- Remove any existing debris and excavate the basin. Save the fill excavated to use for other purposes.
- For the principal spillway, place the pipe and riser on a secure, flat ground and then surround the pipe with a 4" layer of fill soil and compact it to match the density of the foundation soil. This keeps the pipe secure. The lower half of the riser should then be perforated with ½" diameter holes spaced 3" apart. Embed the riser at least 12" into the concrete anchor or other foundation structure used to keep the device from becoming buoyant. Surround the riser with 2' of clean, uniformly graded stone. Place a trash rack at the opening of the riser. The type and size are to be dependent on the design and the Engineer or Designer will need to specify. Install a riprap apron at the pipe outlet that is at least 5' wide and 10' long to a stable grade.
- For the embankment, first scarify the foundation before placing any fill. The fill must be clean and should not contain debris. The most permeable fill is to be placed on the downstream section of the embankment and the least permeable fill in the center of the embankment. Compact the fill material to be 6"-8" continuous layers over the length of the embankment. Protect the spillway barrier with 2' of fill that has been compacted before traversing over with equipment. Construct and compact the embankment to an elevation 5% above the design height to allow for settling to occur. After construction place a reference stake at the sediment clean out elevation.
- For the emergency spillway, construct this structure in undisturbed soil around one end of the embankment, and locate it so that any flow will return to the receiving channel without any damage to the embankment. Stabilize the spillway as soon as grading is complete with vegetation or erosion control blankets. Install paving material to finished grade if the spillway is not to be vegetated.
- Once the sediment basin is installed verify that the basin drains between storm events.
- The basin shall remain until less than 10 acres remain of sediment basin contributing area needing final stabilization within the drainage basin. Whenever the basin is no longer needed, remove the basin. This is done by draining any water, removing the sediment in the basin, and smoothing the site to blend in with the surrounding area. After this has occurred then stabilize the area.

List of common placement/installation mistakes to avoid

- Do not construct the sediment basin in an area that serves as a high point. The sediment basin should be located in an area that is easily accessed for maintenance purposes.
- Attach an anchor or foundation to the riser to reduce flotation.
- Do not make the principal spillway too small or this could result in an increased amount of erosion at the emergency spillway.

- Do not undersize the basin or place the spillways too high that could result in overtopping.
- Do not make the slopes of the embankment too steep or it could result in slumping.
- Apply proper erosion control measures to the sediment basin during construction.

Inspection/Maintenance

A sediment basin should be inspected at least once within every 7-day inspection monitoring period. The sediment basin should also be inspected after each storm event. The following is a general list of questions that should be addressed during each inspection:

- Is the pipe failing along the conduit?

This is due to improper compaction, omission of an anti-seep collar, leaking of pipe joints, or use of unsuitable soil. To fix this, identify the problem and repair the embankment using proper construction methods and materials.

- Are the spillway or embankment slopes eroding?

This is most likely due to inadequate vegetation or improper grading or sloping. To fix this issue, repair by using proper grades and slopes or establish adequate vegetation to reduce erosion.

- Is the riser blocked and not allowing water to enter?

This problem is most likely due to the riser being blocked with debris. To fix this problem clean out the debris and confirm a trash rack is installed to filter debris from entering the riser.

- Is the sediment basin overtopping?

This overtopping is most likely due the elevation of the principal and emergency spillway being too high compared to the top of embankment elevation. To fix this, re-evaluate the spillway design and repair erosion damage. Consider re-sizing the sediment basin to have a larger storage capacity.

- Does the sediment basin water level seem to be too high or look dirty?

This problem could be due to gravel clogging the drainage system. To fix this problem, clean out the dewatering system regularly and after major storms.

- Does the emergency spillway seem to be used often and have extensive erosion?

This issue is due to the principal spillway being too small and causing the emergency spillway to be used in excess. Since this can also cause increased erosion potential, the solution should be to install a larger principal spillway or to investigate some type of supplemental spillway.

- Does the embankment look to be slumped or have settled too much?

This problem could be due to inadequate compaction or not using suitable fill soil. To fix this problem, add compacted fill material that is without debris to the embankment.

- Does there appear to be a slumping failure on slopes?

This is most likely due to the slopes being too steep. To fix this, flatten the slopes and verify they do not exceed the maximum slope of 2.5:1 on the embankment.

- Is there severe erosion below the principal spillway?

This problem is likely due to there not being adequate outlet protection. To fix this, install outlet protection like rip rap into place.

- Is maintenance to the sediment basin becoming difficult and costly?

This is most likely due to the basin not being adequately placed in an area that is easily accessible. Depending on the scope of the project and the site, consider relocating the basin or improving access to the site.

- Does the storage capacity seem to become inadequate over time?

This problem is most likely caused by the sediment not being properly removed from the sediment basin. To fix this issue, remove accumulated sediment more frequently and after major storms. Sediment also needs to be removed and properly disposed of whenever it accumulates to ½ of the design volume.

Please refer to the project specific SWP2, Contract Documents, and detailed drawings for additional inspection and maintenance criteria.