STORMWATER POLLUTION PREVENTION PRACTICES DURING CONSTRUCTION FOR INSPECTORS

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GOAL

To train municipal personnel inspecting stormwater pollution prevention requirements at construction sites using consistent inspection guidelines

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COURSE OUTLINE

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- Erosion & Sedimentation Control Theory
- Impacts of Erosion and Sedimentation
- Inspection Types
- Inspection Process
- Common BMPs and What to Look For:
  - Stabilized Construction Exit
  - Erosion Control Blankets
  - Filter Tubes
  - Silt Fence
  - Inlet Protection
  - Stone Outlet Sediment Traps
  - Sediment Basins
  - Material & Waste BMPs

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ACRONYMS

- **BMP –** Best Management Practice
- **CGP –** Construction General Permit (TXR150000)
- **CSN_{SM} –** Small Construction Site Notice
- **CSN_{LG} –** Large Construction Site Notice
- **EPA –** Environmental Protection Agency
- **MS4 –** Municipally Separate Storm Sewer System
- **NOI –** Notice of Intent
- **NOT –** Notice of Termination
- **NPDES –** National Pollutant Discharge Elimination System
- **SWPPP (aka SW3P, SWP3) –** Storm Water Pollution Prevention Plan
- **TCEQ –** Texas Commission on Environmental Quality
- **TPDES –** Texas Pollution Discharge Elimination System
- **TXR150000 –** General Permit to Discharge Under the TPDES (AKA the CGP)
- **TXR15xxxx –** TCEQ authorization number issued to primary operators with an NOI on a project

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EROSION AND SEDIMENTATION: A THREE-PART PROCESS

1. IMPACT – Erosion is the wearing away of the soil by forces such as water and wind.
2. TRANSPORT – Surface flow or wind carries loose soil particles away.
3. DEPOSITION – Sedimentation occurs when the velocity of wind or water slows to allow eroded material to settle out.

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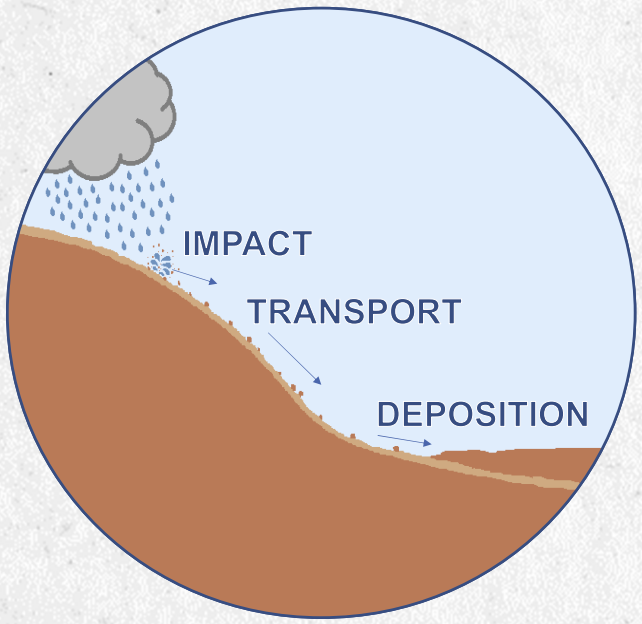

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IMPACTS OF EROSION AND SEDIMENTATION

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- Suspended solids from erosion are the largest source of pollutants in waterways and have two types of impacts…
  - Economic
  - Environmental
- Erosion and sedimentation not only have immediate impacts near the site, but they impact stream hydraulics, damage to water resources and water quality downstream.

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IMPACTS OF EROSION AND SEDIMENTATION

- Additional costs for off-site sedimentation cleanup

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IMPACTS OF EROSION AND SEDIMENTATION

- Property damage and local flooding due to improper BMP

8

IMPACTS OF EROSION AND SEDIMENTATION

- Additional costs for infrastructure repair or replacement

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INSPECTION

Types of construction site inspections related to stormwater:

- SWPPP required inspections
- MS4 inspections

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SWPPP INSPECTIONS

- Operator(s) must provide qualified inspector
  - Knowledge of Construction General Permit
  - Familiar with construction site
  - Knowledge of SWPPP for the site
- Qualified inspector must inspect the following areas:
  - Disturbed areas that aren't finally stabilized
  - Discharge locations
  - Materials storage areas
  - Erosion and sediment control measures and structural controls
  - Vehicle entrances and exits

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https://www.epa.gov/npdes/construction-inspection-training-course 11

SWPPP INSPECTIONS

- Frequency specified in SWPPP
  - At minimum, once every 14 calendar days and within 24 hours after a storm of 0.5 inches or greater, or …
  - Once every seven calendar days, regardless of rainfall
  - May temporarily suspend or modify the inspection during adverse conditions if documented in accordance with the CGM
  - Daily inspection and documentation of dewatering operations and BMPs associated with these operations
- SWPPP modification
  - If inspection finds deficiencies, modify SWPPP within seven days

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SWPPP INSPECTIONS

- Report contents
  - Name of inspector
  - Date of inspection
  - Locations of sediment or pollutant discharges
  - Locations of BMPs that need maintenance
  - Locations of where additional BMPs are needed
  - Operator certification when report does not identify non-compliance

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MS4 INSPECTIONS: INSPECTOR RESPONSIBILITY

- Assess site conditions and understand the developer's erosion & sediment control plan and SWPPP
- Possess technical competency to determine if BMPs are properly installed and effective for the site conditions
- Check that BMPs are properly maintained
- Enforce all applicable local (MS4) ordinances
- Take appropriate enforcement actions against violators, including referral to TCEQ in accordance with local (MS4) procedures, if necessary

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MS4 INSPECTIONS: INSPECTOR RESPONSIBILITY

- Determine if the SWPPP postings are correct and in place.
- Determine if the SWPPP is being kept up to date as site conditions change and deficiencies are identified
- Determine if the SWPPP inspections are being done
- Advise TPDES permittees of identified deficiencies related to compliance with the Construction General Permit

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MS4 INSPECTOR CHECKLIST

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Pre-construction meeting or initial on site meeting with owner and contractor(s)

- Provide contact information for all parties
- Provide overview of the MS4 requirements, inspection process and enforcement procedures
- Review the site erosion and sedimentation control plan and the SWPPP (If one is required)
- Discuss BMP phasing, schedules and details
- Contractor's schedule, means and methods
- Potential pollution sources and issues
- Process for any proposed changes or revisions

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MS4 INSPECTOR CHECKLIST

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Conduct comprehensive evaluation and observe site conditions at **initial inspection**:

- Determine if SWPPP postings CSN_{SM} or CSN_{LG} are in place.
- Determine if good housekeeping practices are being followed
- Determine if the SWPPP is readily accessible on site and is being kept up to date. SWPPPs can be stored electronically as long as they are readily available to the inspector on site.
- Site limits and disturbed area
- Existing natural features to be protected
- Existing and proposed site drainage patterns
- Review the installation of initial phase BMPs
- Expected short- and long-term weather conditions

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MS4 INSPECTOR CHECKLIST

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Observe overall conditions during **follow-up inspections**:

- Corrections requested in last report complete
- SWPPP postings CSN_{SM} or CSN_{LG} are in place.
- Good housekeeping practices being followed
- SWPPP on site and is it up to date
- Existing natural features to be protected
- Limits of disturbed land area and any off-site sedimentation
- SWPPP schedule status and plan being followed
- Installed BMPs, particularly at critical discharge locations from site
- BMPs maintained and revised per the SWPPP
- SWPPP inspections performed and certified
- Expected short-term weather conditions
- Notify all necessary contacts of any shortcomings, necessary maintenance or violations

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MS4 INSPECTOR CHECKLIST

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Miscellaneous items:

- Conduct inspection during and immediately following significant rain event to allow inspector to ID ineffective erosion/sedimentation controls
- Conduct intermediate inspection between rain events to allow inspector to observe maintenance effort
- Work with operator's site representative, and initiate enforcement actions if necessary
- Continue regular inspections following construction until site is permanently stabilized, and temporary BMPs measures and accumulated sediment are removed

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CONSTRUCTION GENERAL PERMIT: TERMINATING COVERAGE

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Large Construction Activities: Submit Notice of Termination (NOT) to TCEQ when:

- Final stabilization of site is achieved (including removal of temporary BMPs), or …
- Transfer of operation control has occurred (i.e. a new operator with permit coverage has control)

Note: Send copy of NOT to any MS4 receiving discharge.

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CONSTRUCTION GENERAL PERMIT: TERMINATING COVERAGE

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Small Construction Activities: Terminate by removing small Construction Site Notice when:

- Final stabilization of site is achieved (including removal of temporary BMPs), or …
- Transfer of operation control has occurred (i.e. a new operator with permit coverage has control)

Note: Send copy of completed small Construction Site Notice to any MS4 receiving discharge.

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EVALUATING TEMPORARY BMPS

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- Are they effective in trapping sediment?
- Can they be maintained during construction?
- Do they allow safe overflow of a major storm event?
- Do they drain completely in 48 to 96 hours after a rain event?

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STABILIZED CONSTRUCTION EXIT

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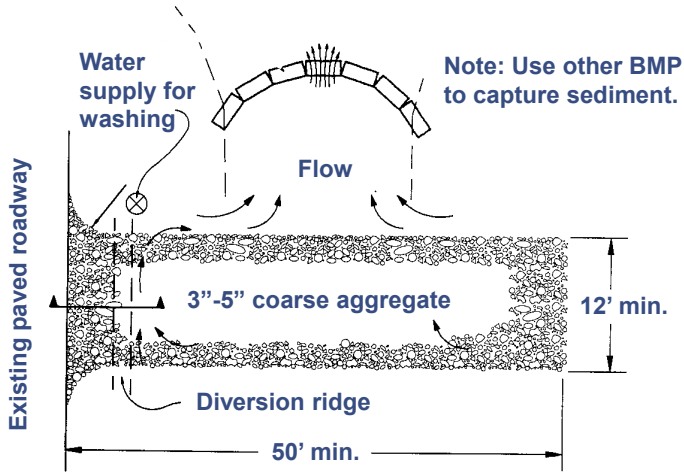
STABILIZED CONSTRUCTION EXIT



PLAN

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STABILIZED CONSTRUCTION EXIT

SECTION

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INSPECTIONS: STABILIZED CONSTRUCTION EXIT

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Initial Inspection

- Entrance is placed at location specified by plan or as needed, according to site conditions.
- Crushed rocks or recycled concrete meet minimum 3- to 5-inch-diameter requirements and are placed on filter fabric.
- Entrance meets minimum and site-specific length, width and 12-inch thickness requirements.

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INSPECTIONS: STABILIZED CONSTRUCTION EXIT

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Follow-up Inspection

- Look for signs of off-site sediments on paved areas. Tracked sediments need to be removed. Identify the reason. Is the construction entrance serving its intended purpose at the location?
- Provide a new dressing of rock/concrete when gaps between rock/concrete are filled with sediment or rock/concrete is crushed to less than 3 inches in diameter.

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STABILIZED CONSTRUCTION EXIT - ISSUES

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STABILIZED CONSTRUCTION EXIT - ISSUES

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STABILIZED CONSTRUCTION EXIT - ISSUES

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EROSION CONTROL BLANKETS

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INSPECTIONS: EROSION CONTROL BLANKET

Initial Inspection

- All rocks, dirt clods, stumps, roots, trash and obstructions are removed prior to installation.
- The erosion control blanket is the type and class specified on the SWPPP.
- Installation and anchoring conforms to the details shown on the SWPPP.

Follow-up Inspection

- Blankets are checked for uniform contact with the soil, security of the lap joints and flushness of the staples with the ground.

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EROSION CONTROL BLANKET - ISSUES

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EROSION CONTROL BLANKET - ISSUES

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EROSION CONTROL BLANKET - DISCUSSION

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FILTER TUBES - PERIMETER

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INSPECTIONS: FILTER TUBES

Initial Inspection

- Filter tube materials meet the specifications on the plans and SWPPP.
- Filter tube diameter meets specifications on plans and SWPPP.
- Tubes are typically installed along contour and receives only sheet flow.
- Ends of filter tube are turned upslope such that runoff does not flow around the tube.
- Ensure that there are no gaps under the tubes, at joint overlaps and around the ends of tubes that would allow sediment laden runoff to not be trapped

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INSPECTIONS: FILTER TUBES

Follow-up Inspections

- Observe signs of sedimentation downstream of the filter tube locations
- Observe signs of tube dislocation or rills developing under the tube due to concentrated flows
- Remove silt when it reaches half the height of the filter tube
- Repeated clogging of the filter tube may require repeated replacement or the installation of a different type of BMP.

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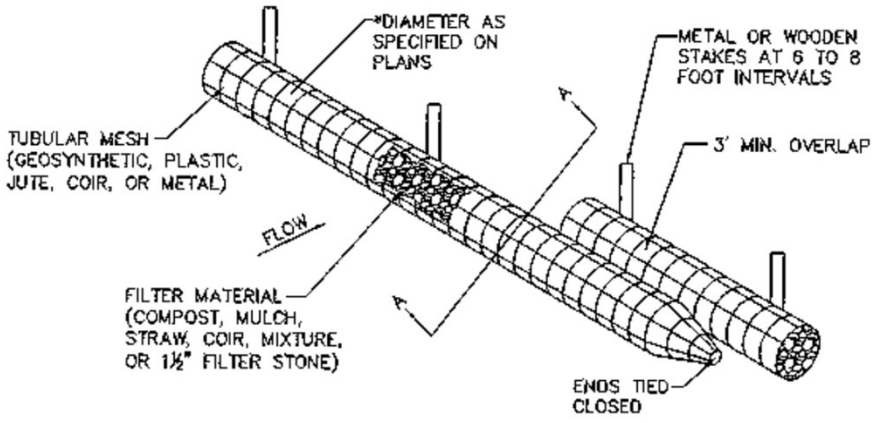
FILTER TUBES - PERIMETER



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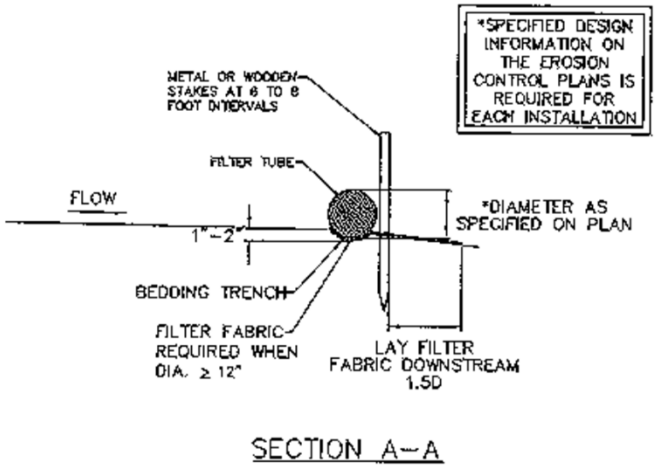
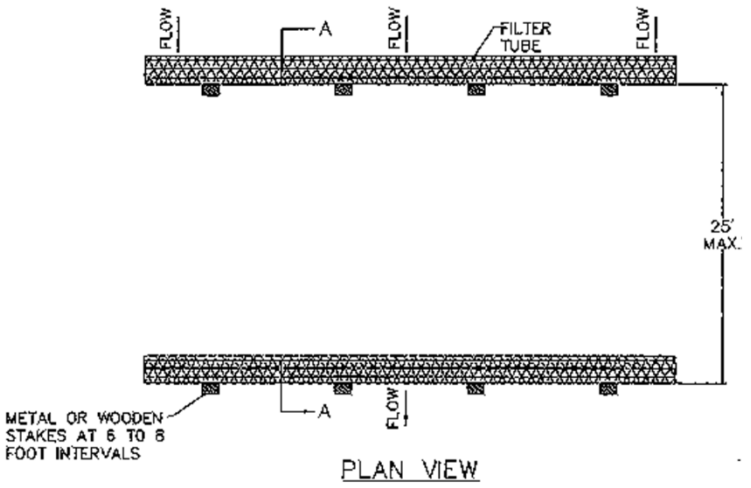
FILTER TUBES - PERIMETER



FILTER TUBES – SLOPE PROTECTION

FILTER TUBES – SLOPE PROTECTION



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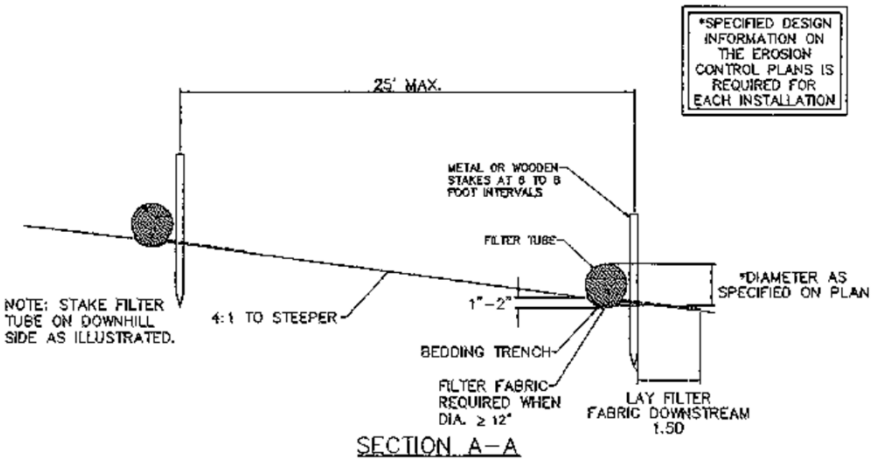
FILTER TUBES – SLOPE PROTECTION



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SILT FENCE

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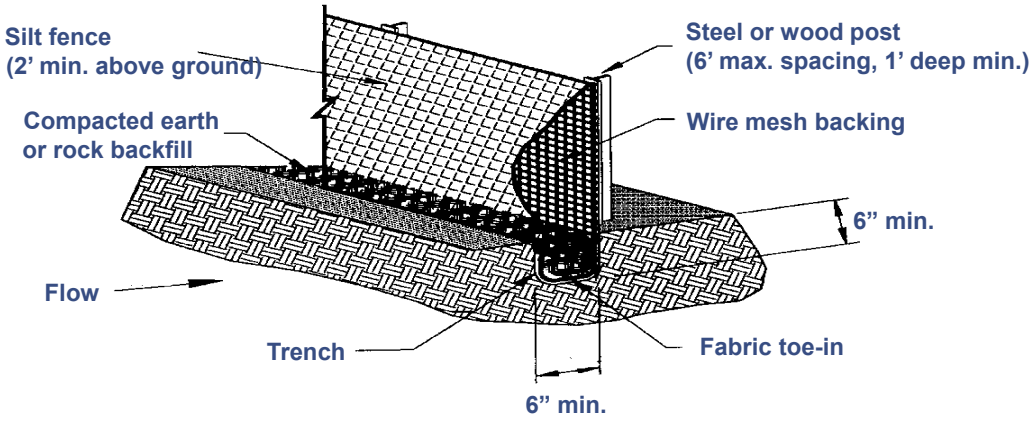
SILT FENCE



ISOMETRIC PLAN

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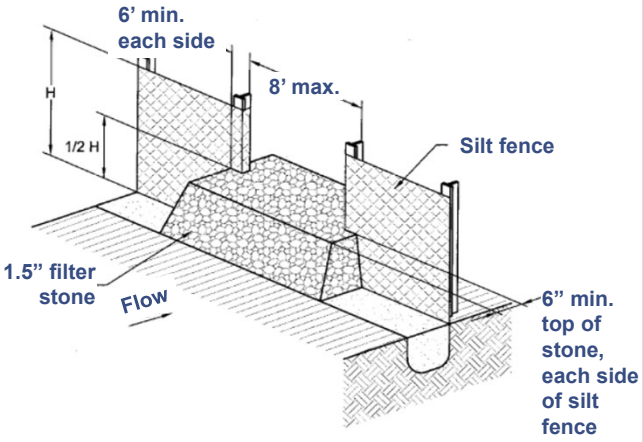
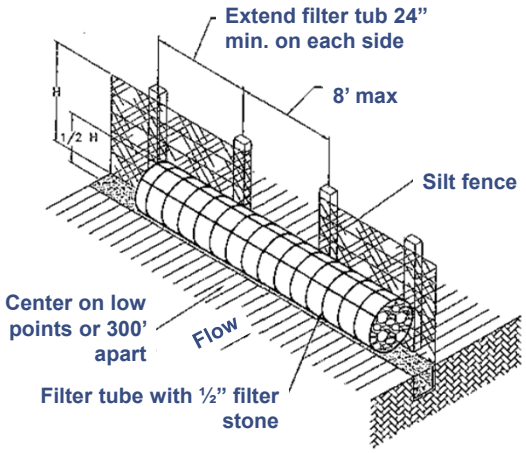
SILT FENCE





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STONE OVERFLOW (AT LOW POINTS)

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INSPECTIONS: SILT FENCE

Initial Inspection

Ensure silt fence …

- Meets stated technical specifications
- Fabric is secured and supported by posts
- Fabric is embedded in trench to prevent any bypass of runoff under the silt fence
- Is placed on contour to receive only sheet flow as specified by the SWPPP
- Fabric at the ends is turned upslope such that runoff does not flow around silt fence

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INSPECTIONS: SILT FENCE

Follow-up Inspection

- Observe signs of sedimentation downstream of the silt fence.
- Ensure through inspection that the silt fence remains secured and imbedded with no gaps.
- Clean or replace silt fence fabric that is clogged with sediment.
- Remove silt when it reaches half the height of the fabric.

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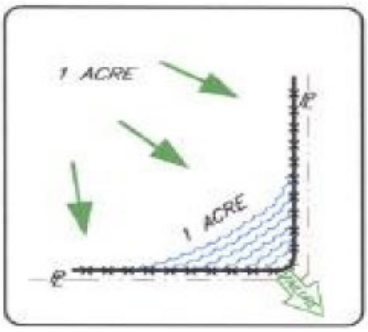
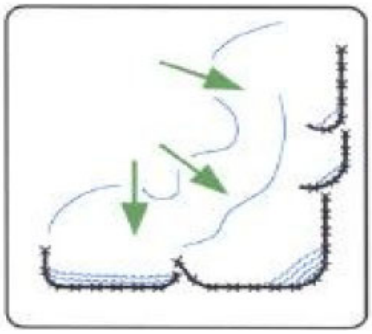
SILT FENCE - DISCUSSION





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SILT FENCE - ISSUES

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SILT FENCE - ISSUES

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SILT FENCE - ISSUES

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SILT FENCE - DISCUSSION

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INLET PROTECTION

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- There are 5 types of storm inlets:
  - Curb Inlets
  - Grate Inlets
  - Combination Inlets
  - Area Inlets
  - Pipe Inlets (Culverts)
- Inlet protection is used in paved or unpaved areas.
- If used, inlet protection BMPs must provide:
  - Effective sedimentation control
  - Allow removal of collected sediment/debris without loss of material into the pipe
  - Allow safe overflow or bypass of major storm events without BMP damage

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INLET PROTECTION TYPES SUMMARY

INLET TYPE	PAVED AREAS	UNPAVED AREAS
CURB INLET	Filter Fabric Filter Tubes	N/A
GRATE INLET	Filter Fabric Filter Tubes	Filter Fabric Filter Tubes Over Excavated
COMBINATION INLET	Filter Tubes	N/A
AREA INLET	Filter Fabric Filter Tubes	Filter Fabric Filter Tubes Over Excavated
PIPE INLET	Filter Tubes Stone Outlet Sediment Trap	Filter Tubes Stone Outlet Sediment Trap

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INLET PROTECTION ISSUES

- **HOW THEY WORK**
  - They slow flow velocity to allow sediment to settle
  - They pond water if they're working properly.
  - Where will the water go if the BMP clogs?
- **SECONDARY BMPs**
- **NEW CONSTRUCTION vs RE-HAB PROJECTS**
- **PHASED PROTECTION DURING INSTALLATION**
- **AT GRADE vs LOW POINT INSTALLATIONS**
- **PAVED vs UN-PAVED INSTALLATIONS**

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INLET PROTECTION - CURB

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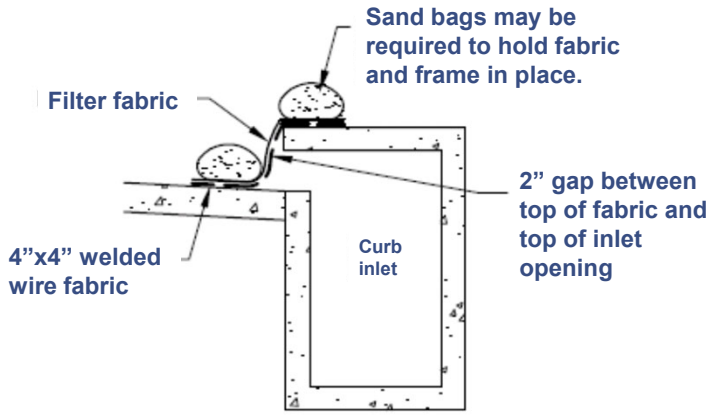
INLET PROTECTION - CURB



CROSS SECTION

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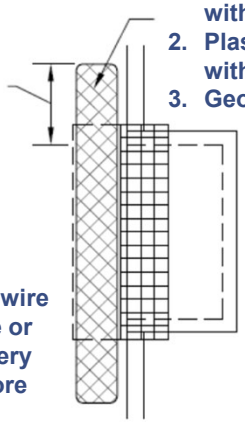
INLET PROTECTION - CURB

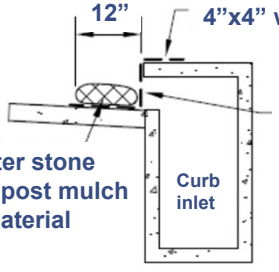
1. Double wrap of flexible wire mesh with mesh opening ¾" max, or …
2. Plastic netting double-wrapped with ½" max. opening, or …
3. Geosynthetic tubes

Extend wrapped filter material 12" min. beyond end of curb opening on both sides.



Note: Plastic or wire ties around wire or plastic mesh every 12" to 18" or more as needed

PLAN VIEW



CROSS SECTION

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INLET PROTECTION - CURB - ISSUES

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INLET PROTECTION - CURB - ISSUES

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INLET PROTECTION - CURB - ISSUES

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INLET PROTECTION - CURB - ISSUES

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INLET PROTECTION - GRATE

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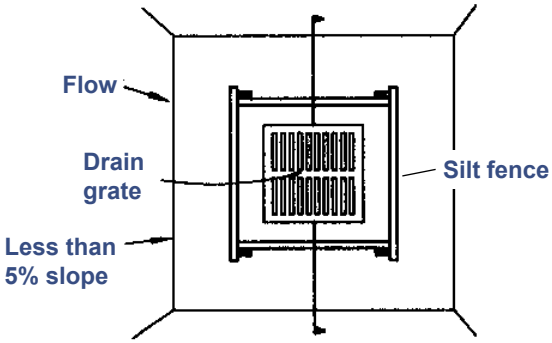
INLET PROTECTION - GRATE



PLAN VIEW

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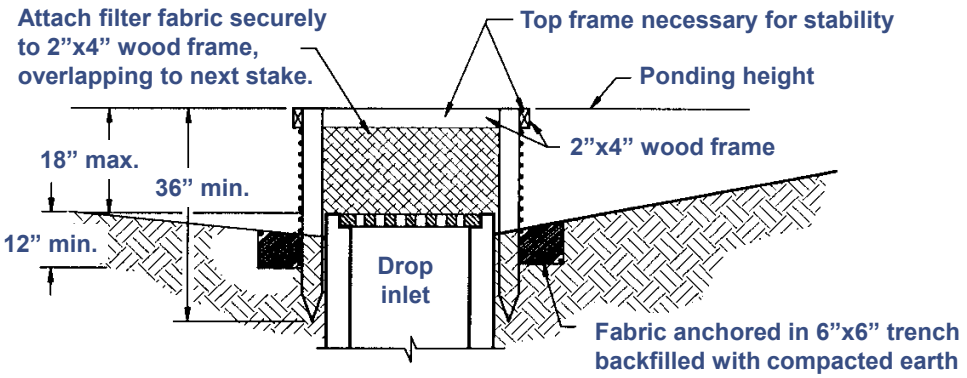
INLET PROTECTION - GRATE



SECTION VIEW

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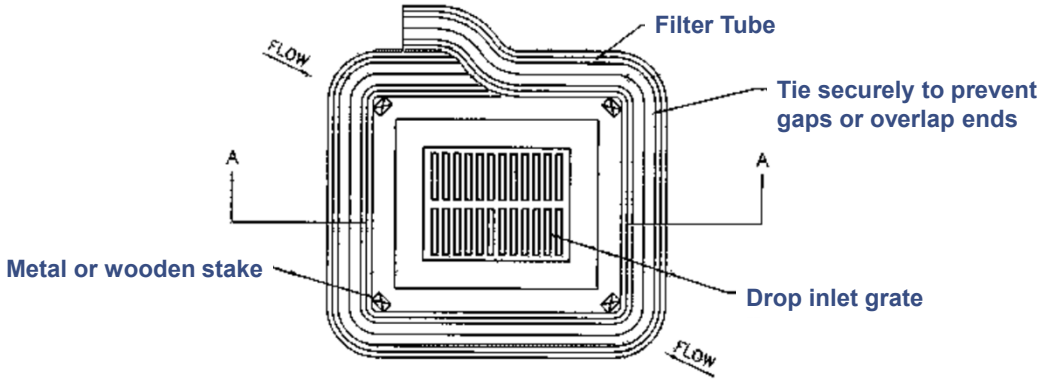
INLET PROTECTION - GRATE



SECTION A-A: DROP INLET

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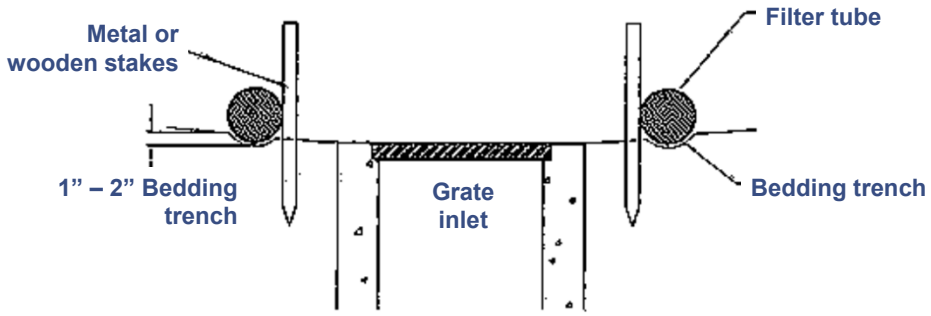
INLET PROTECTION - GRATE



SECTION A-A: DROP INLET

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INLET PROTECTION - GRATE - ISSUES

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INLET PROTECTION - GRATE - ISSUES

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INLET PROTECTION - GRATE - DISCUSSION

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INLET PROTECTION - COMBINATION

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INLET PROTECTION: COMBINATION

- Almost all combination inlet protection BMPs are proprietary (i.e. patented and manufactured by specific companies)

Photo Source: Rubb Erosion, Inc.

Photo Source: Ultra Tech International, Inc.

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INLET PROTECTION - AREA

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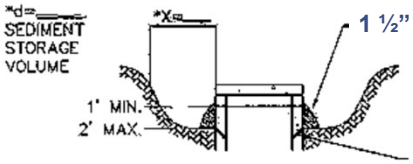
INLET PROTECTION - AREA



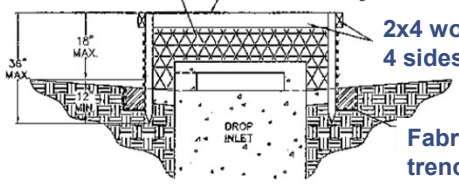
1 ½" Filter stone

1" dia. weep hole to be filled with grout prior to backfilling of storage area

SECTION A-A
"Y" INLET

Attach filter fabric securely to wood frame overlapping fabric to next stake

Top frame necessary for stability

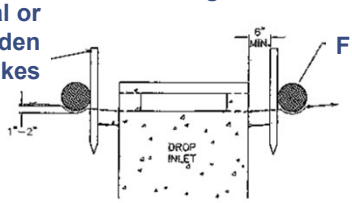


2x4 wood frame, 4 sides of drop inlet

Fabric anchored in trench backfilled with compacted earth

SECTION A-A
DROP INLET

Metal or Wooden stakes



Filter tube

SECTION A-A
DROP INLET

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INLET PROTECTION - AREA - ISSUES

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INLET PROTECTION - AREA - ISSUES

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INLET PROTECTION - PIPE

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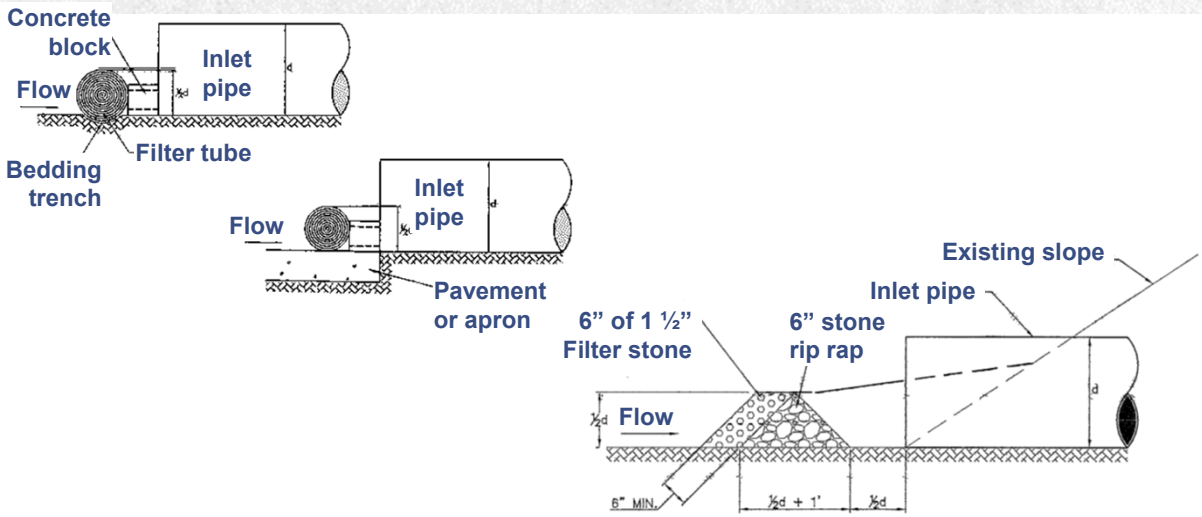
INLET PROTECTION - PIPE



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INLET PROTECTION - PIPE

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INSPECTIONS: INLET PROTECTION

Initial Inspection

- Inlet protection is placed as specified by the SWPPP, plan details and material specifications
- Inlet protection will pond water if installed properly; therefore, consider traffic, property and pedestrian safety.
- Confirm that overflow/relief is provided to avoid flooding of streets, structures and the construction site.

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INSPECTIONS: INLET PROTECTION

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Follow-up Inspection

- Inlet protection remains properly installed
- If water does not pond during a rain event, then filter media is not properly placed, have media installed correctly
- If water remains standing around the filter media for more than 48 hours after a rain event, remove/replace filter media
- Remove sediment/debris as needed to prevent, traffic hazards, clogging of the filter media or clogging of the overflow path for the device
- Damage from construction activities, vehicles or vandalism should be repaired immediately per SWPPP requirements.

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STONE OUTLET SEDIMENT TRAP - UNCONFINED

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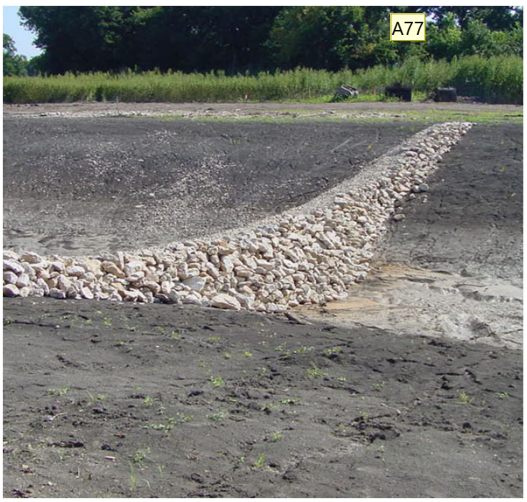
STONE OUTLET SEDIMENT TRAP - UNCONFINED



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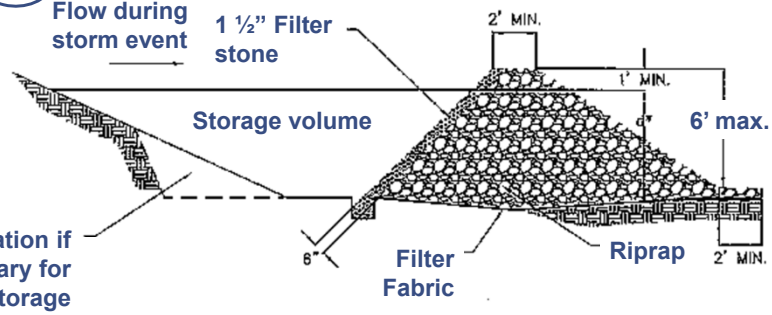
STONE OUTLET SEDIMENT TRAP

Design Computation Required

Specific design information on the erosion control plans is required for each installation



SECTION

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Slide 85

A77 Insert this new slide 133 after existing slide 66.
Author, 10/8/2019

STONE OUTLET SEDIMENT TRAP - CONFINED

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STONE OUTLET SEDIMENT TRAP - CONFINED

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STONE OUTLET SEDIMENT TRAP - CONFINED

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INSPECTIONS: STONE OUTLET SEDIMENT TRAP

Initial Inspection

- Ensure the trap is installed as specified by the SWPPP. Check location, size, depth and embankment.

Follow-up Inspections

- Ensure the trap is not clogged. Filter stones may need to be replaced.
- Remove sediment buildup when it is beyond one-third the capacity of the trap.
- Dispose of removed sediment properly.

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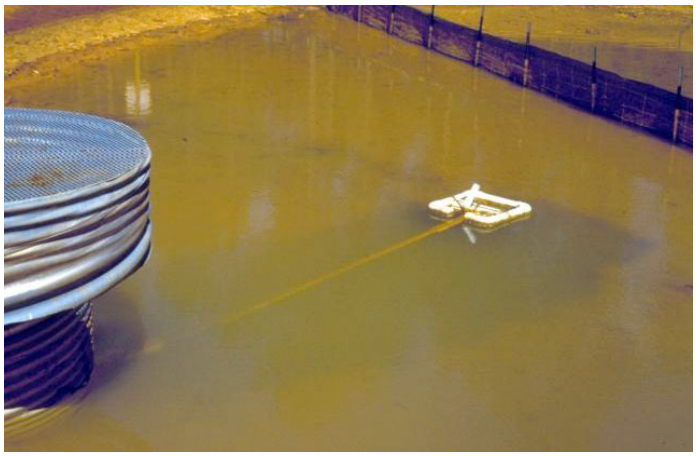
SEDIMENT BASIN

A sediment basin can be the most effective treatment practice in removing sediment from runoff.



Disclaimer: The surface skimmer shown is for informational purposes only. Information provided on this slide regarding any specific commercial product by trade name, manufacture, or otherwise does not constitute or imply its endorsement, recommendation, or approval by the Public Works Council or NCTCOG.

Photo Source: J. W. Faircloth & Son Inc.

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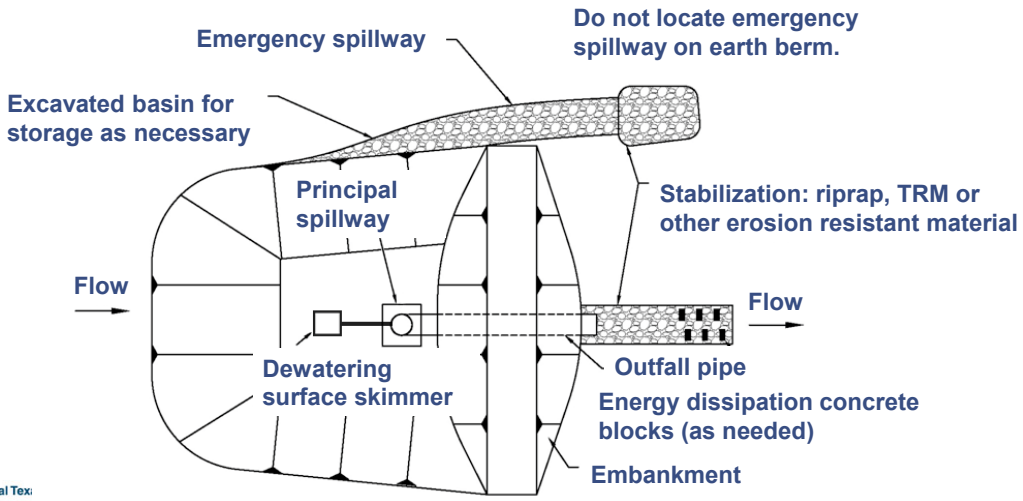
SEDIMENT BASIN



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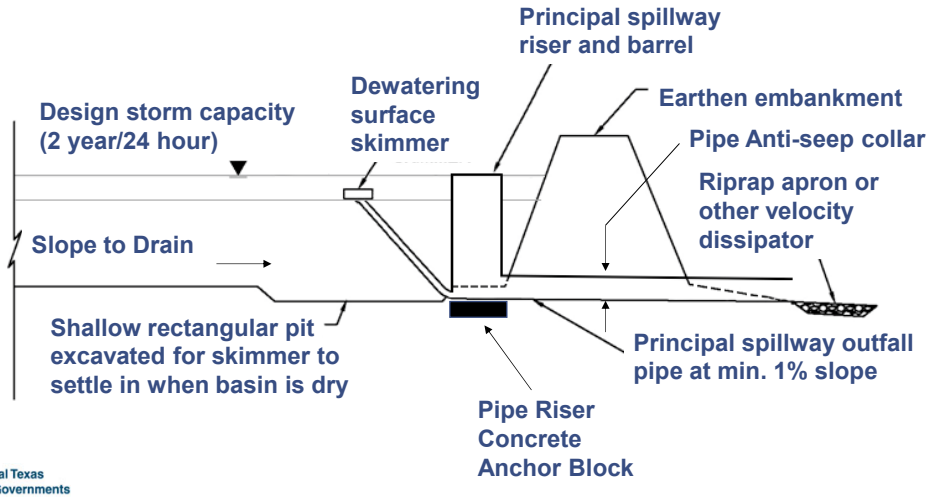
SEDIMENT BASIN



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SEDIMENT BASIN SURFACE SKIMMER

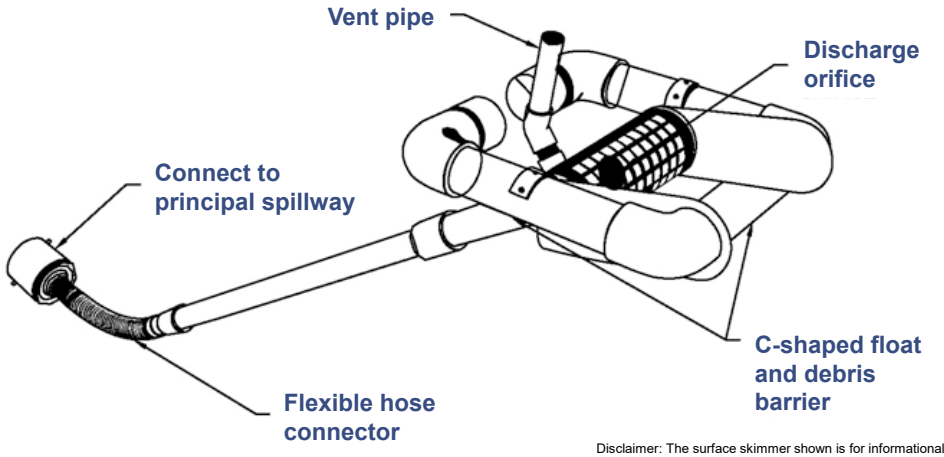

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Diagram Source: J. W. Faircloth & Son Inc.

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SEDIMENT BASIN & SURFACE SKIMMER

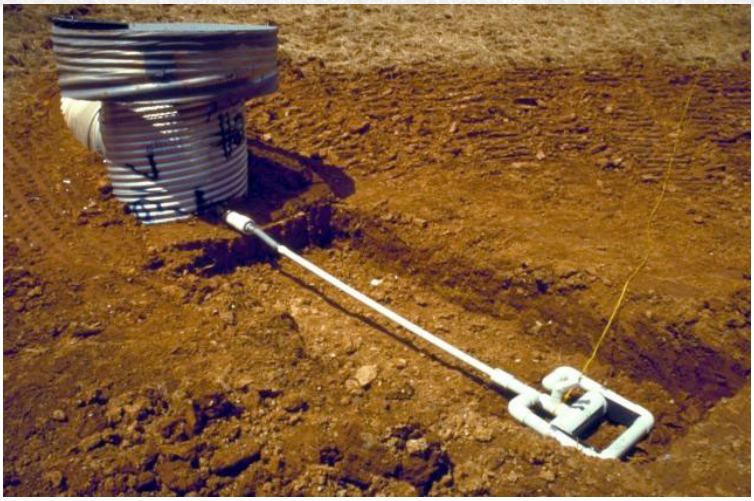

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Photo Source: J. W. Faircloth & Son Inc.

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INSPECTIONS: SEDIMENT BASIN

Initial Inspection

- Ensure the basin plans are complete and the basin is installed as specified by the SWPPP. Check location (Horizontal & vertical), size, depth, embankment, spillway, all material specifications and outlet.
- Check that the dewatering outlet structure is designed and installed to withdraw water from the surface of the impounded water.
- Ensure the discharge point of the principal spillway pipe is stabilized with riprap or another form of stabilization, and no additional erosion is created.
- Stabilize basin embankments to prevent erosion.

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INSPECTIONS: SEDIMENT BASIN

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Follow-up Inspections

- Ensure outlet structure is not clogged; have debris removed as needed.
- Remove sediment buildup when it is greater than 20% of the original storage capacity of the basin.
- Dispose of removed sediment properly.
- Ensure spillway outlet pipe does not create any erosion downstream of sediment basin.
- Observe riprap at discharge for signs of sedimentation to provide an indication of the effectiveness of the sediment basin.
- Check for basin embankment stabilization.
- Check that basin drains fully in less than 72 hours to minimize the breeding of mosquitoes.

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SEDIMENT BASIN - CONSTRUCTION

EARTH DAM

RISER/ BARREL & ANTI-SEEP COLLARS

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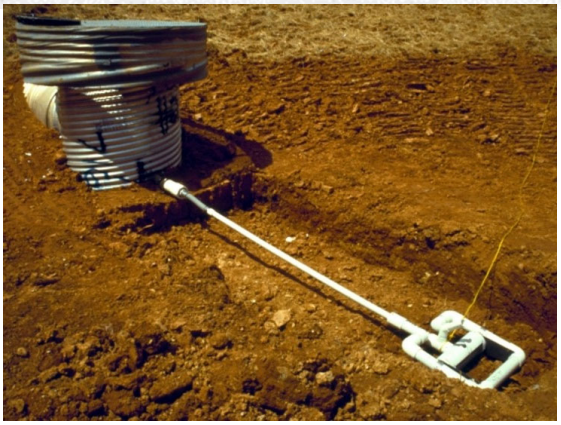
SEDIMENT BASIN - CONSTRUCTION

BARREL THRU DAM COMPACTION



RISER W/ SURFACE SKIMMER

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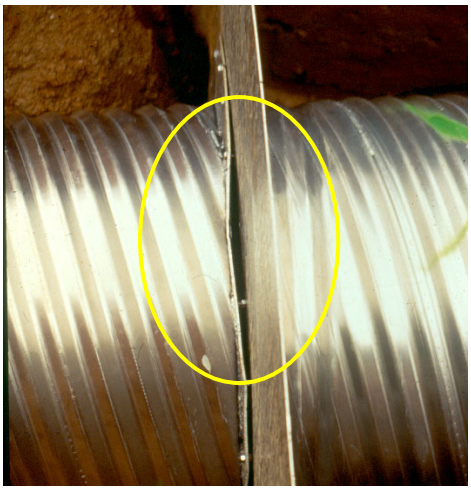
SEDIMENT BASIN - ISSUES



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SEDIMENT BASIN - ISSUES

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MATERIAL & WASTE BMPS

MATERIAL & WASTE BMPS

- Chemical Management
- Concrete Sawcutting Waste Mgmnt.
- Concrete Waste Mgmnt.
- Debris and Trash Mgmnt.
- Hyperchlorinated Water Mgmnt.
- Sandblasting Waste Mgmnt.
- Sanitary Waste Mgmnt.
- Spill & Leak Response Procedures
- Sub-grade Stabilization Mgmnt.
- Vehicle & Equipment Mgmnt.

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MATERIAL & WASTE BMPS

- **Chemical management** (iSWM Sec. 4.1)
  - Check for leakage around storage areas.
  - Keep containers labeled and in good condition.
  - Don't throw hazardous chemicals in trash.
  - Store chemicals away from ditches and basins.
  - Provide secondary containment storage tanks.

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MATERIAL & WASTE BMPS

- **Concrete Sawcutting Waste management** (iSWM Sec. 4.2)
  - Continuously vacuum slurry and cuttings
  - Water evaporation and concrete recycling are recommended disposal methods if not vacuumed
  - Protect inlets to prevent discharges
  - Establish on-site containment area if immediate disposal is not available

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MATERIAL & WASTE BMPS

- **Concrete Waste management** (iSWM Sec. 4.3)
  - Prohibit discharge of untreated concrete washout water
  - Water evaporation and concrete recycling are recommended disposal methods
  - Provide a washout containment area, and inspect and repair area regularly
  - Only dispose of waste concrete at regulated disposal sites

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MATERIAL & WASTE BMPS

- **Debris & Trash management** (iSWM Sec. 4.4)
  - Implement job-site education and awareness program
  - Provide sufficient storage containers with covers
  - Provide timely removal of materials
  - Clean up loose trash and debris daily

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MATERIAL & WASTE BMPS

- **Hyperchorinated Water management** (iSWM Sec. 4.5)
  - Disposal to sanitary sewer system
    - If approved by controlling authority
  - On site chemical treatment
    - Use appropriate dosage for specific use
    - Chlorine concentration must be less than 4 ppm before leaving site
  - On site detention to achieve natural attenuation
    - Chlorine concentration must be less than 4 ppm before leaving site
    - Continuously monitor receiving waters for negative effects and test hourly for chlorine

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MATERIAL & WASTE BMPS

- **Sandblasting Waste management** (iSWM Sec. 4.6)
  - Prohibit discharge of sandblasting waste
  - Provide site specific fugitive dust control and containment equipment
  - Provide proper sandblast equipment for the job
  - Contain and dispose of sandblast grit

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MATERIAL & WASTE BMPS

- **Sanitary Waste management** (iSWM Sec. 4.7)
  - Provide facilities at the rate of 1 toilet per 10 workers per 40-50 hr. work week
  - Locate a minimum of 50 feet away from storm drain inlets, channels, etc.
  - If 50 feet is infeasible, provide 20 feet distance and provide secondary containment
  - Check regularly for and clean up leaks and spills

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Portable toilets are required to be staked down

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MATERIAL & WASTE BMPS

- **Spill & Leak Response Procedures** (iSWM Sec. 4.8)
  - Maintain spill kits on site for petroleum and other chemicals frequently used
  - Develop procedures based on Material Safety and Data Sheets for substances onsite
  - Post emergency contact numbers
  - Significant spills or hazardous releases warrant immediate response by trained professionals

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MATERIAL & WASTE BMPS

- **Sub-grade Stabilization management** (iSWM Sec. 4.9)
  - Limit stabilization operations to that which can be mixed and compacted by end of each work day
  - Roughen areas adjacent and downstream of stabilized areas to intercept lime from runoff
  - Provide secondary containment (Section 4.1)
  - Prohibit vehicle traffic until stabilized
  - Halt operations if discharge is found

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MATERIAL & WASTE BMPS

- **Vehicle & Equipment management** (iSWM Sec. 4.10)
  - Prohibit discharge of maintenance fluids and wash water with soap
  - Use spill/overflow devices for fueling
  - Label waste containers
  - Utilize drip pans when parked if leaking
  - If feasible, prohibit onsite vehicle washing and maintenance

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INTEGRATED STORM WATER MANAGEMENT (iSWM)

- iSWM Criteria Manual for Site Development and Construction
  - Widely used in North Central Texas
  - Adopted by several local governments
- iSWM Technical Manual
  - Construction Stormwater Controls fact sheets
  - Information on the selection, installation and maintenance of temporary and permanent BMPs
- www.iswm.nctcog.org

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