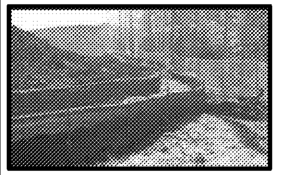
Sediment Barrier (Sd1)



DEFINITION
Sediment Barriers are temporary structures made up of a porous material typically supported by steel or wood posts. Types of sediment barriers may include silt fence, brush piles, mulch berms, compost filter socks or other filtering material.

PURPOSE
To minimize and prevent sediment carried by sheet flow from leaving the site and entering natural drainage ways or storm drainage systems by slowing storm water runoff and causing the deposition and/or filtration of sediment at the structure. The barriers retain the soil on the disturbed land until the activities disturbing the land are completed and vegetation is established.

CONDITIONS
Barriers should be installed where runoff can be stored behind the barrier without damaging the submerged area behind the barrier or the structure itself. Sediment barriers shall not be installed across streams, ditches, waterways, or other concentrated flow areas.

DESIGN CRITERIA
Sediment barriers are designed to retain sediment transported by sheet flow from disturbed area. It is important for the design professional to take into account the profile of the product for use on the site. Sediment Barriers should also provide a riprap splash pad or other outlet protection device for any point where flow may overtop the sediment barrier. Ensure that the maximum height of the barrier at a protected, reinforced outlet does not exceed 1 foot and that the support spacing does not exceed 4 feet.
Where all runoff is to be stored behind the sediment barrier (where no storm water disposal system is present), maximum continuous slope length behind a sediment barrier shall not exceed those shown in Table 6-27.1. For longer slope lengths, slope interrupters must be used. The drainage area shall not exceed ¼ acre for every 100 feet of sediment barrier.

Placement
The type of sediment barrier depends on whether the area is sensitive or nonsensitive. Sensitive areas can be defined as any area that needs additional protection, these areas include but are not limited to, state waters, wetlands, or any area the design professional designates as sensitive.
When using multiple types of sediment barriers on a site in a single run, the barriers must be overlapped 18 inches or as specified by design professional. See Figure 6-27.5

CONSTRUCTION SPECIFICATIONS

Non-sensitive Areas * (Sd1-NS)

Sediment barriers being used as Type NS shall have a support spacing of no greater than 6 feet on center, with each being driven into the ground a minimum of 18 inches.

Sensitive Areas* (Sd1-S)

Sediment barriers being used as Type S shall have a support spacing of no greater than 4 feet on center, with each being driven into the ground a minimum of 18 inches. *As of January 1 2016, in the existing Georgia Department of Transportation Qualified Products list #36 (QPL- 36), Type A, B, or C will fall under sensitive and non-sensitive applications. **Type C** will be classified as sensitive and Type A and **B as non-sensitive.** Refer to Appendix A-2 and the Equivalent BMP List.

PRACTICE CLASSIFICATIONS
For silt fence Type A, B or C refer to Table 6-27.4.

Type A Silt Fence
This 36-inch wide filter fabric shall be used on developments where the life of the project is great than or equal to six months. Type A is classified as non-sensitive application.

Type B Silt Fence
Though only 22-inches wide, this filter fabric allows the same flow rate as Type A silt fence. Type B silt fence shall be limited to use on minor projects, such as residential home sites or small commercial developments where permanent stabilization will be achieved in less than six Type B is classified as non-sensitive **application.**

Type C Silt Fence
Type C fence is 36-inches wide with wire reinforcement or equivalent. The wire reinforcement is necessary because this fabric allows almost three times the flow rate as Type A silt fence. Type C silt fence shall be used where runoff flows or velocities are particularly high or where slopes exceed a vertical height of 10 feet. **Type** C is classified as sensitive application.

Filter Media Sock Specifications
Compost filter media used for sediment barrier filler material shall be weed free and derived from a well-decomposed source of organic matter. Filter Media Sock is classified as a Type **B, non-sensitive application.** The compost shall be produced using an aerobic composting process meeting CFR 503 regulations including time and temperature data. The compost shall be free of any refuse, contaminants or other materials toxic to plant growth. Non-composted products will not be accepted without applicable water quality test results. Test methods for the items below should follow US Composting Council Test Methods for the Examination of Composting and Compost guidelines for laboratory procedures:

A. pH – 5.0-8.0 in accordance with TMECC 04.11-A, "Electrometric pH Determinations for Compost"
B. Particle size – 99% passing a 2 inch (50mm) sieve and a maximum of 40% passing a 3/8 inche (9.5mm) sieve, in accordance with TMECC 02.02-B, "Sample Sieving for Aggregate Size Classification". (Note: In the field, product commonly is between ½ in./12.5mm and 2 in./50 mm in particle size.)
C. Moisture content of less than 60% in accordance with standardized test methods for moisture determination.
D. Material shall be relatively free (<1% by dry weight) of inert or foreign manmade materials.
E. Sock containment system for compost filter media shall be a photodegradable or biodegradable knitted mesh material and should have 1/8 in. to 3/8 in., openings.

Table 6-27.4

TYPE FENCE	A	B	C
Tensile Strength (Lbs. Min.) (1) (ASTM D-4632)	Warp - 120 Fill - 100	Warp - 120 Fill - 100	Warp - 260 Fill - 180
Elongation (% Max.) ASTM D-4632)	40	40	40
AOS (Apparent Opening Size) Max. Sieve Size) (ASTM D-4751)	#30	#30	#30
Flow Rate (Gal/Min/Sq. Ft.) GDT-87)	25	25	70
Ultraviolet Stability (2) ASTM D-4632 after 300 hours weathering in accordance with ASTM D-4355)	80	80	80
Bursting Strength (PSI Min.) ASTM D-3786 Diaphram Bursting Strength Tester)	175	175	175
Minimum Fabric Width (Inches)	36	22	36

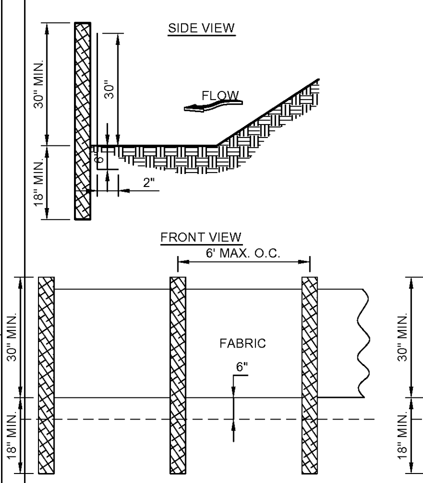
(1) Minimum roll average of five specimens.
(2) Percent of required initial minimum tensile strength.

Table 6-27.1 Criteria for Sediment Barrier

Land Slope	Maximum Slope Length Above Fence
Percent	Feet
< 2	100
2 to 5	75
5 to 10	50
10 to 20	25
> 20*	15

*In areas where the slope is greater than 20%, a flat area length of 10 feet between the toe of the slope to the fence should be provided.

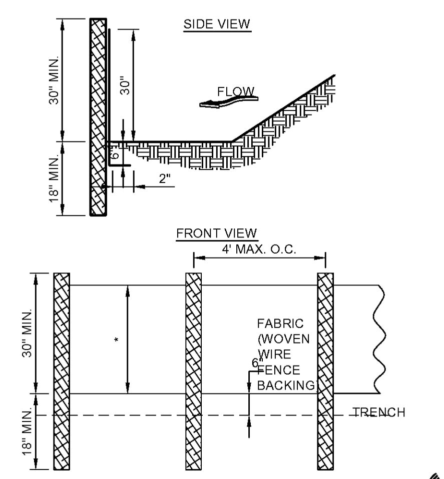
SILT FENCE - TYPE NON-SENSITIVE



NOTES:
1. USE STEEL OR WOOD POSTS OR AS SPECIFIED BY THE EROSION, SEDIMENTATION, AND POLLUTION CONTROL PLAN.
2. HEIGHT (*) IS TO BE SHOWN ON THE EROSION, SEDIMENTATION, AND POLLUTION CONTROL PLAN.

Figure 6-27.1

SILT FENCE - TYPE SENSITIVE



NOTES:
1. USE STEEL OR WOOD POSTS OR AS SPECIFIED BY THE EROSION, SEDIMENTATION, AND POLLUTION CONTROL PLAN.
2. HEIGHT (*) IS TO BE SHOWN ON THE EROSION, SEDIMENTATION, AND POLLUTION CONTROL PLAN.

Figure 6-27.2

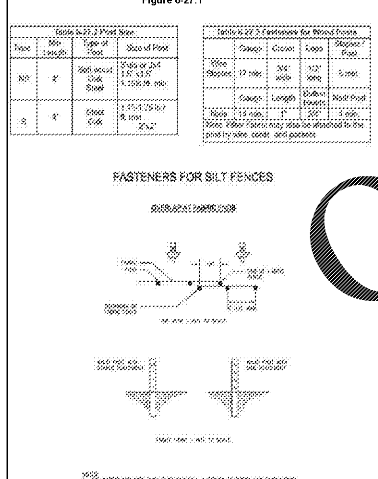
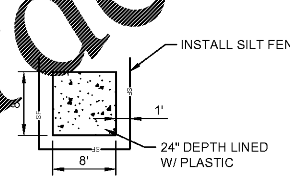


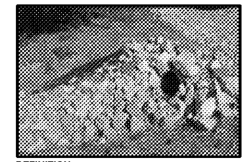
Figure 6-27.5

B1 CE501 SEDIMENT BARRIER (Sd1)
SCALE: NTS



A2 CE501 CONCRETE WASHOUT
SCALE: NTS

STORM DRAIN OUTLET PROTECTION (St)



DEFINITION
Paved and/or riprapped channel sections, placed below storm drain outlets.

PURPOSE
To reduce velocity of flow before entering receiving channels below storm drain outlets.

CONDITIONS
This standard applies to all storm drain outlets, road culverts, paved channel outlets, etc., discharging into natural or constructed channels. Analysis and/or treatment will extend from the end of the conduit, channel or structure to the point of entry into an existing stream or publicly maintained drainage system.

DESIGN CRITERIA
Structurally lined aprons at the outlets of pipes and paved channel sections shall be designed according to the following criteria:

Capacity
Peak stormflow from the 25-year, 24-hour frequency storm or the storm specified in Title 12-7-1 of the Official Code of Georgia Annotated or the design discharge of the water conveyance structure, whichever is greater.

Tailwater Depth
The depth of tailwater immediately below the pipe outlet must be determined for the design capacity of the pipe. Manning's Equation may be used to determine tailwater depth. If the tailwater depth is less than half the diameter of the outlet pipe, it shall be classified as a Minimum Tailwater Condition. If the tailwater depth is greater than half the pipe diameter, it shall be classified as a Maximum Tailwater Condition. Pipes that outlet onto flat areas with no defined channel may be assumed to have a Minimum Tailwater Condition.

Apron Length and Thickness
The apron length and d50, stone median size, shall be determined from the curves according to tailwater conditions:
Minimum Tailwater- Use Figure 6-34.1
Maximum Tailwater- Use Figure 6-34.2
Maximum Stone Size = 1.5 x d50
Apron Thickness = 1.5 x dmax

Apron Width
If the pipe discharges directly into a well-defined channel, the apron shall extend across the channel bottom and up the channel banks to an elevation one foot above the maximum tailwater depth or to the top of the bank (whichever is less). If the pipe discharges onto a flat area with no defined channel, the width of the apron shall be determined as follows:

a. The upstream end of the apron, adjacent to the pipe, shall have a width three times the diameter of the outlet pipe.
b. For a Minimum Tailwater Condition, the downstream end of the apron shall have a width equal to the pipe diameter plus the length of the apron. Refer to Figure 6-34.1.
c. For a Maximum Tailwater Condition, the down stream end shall have a width equal to the pipe diameter plus 0.4 times the length of the apron. Refer to Figure 6-34.2.

Bottom Grade
The apron shall be constructed with no slope along its length (0.0% grade). The invert elevation of the downstream end of the apron shall be equal to the elevation of the invert of the receiving channel. There shall be no overfall at the end of the apron.

Side Slope
If the pipe discharges into a well-defined channel, the side slopes of the channel shall not be steeper than 2:1.

Alignment
The apron shall be located so that there are no bends in the horizontal alignment.

Geotextile
Geotextiles should be used as a separator between the graded stone, the soil base, and the abutments. The geotextile will prevent the migration of soil particles from the subgrade into the graded stone. The geotextile shall be specified in accordance with AASHTO M288-96 Section 7.5, Permanent Erosion Control Recommendations. The geotextile should be placed immediately adjacent to the subgrade without any voids.

Materials
The apron may be lined with riprap, grouted riprap, or concrete. The median sized stone for riprap, d50, shall be determined from the curves, Figures 6-24.1 and 6-24.2, according to the tailwater condition. The gradation, quality and placement of riprap shall conform to Appendix C.

Refer to Figure 6-24.4, for alternative structures to achieving energy dissipation at an outlet. For information regarding the selection and design of these alternative energy dissipators, refer to:

FHWA Standard (REF. Hydraulic Design of Energy Dissipators for Culverts and Channels; HEC No. 14, FHWA, Available from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402.

CONSTRUCTION SPECIFICATIONS

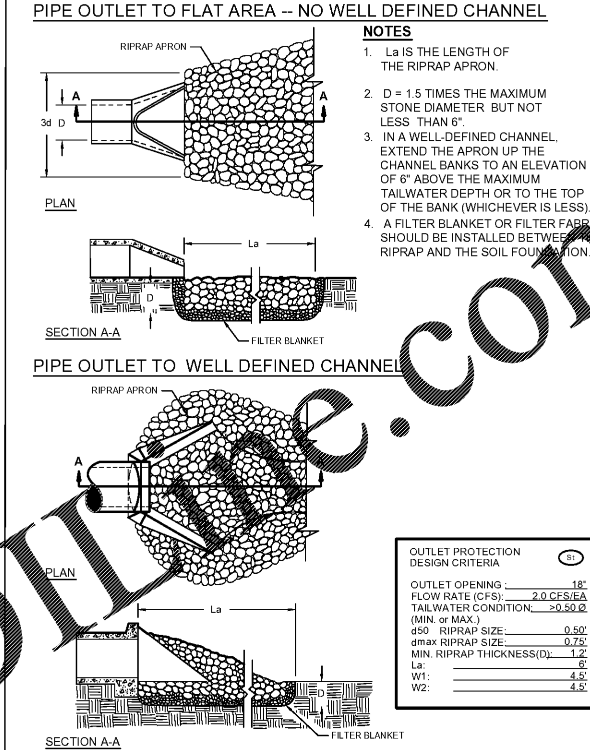
1. Ensure that the subgrade for the filter and riprap follows the required lines and grades shown in the plan. Compact any fill required in the subgrade to the density of the surrounding undisturbed material. Low areas in the subgrade on undisturbed soil may also be filled by increasing the riprap thickness.
2. The riprap and gravel filter must conform to the specified grading limits shown on the plans.
3. Geotextile must meet design requirements and be properly protected from punching or tearing during installation. Repair any damage by removing the riprap and placing another piece of filter fabric over the damaged area.

All connecting joints should overlap a minimum of 1 ft. If the damage is extensive, replace the entire filter fabric.

4. Riprap may be placed by equipment, but take care to avoid damaging the filter.
5. The minimum thickness of the riprap should be 1.5 times the maximum stone diameter.
6. Construct the apron on zero grade with no overfall at the end. Make the top of the riprap at the downstream end level with the receiving area or slightly below it.
7. Ensure that the apron is properly aligned with the receiving stream and preferably straight throughout its length. If a curve is needed to fit site conditions, place it in the upper section of the apron.
8. Immediately after construction, stabilize all disturbed areas with vegetation.
9. Stone quality - Select stone for riprap from field stone or quarry stone. The stone should be hard, angular, and highly weather-resistant. The specific gravity of the individual stones should be at least 2.5.
10. Filter - Install a filter to prevent soil movement through the openings in the riprap. The filter should consist of a graded gravel layer or a synthetic filter cloth. See Appendix C, p. C-1.

MAINTENANCE
Inspect riprap outlet structures after heavy rains to see if any erosion around or below the riprap has taken place or if stones have been dislodged. Immediately make all needed repairs to prevent further damage.

RIPRAP OUTLET PROTECTION



NOTES
1. La IS THE LENGTH OF THE RIPRAP APRON.
2. D = 1.5 TIMES THE MAXIMUM STONE DIAMETER BUT NOT LESS THAN 6".
3. IN A WELL-DEFINED CHANNEL, EXTEND THE APRON UP THE CHANNEL BANKS TO AN ELEVATION OF 6" ABOVE THE MAXIMUM TAILWATER DEPTH OR TO THE TOP OF THE BANK (WHICHEVER IS LESS).
4. A FILTER BLANKET OR FILTER FABRIC SHOULD BE INSTALLED BETWEEN THE RIPRAP AND THE SOIL FOUNDATION.

OUTLET PROTECTION DESIGN CRITERIA (St)

OUTLET OPENING:	18"
FLOW RATE (CFS):	2.0 CFS/EA
TAILWATER CONDITION: (MIN. or MAX.)	>0.50 Ø
d50 RIPRAP SIZE:	0.50'
dmax RIPRAP SIZE:	0.75'
MIN. RIPRAP THICKNESS(D):	1.2'
La:	6'
W1:	4.5'
W2:	4.5'

FIGURE 6-34.3 - RIPRAP OUTLET PROTECTION (MODIFIED FROM VA SWCC)

C4 CE501 STORM DRAIN OUTFALL PROTECTION (St)
SCALE: NTS

Disturbed Area Stabilization (With Mulching Only) Ds1

DEFINITION
Applying plant residues or other suitable materials, produced on the site if possible, to the soil surface.

PURPOSE
- To reduce runoff and erosion
- To conserve moisture
- To prevent surface compaction or crusting
- To control undesirable vegetation
- To modify soil temperature
- To increase biological activity in the soil

REQUIREMENT FOR REGULATORY COMPLIANCE
Mulch or temporary grassing shall be applied to all exposed areas within 14 days of disturbance. Mulch can be used as a singular erosion control device for up to six months, but it shall be applied at the appropriate depth, depending on the material used, anchored and have a continuous 90% cover or greater of the soil surface.
Maintenance shall be required to maintain appropriate depth and 90% cover. Temporary vegetation may be employed instead of mulch if the area will remain undisturbed for less than six months.

If any area will remain undisturbed for greater than six months, permanent vegetative techniques shall be employed. Refer to **Ds2 -Disturbed Area Stabilization (With Temporary Seeding), Ds3 - Disturbed Area Stabilization (With Permanent Seeding), and Ds4 - Disturbed Area Stabilization (With Sodding).**

SPECIFICATIONS
Mulching Without Seeding
This standard applies to graded or cleared areas where seedings may not have a suitable growing season to produce an erosion retardant cover, but can be stabilized with a mulch cover.

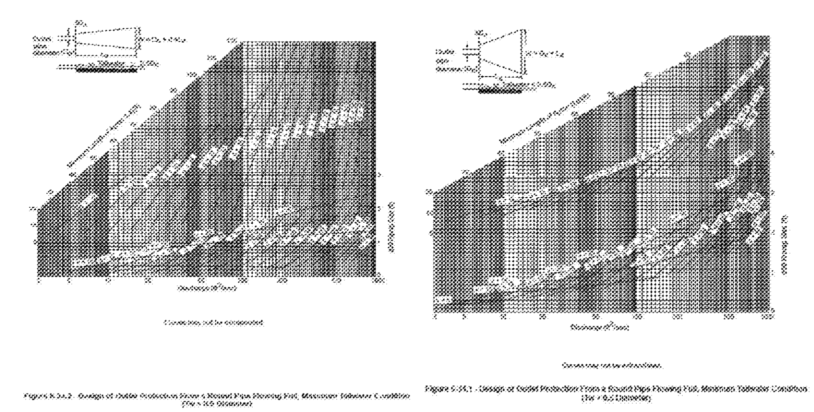
Site Preparation
1. Grade to permit the use of equipment for applying and anchoring mulch.
2. Install needed erosion control measures as required such as dikes, diversions, berms, terraces and sediment barriers.
3. Loosen compact soil to a minimum depth of 3 inches.

Mulching Materials
Select one of the following materials and apply at the depth indicated:

1. Dry straw or hay shall be applied at a depth of 2 to 4 inches providing complete soil coverage. One advantage of this material is easy application.
2. Wood waste (chips, sawdust or bark) shall be applied at a depth of 2 to 3 inches. Organic material from the clearing stage of development should remain on site, be chipped, and applied as mulch. This method of mulching can greatly reduce erosion control costs.
3. Polyethylene film shall be secured over banks or stockpiled soil material for temporary protection. This material can be salvaged and re-used.

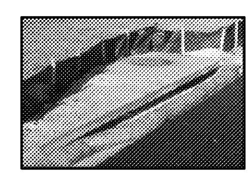
Applying Mulch
When mulch is used without seeding, mulch shall be applied to provide full coverage of the exposed area.
1. Dry straw or hay mulch and wood chips shall be applied uniformly by hand or by mechanical equipment.
2. If the area will eventually be covered with perennial vegetation, 20-30 pounds of nitrogen per acre in addition to the normal amount shall be applied to offset the uptake of nitrogen caused by the decomposition of the organic mulches.
3. Apply polyethylene film on exposed areas.

Anchoring Mulch
1. Straw or hay mulch can be pressed into the soil with a disk harrow with the disk set straight or with a special "packer disk." Disks may be smooth or serrated and should be 20 inches or more in diameter and 8 to 12 inches apart. The edges of the disk should be dull enough not to cut the mulch but to press it into the soil leaving much of it in an erect position. Straw or hay mulch shall be anchored immediately after application. Straw or hay mulch spread with special blower-type equipment may be anchored. Tackifers, binders and hydraulic mulch with tackifier specifically desgined for tacking straw can be substituted for emulsified asphalt. Please refer to specification Tac-Tackifers. Plastic mesh or netting with mesh no larger than one inch by one inch shall be installed according to manufacturer's specifications.
2. Netting of the appropriate size shall be used to anchor wood waste. Openings of the netting shall not be larger than the average size of the wood waste chips.
3. Polyethylene film shall be anchor trenched at the top as well as incrementally as necessary.



A3 CE501 DISTURBED AREA STABILIZATION (Ds1)
SCALE: NTS

INLET SEDIMENT TRAP (Sd2)



DEFINITION
A temporary protective device formed at or around an inlet to a storm drain to trap sediment.

PURPOSE
To prevent sediment from entering a storm drainage systems prior to permanent stabilization of the disturbed area draining to the inlet.

CONDITIONS
All storm drain drop inlets that receive runoff from disturbed areas.

DESIGN CRITERIA
Through testing there are two different categories (high retention and high flow) supported. In areas where BMPs are being used on paved surfaces, or safety is a concern, the potentially negative effects of ponding should be taken into account. In such cases, a high flow BMP is preferred.

On unpaved areas where ponding will not cause a safety hazard, high retention shall be taken into account. If high retention is not used in this situation a rationale shall be given on the plan and an unpaved application should apply.

Sediment traps must be self-draining unless they are otherwise protected in an approved fashion that will not present a safety hazard. The drainage area entering the inlet sediment trap shall be no greater than one acre.

If runoff may bypass the protected inlet, a temporary dike should be constructed on the down slope side of the structure. Also, a stone filter ring may be used on the up slope side of the inlet to slow runoff and filter larger soil particles. Refer to Fr-Stone Filter Ring.

CONSTRUCTION SPECIFICATIONS
Excavated Inlet Sediment Trap
An excavation may be created around the inlet sediment trap to provide additional sediment storage. The trap shall be sized to provide a minimum storage capacity calculated at the rate of 67 cubic yards per acre of drainage area. A minimum depth of 1.5 feet for sediment storage should be provided. Side slopes shall not be steeper than 2:1.

Sediment traps may be constructed on natural ground surface, on an excavated surface, or on machine compacted fill, provided they have a non-erodible outlet.

Filter Fabric with Supporting Frame (Sd2-F)

This method of inlet protection is applicable where the inlet drains a relatively flat area (slope no greater than 5%) and shall not apply to inlets receiving concentrated flows, such as in street or highway medians. As shown in Figure 6-28.1, Type S silt fence supported by steel posts should be used. The stakes shall be spaced evenly around the perimeter of the inlet a maximum of 3 feet apart, and securely driven into the ground, approximately 18 inches deep. The fabric shall be 36 inches tall and entrenched 12 inches and backfilled with crushed stone or compacted soil. Fabric and wire shall be securely fastened to the posts, and fabric ends must be overlapped a minimum of 18 inches or wrapped together around a post to provide a continuous fabric barrier around the inlet.

FABRIC AND SUPPORTING FRAME FOR INLET PROTECTION

STEEL FRAME AND TYPE C SILT FENCE INSTALLATION

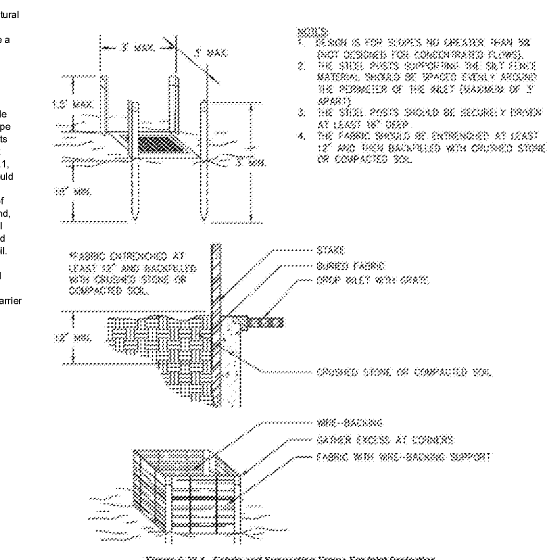


Figure 6-28.1 - Fabric and Supporting Frame For Inlet Protection

A6 CE501 INLET SEDIMENT CONTROL (Sd2-F)
SCALE: NTS

GEORGIA PORTS AUTHORITY
GCT CAPACITY IMPROVEMENTS - PHASE 2
ES&PC DETAILS

No.	Description	Date	App'd
0	ISSUE FOR BID	02/02/2021	JHP

moffatt & nichol
2 EAST BRYAN ST., STE 501
SAVANNAH, GA 31401
912-231-0044

Designed by: JHP | Drawn by: JAH | Chk'd by: | Submitted by: MOFFATT & NICHOL | Reviewed by:
Date: | M&N Project No. 5531-264B | GPA Project No. 1910-1011C | Drawing Scale: AS NOTED | Plot scale: 1:1 (D SHEET)
Rev. 0

SEAL

REVISION NAME-YYYY-MM-DD
FOR (SUBMITTAL NAME)
ISSUED: YYYY-MM-DD
NOT TO BE USED FOR CONSTRUCTION
DRAWING SCALES SHOWN BASED ON 22"x34" DRAWING

Sheet Reference No.
CE501
INDEX: OF