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DIVISION 01 - GENERAL REQUIREMENTS

SECTION 01412

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SECTION 01412

TURBIDITY CONTROL CURTAIN

PART 1 GENERAL

1.1 SCOPE

This Section describes the measures to be taken to control turbidity during construction.

1.2 APPLICABLE PUBLICATIONS

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by the basic designation only.

American Society for Testing and Materials (ASTM).

ASTM D 3776	Test Methods for Mass per Unit Area (weight) of Woven Fabric
ASTM D 3786	Hydraulic Bursting Strength of Knitted Goods and Non woven Fabrics -Diaphragm Bursting Strength Tester Method
ASTM D 3885	Standard Test Method for Abrasion Resistance of Textile Fabrics
ASTM D 4355	Test Methods For Deterioration of Geotextile From Exposure to Ultraviolet Light and Water
ASTM D 4491	Test Methods For Water Permeability of Geotextiles by permittivity
ASTM D 4533	Test Methods For Trapezoidal Tearing Strength of Geotextiles
ASTM D 4632	Grab Breaking Load and Elongation of Geotextiles
ASTM D 4751	Determining the Apparent Opening size of Geotextiles
ASTM D 4833	Index Puncture Resistance of Geotextiles, Geomembranes, and Related Products
ASTM D 5035	Standard Test Method for Breaking Force and Elongation of Textile Fabrics (Strip

Force)

ASTM E 84

Test Method For Surface Burning
Characteristics of Building Materials

1.3 SYSTEM PERFORMANCE.

Turbidity shall be controlled by construction of an area formed by floating and/or staked turbidity curtains around groin demolition, groin construction and beach fill operations to protect nearshore seagrass beds. Turbidity outside the settling area during construction shall not exceed 29 Nephelometric Turbidity Units (NTU's) above background. The contracting Officer may require the Contractor to work with a curtain manufacturer to improve the curtain design if the turbidity standards are not met. A double-curtain barrier may be required to reduce turbidity.

PART 2 PRODUCTS

2.1 MANUFACTURER.

Type PC-2 curtains manufactured by American Boom and Barrier or equivalent are to be used.

2.2 MATERIALS.

2.2.1 Fabrics.

The curtain shall be manufactured with 22oz/sq yd PVC reinforced fabric combined with Mirafi 700x or equivalent woven geotextile fabric. The 22 oz/sq yd fabric shall be certified by the manufacturer as having a minimum specification of:

Base Fabric:	Weight per square yard:	6.0 oz
	Fabric Count:	Warp 26/Fill 12
	Denier:	1000 x 1800
	Scrim:	polyester/Nylon
	Weave I	Oxford
Total weight per square yard (ASTM D 3776):		22 +/- 1oz
Adhesion of coating:		25 lbs/2 in
Type of Coating:		Face: PVC / Back: PVC
Mullen Burst (ASTM D 3786):		600 psi
Distribution:		Face: 60% / Back: 40%
Grab Tensile Strength (ASTM D 4632):		Warp 500/Fill 450 lbs)
Tensile strength (1") (ASTH D 5035):		Warp 400/Fill 300 lbs
Trapezoidal Tear Strength (ASTM D14533):		Warp 110/Fill 110 lb.
Abrasion Resistance (ASTM D 3885):		300 Cycles* Normal 550
Rot Resistant		
Mildew Resistant		
Ultraviolet Resistant		
Flame certification -ASTM E-84, Class A/UL-214		

Woven Geotextile:

Grab Tensile Strength (ASTM D-4632):	Warp 370/Fill 250 lbs
Grab Tensile Elongation (ASTM D-4632):	Warp 16%/Fill 15%
Mullen Burst Strength (ASTH D-3786):	480 psi
Puncture strength (ASTH D-4833):	135 lbs
Trapezoid Tear Strength (ASTM D-4533):	Warp 100/Fill 60 lbs
Apparent Opening Size (ASTM D4751):	70 (U. S. Std.)
permittivity (ASTM D-4491):	4/.ec
Flow Rate (ASTH D-4491):	0.28 gpm/ft. sq.
UV Resistance (ASTM D-4355):	18% strength retained
After 500 hrs	90% strength retained.

2.3 COMPONENTS.

2.3.1 Color AND Lighting.

Barriers shall be a highly visible bright yellow or international orange that will attract the attention of boaters and other navigation vessels. The barrier. must be marked by lights during bad weather and during night time hour.

2.3.2 Seams and Seals.

Metal plates or strips, Plastic stripe, and other forms of inappropriate sealing mechanism of the materials shall not be accepted as they do not attain a continuous watertight seal, they may be the direct cause of damage. to the curtain edges, or cause fatigue resulting in the loss of seal and ultimate failure of the curtain.

2.3.2.1 PVC Reinforced fabrics.

All seams of PVC reinforced fabric in the horizontal directions shall be hot air welded to a minimum of 1 1/2 inches in width forming a continuous unbroken seal and attaining a parting strength equal to or greater than the adhesion specification of the fabric. R welding in the horizontal direction is not permitted. All seams of PVC reinforced fabric in the vertical direction shall be R welded with a minimum width of 1 inch. All R welded seams in the vertical direction shall overlap a minimum of 1 inch. All end seals in the vertical direction of the PVC reinforced fabric of the constructed curtain shall maintain a minimum width of 2 inches.

2.3.2.2 Woven Geotextile fabrics.

All seams of Woven Geotextile fabric. shall be sewn in such a manner (300 series lock stitch recommended), that the seams exceed the strength of all fabrics incorporated in the finished product. As a minimum, no less than two sewn lines shall be acceptable. Geotextiles shall be folded at the sewn edge to attain maximum strength.

2.3.3 Flotation.

Flotation shall be flexible, buoyant units, contained in an

individual flotation sleeve or collar attached to, or an internal part of, the curtain. Buoyancy provided by the flotation units shall be sufficient to support the weight of the curtain and maintain a minimum freeboard of 80% of the flotation height above the water surface level. The flotation shall have minimum specifications of:

- a. 19 lbs per cubic foot buoyancy
- b. Polystyrene block
- c. Maximum length of 8 feet
- d. Minimum diameter of 6 inches
- e. All edges shall be made blunt
- f. All ends shall be tapered and blunted

2.3.4 Load Lines.

Bottom load lines shall be fabricated into the bottom of all floating turbidity curtains. This bottom tension load line shall be a chain incorporated internally into the bottom continuous hem of the curtain and of sufficient weight to serve as ballast to hold the curtain in a vertical position when no load is applied. The ends of each chain shall be securely fastened to the vertical edges of each section of barrier utilizing a galvanized shackle. Quick Links or other means of fastening is not permitted. The upper load line must be fabricated into the top of the fabric. The upper load line shall be a vinyl-sheathed steel cable, or uncoated cable inserted through tubing. The wire rope (cable), shall be 5/16 inch diameter, 7x19 galvanized wire rope with minimum breaking strength of 9,800 lbs. The wire rope shall be HD thimbled and swaged at both ends, the swedge shall completely cover the exposed ends of the cable. The wire rope shall be inserted and completely encapsulated through tubing which shall not impede the vertical movement of the wire rope. Continuous tubing shall be used, separate pieces or sections of tubing shall be unacceptable. The wire rope shall terminate a distance of no less than six inches from the leading vertical edge of the barrier and be attached to a hook (with latch) which meets or exceeds the break strength of the wire rope.

2.3.5 Drain.

Sufficient drains shall be provided to allow complete drainage of the water from the bottom ballast pocket upon recovery of the curtain. Drains also allow the release of trapped air during deployment.

2.3.6 Connecting Device.

The 100 foot sections of the curtain shall be connected with a slotted PVC tube connector. The tubing shall be schedule 40 PVC reinforced with aluminum bands, which are riveted to the tube by aluminum pop rivets. The slot in the tube, used to hold the ends of the curtain, shall not exceed 1/4 inch in width. All corners shall be rounded. The PVC slotted tube connector shall include a lanyard and peg which shall have sufficient length and diameter to fit to and through a grommet located at the top corners of the barrier, preventing the loss of the tube when deploying, recovering, or when stresses force the connector to release from the curtain. The PVC slotted Tube should be allowed to release from the curtain

when the current or water volume exceeds the full strength of the curtain itself, thereby preventing undue damage to the barriers.

PART 3 EXECUTION

3.1 ERECTION

The curtain shall not be in contact with the bottom of the waterway. A minimum 1 foot gap should exist between the weighted lower end of the skirt and the bottom at mean low water. Turbidity curtain shall be placed parallel to groins and along the beach fill area to prevent dispersion of sediments into the seagrass beds. The ends of the curtain shall be secured firmly. Rock anchors with an embedment strength equal to or exceeding the top load lines may also be used. Joint spacing in the curtains shall be approximately 100 feet. If the contractor elects to extend the curtain to the bottom of the water course, a heavy woven pervious filter fabric may be substituted for the pvc fabric.

3.2 ANCHORING

3.2.1 Manufacturer's Recommendations

Manufacturer's recommendations should be followed for anchoring the curtains.

3.2.2 Anchors

Anchors must be sufficient to hold the curtain in the same position relative to the bottom of the watercourse with the curtain in its designated position. The anchor may dig into the bottom (grappling hook, plow, or fluke-type) or may be weighted (mushroom type, cement block) Anchor line should run from the buoy to the connector of the curtain to the top load line between buoys.

3.2.3 CONTRACTOR'S ELECTION

The Contractor may elect to use anchors that consist of wooden or metal stakes (2x4 inch or 2.5 inch minimum diameter wood or 1.33 pounds per linear foot steel) if the Contractor deems the stakes will be sufficient to hold curtain.

3.2.4 Anchoring

Anchors should be installed on both sides of the curtain.

3.3 INSTALLATION

Set all curtain anchor points prior to curtain deployment. Care must be taken to ensure that anchor points are of sufficient holding power to maintain the curtain under the existing current conditions, prior to putting the furled curtain into the water. The curtain should remain furled until completely anchored in place. Anchor buoys should be employed on all anchors to prevent the current from submerging the flotation at the anchor points and to visibly mark the anchor locations for other waterway traffic.

When the anchors are secure, the furled curtain should be attached to the upstream anchor point, and then sequentially attached to each next downstream anchor point. Any necessary adjustments to the lay of the curtain should be made prior to unfurling the curtain.

3.4 REMOVAL OF THE TURBIDITY BARRIER

Care should be taken to protect the skirt from-damage as the turbidity curtain is removed from the water. The use of a crane is not recommended as a method to pick up and remove non-bundled lengths of turbidity barrier from the water. Neither is the use of a vehicle to drag the turbidity barrier from water recommended. When the curtain is no longer required, as determined by the Contracting Officer, the curtain and related components shall be removed in such a manner as to minimize the release of sediment and creation of turbidity. Remaining sediment shall be sufficiently settled before removing the curtain. The turbidity barrier should be removed in small sections, cleaned, repaired and folded according to manufacturer's recommendations.

3.5 MAINTENANCE

The Contractor shall be responsible for maintenance of the turbidity barrier for the duration of the project. The barrier shall be maintained in a condition which shall ensure the continuous protection of the seagrass beds. Should repairs to the turbidity barrier be necessary, there are repair kits available from the manufacturer; manufacturer's recommendations or instructions must be followed to ensure the adequacy of the repair and continued appropriate use of the barrier. Repair kits shall be kept on site during the work.

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