

TURBIDITY CURTAINS

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This document is distributed by Elastec/American Marine, Inc. to provide familiarization with silt control curtains and their good and bad points. It is intended to provide basic information to marine construction planners and on-site supervision regarding the selection, installation, maintenance, repair and storage of silt control curtains.

APPLICATION AND PERFORMANCE OF SILT CURTAINS

1. GENERAL DESCRIPTION

One method for physically controlling the dispersion of near surface turbid water in the vicinity of open-water pipeline disposal operations, effluent discharges from upland containment areas, and possibly small (clamshell) dredging operation in quiescent environments involves placing a silt curtain or turbidity barrier either downstream or around the operation. Silt curtains (Fig. 1) are impervious, vertical barriers that extend from the water surface to specified water depth. The flexible, polyester reinforced vinyl fabric forming the barrier is maintained in a vertical position by flotation material at the top and a ballast chain along the bottom. A tension cable is often built into the curtain immediately above or just below the flotation segments (top tension) to absorb stresses imposed by currents and other hydrodynamic forces. The curtains are usually manufactured in 100 ft. sections that can be joined together at a particular site to provide a curtain of specified length. Anchored lines hold the curtain in a deployed configuration that is usually U-shaped or circular.

Silt curtain effectiveness, defined as the degree of turbidity reduction outside the curtain relative to the turbidity levels inside the curtain enclosure, depends on several factors such as the nature of the operation; the quantity and type of materials in suspension within or upstream of the curtain; the characteristics, construction, and condition of the silt curtain, as well as the area and configuration of the curtain enclosure; the method of mooring; and the hydrodynamic conditions (i.e., currents, tides, waves, etc.) present at the site. Because of the high degree of variability in these factors, the effectiveness of different silt curtain operations is consequently highly variable. It should be emphasized here that silt curtains cannot effectively be used around every conceivable dredging or disposal operation; they are not recommended for operations in the open ocean, in currents exceeding 1 kt, in areas frequently exposed to high winds and large breaking waves, or around hopper or cutterhead dredges where frequent curtain movement would be necessary.

2. PROCESSES EFFECTING SILT CURTAIN PERFORMANCE

In many cases where silt curtains are used the concentration of fine-grained suspended solids inside the curtain enclosure may be relatively high (i.e., in excess of 1/g) of the suspended material may be composed of relatively large, rapidly settling flocs. In the case of a typical pipeline disposal operation surrounded by a silt curtain (Fig. 2) where suspended solid concentrations are high and material usually flocculated, the vast majority (95 percent) of the fine-grained material descends rapidly to the bottom where it forms a fluid mud layer that slopes away from the source of material at an approximate gradient of 1:200. The other 5 percent of the material remains suspended in the water column above the fluid mud layer and is responsible for the turbid appearance of the water inside the curtain. While the curtain provides an enclosure where some of the fine-grained material may flocculate and/or settle, most of this fine-grained suspended material in the water column escapes with the flow of water and fluid mud under the curtain. The silt curtain does not indefinitely contain turbid water but instead controls the dispersion of turbid water by diverting the flow under the curtain, thereby minimizing the turbidity in the water column outside the silt curtain.

Whereas properly deployed and maintained silt curtains can effectively control the flow of turbid water, they are not designed to contain or control fluid mud. In fact, when the accumulation of fluid mud reaches the depth of the ballast chain along the lower edge of the skirt, the curtain must be moved away from the discharge; otherwise sediment accumulation on the lower edge of the skirt will pull the curtain underwater and eventually bury it. Consequently, the rate of fluid mud accumulation relative to changes in water depth due to tides must be considered during a silt curtain operation.

3. SILT CURTAIN EFFECTIVENESS

In some cases where relatively quiescent current conditions (0.2 ft/sec or less) are present, turbidity levels (measured in terms of NTU's or mg/l) in the water column outside the curtain can be 80 to 90 percent lower than the levels inside or upstream of the curtain. While there may be a turbid layer flowing under the curtain, the amount of suspended material in the upper part of the water column, as a whole, is substantially reduced. However, the effectiveness of silt curtains can be significantly reduced in high energy regimes characterized by currents and

turbulence. High currents cause silt curtains to flair, thus reducing the curtain's effective depth; in fact, in a current of 1 kt the effective skirt depth of a 5-ft curtain is approximately 3 ft. Increased water turbulence around the curtain also tends to resuspend the fluid mud layer and may cause the turbid layer flowing under the curtain to resurface just beyond the curtain.

However, even under moderate currents (up to 0.5 kt), a properly deployed and maintained center tension curtain can effectively control the flow of turbid water (under the curtain). In other cases, where anchoring is inadequate and particularly at sites where tidal currents dominate the hydrodynamic regime and may cause resuspension of the fluid mud as the curtain sweeps back and forth (over the fluid mud) with changes in the direction of the current, the turbidity levels outside the curtain can be as much as 10 times higher than the levels inside the curtain. With respect to overall effectiveness and deployment considerations a current velocity of approximately 1.5 ft/sec appears to be a practical limiting condition for silt curtain use.

4. GUIDELINES FOR SELECTING AND USING SILT CURTAINS

A. SITE SURVEY: Prior to specifying or selecting a curtain for a particular project, it is necessary to characterize the deployment site with respect to current velocity, water depth (relative to tidal range), bottom sediment types, and possibly background levels of turbidity. Since silt curtains are only marginally effective at current velocities in excess of 1 kt, maximum surface currents over a tidal cycle (12 or 24 hours) should be established first. Current velocities can be estimated by determining the time that it takes for a block of wood to float downstream a specified distance; velocity is equal to distance divided by time. In addition, information on current direction and water turbulence may also indicate potential deployment problems and/or the best configuration(s) to use.

If hydrodynamic regime appears to be conducive to silt curtain deployment (i.e., current velocities are less than 1 kt), a survey of the water depths over the entire site and surrounding areas is required so that a curtain with a proper skirt depth can be selected and its initial and future placement geometries determined. At the sites where the tidal range (i.e., the difference in depth between high and low tide) is negligible, a simple bathymetric survey can be performed preferably with a vessel equipped with a

precision navigation system and a fathometer. However, if tidal prediction tables (or curves) indicate that the tidal range exceeds approximately 1 ft over a tidal cycle, the survey data must be adjusted to account for these changes in the water depth that will occur during the silt curtain operation. These minimum depths at the lowest low tide are then used to determine necessary skirt depth allowing 1 or 2 ft of clearance between the lower edge of the skirt and the existing bottom in the disposal area at the lowest low tide during the operation. The effect of fluid mud accumulation on water depth as well as the proposed schedule for moving the silt curtain to prevent burial should also be considered in selecting the curtain skirt depth.

In addition to evaluating the current conditions and water depths, the character of the bottom sediment/vegetation at the proposed deployment site should also be established using a grab sampler or a coring device, to determine the type of anchors to use. Convenient anchor points on the outer limits of the deployment site should also be noted. The potential effect of boat traffic and boat generated waves on the proposed deployment configuration and mooring system should also be considered. Since launching and retrieving the silt curtain will undoubtedly involve the use of a large truck and a boat(s), a launching ramp, crane services, etc., should be located as near the site as possible. If an evaluation of silt curtain effectiveness relative to pre-operation on background conditions is desired, background turbidity levels must be determined preferably under a variety of current and wave conditions. Samples may be taken with a conventional water sampler at the surface, mid-depth, and near the bottom.

B. DEPLOYMENT CONFIGURATIONS. After the deployment site has been surveyed, the geometry of the deployed curtain should be determined based on the type of silt curtain application, the hydrodynamic regime at the deployment site, and such factors as boat traffic. Any environmental policies regulating allowable turbidity levels as a function of distance from the operation should also be considered. Some typical deployment geometries are shown in Fig. 3.

In some cases, the curtain may be deployed in an open-water environment in the form of a “maze”, a semi-circle or U, or a circle or ellipse. The maze configuration (“A”,

Fig. 3) has been used on rivers where boat traffic is present, but appears to be relatively ineffective due to direct flow through the aperture between the curtain sections. On a river where the current does not reverse, a U configuration (“B”, Fig. 3) is acceptable, but the distance between the anchored ends of the curtain (i.e., across the gap) should be large enough to prevent leakage of turbid water around the ends of the U. Where the turbid water is being generated by effluent from a containment area or a pipeline disposal operation close to the shoreline the curtain can be anchored in a semi-circular or U configuration (“C”, Fig. 3) with the ends of the curtain anchored onshore approximately equidistant from the discharge point. The required radius of the configuration is determined by the type and volume of material being disposed inside the curtained area as well as the water depth. (Procedures for calculating the necessary radius and/or schedule for moving the curtain to prevent burial are given in Fig. 8). In a tidal situation with reversing currents a circular or elliptical configuration (“D”, Fig. 3) is necessary. Unfortunately, this latter case requires a more extensive mooring system. Typical curtain might be 500 to 1500 ft for the U or semi-circular configurations; 1000 to 3000 ft for the circular/elliptical case.

- C. SILT CURTAIN SPECIFICATIONS. The silt curtain can now be selected based on the appropriate deployment geometry and the characteristics of the deployment site. From an evaluation of silt curtain performance under varying field conditions, it is recommended that silt curtains have a skirt depth such that the lower edge is 1 to 2 ft off the bottom at low water; however, the skirt depth should not exceed 10 ft unless the current velocities at the site are negligible. The fabric should be a reinforced PVC material (or equivalent) with a minimum tensile strength of 300 lb/in.; a minimum fabric weight of 13 oz/sq yd for very low current conditions, 22 oz/sq yd for higher current conditions; a tear strength of 80 lbs or 200 lbs for 13 oz or 22 oz fabric, respectively; and a tensile strength after abrasion of greater than 200 lb/in. The fabric surface should be easy cleaning and resistant to marine growth, ultraviolet light, and mildew. All fabric seams should be heat sealed. Sections of solid, closed-cell, plastic foam flotation material should be sealed into a fabric pocket and provide a buoyancy ration (buoyant force/curtain weight) of greater than 5. Each flotation section should have a maximum

length of less than 10 ft so the curtain may be easily folded for storage or transport. In low current situations (where velocities are less than 0.1 kt) most available connectors for joining 100 ft sections probably maintain adequate physical contact along the entire skirt joint. If current velocities exceed 0.1 kts aluminum extrusion (or an equivalent) load transfer connectors are recommended (Fig. 4). The non-corrosive, ballast chain should have a weight ranging from approximately 1 lb/in ft for a 5 ft skirt depth up to 2 lb/in ft for a 10 ft skirt depth. When current velocities are negligible, no tension member (other than the fabric itself) is necessary. For current velocities between 0.1 and 1.0 kt, a galvanized or stainless steel wire rope should be used as a top or center tension member; the center tension curtain provides a greater effective skirt depth, and strength, but requires more effective anchor systems. Repair kits are necessary for patching minor tears in the fabric.

5. TRANSPORTATION.

When transporting silt curtains from a storage facility to an unloading site, they should be furled (Fig. 5) tied with light straps or line every 3 to 5 ft, compactly folded accordion style, packaged into large bundles, carefully lifted into the transport vehicles, and transported to the unloading site. At the unloading dock the curtain can be unloaded and maneuvered into the water by backing the truck down the ramp so that the tailgate is as close as possible to the water and then unloading the curtain by carefully pulling it out of the truck (like a string of sausages); the 100 ft sections are joined as they are payed out. After all the sections have been joined, the curtain can be towed to the site by boat at 2 to 3 kts. Curtains over 2000 ft long have been towed in this way. The curtain should always remain furled until it has been deployed at the operation site. An alternative method involves maneuvering the curtain onto an open-decked work boat or barge, transporting it to the site, and finally offloading the curtain in sections. The sections are then joined as the curtain is deployed.

6. MOORING.

Improper and/or inadequate mooring systems have historically contributed to silt curtain

ineffectiveness and catastrophic failure. The recommended mooring system (Fig. 6) consists of an anchor, a chain, an anchor rope (line or cable), and mooring and crown buoys. It is recommended that the curtain be anchored from the section joints every 50 or 100 ft in a radial pattern (Fig.3) and on both sides if the curtain is exposed to reversing tidal currents. Half-inch polypropylene line used in conjunction with lightweight, self butying anchors with weights of at least 22 lbs for sandy bottom sediment and 50 lbs for mud will provide adequate holding power in most situations. However, with increasing current velocities, the anchor weights will also have to be increased.

After the furled curtain has been anchored, it should be checked to ensure that the skirt is not twisted around the flotation. If this is the case, the curtain should be separated at the nearest connector, untwisted, and rejoined. The curtain in its deployed, untwisted configuration can now be unfurled by simply cutting the furling lines or straps. If the barrier needs to be repositioned during the operation, any curtain with a long skirt depth relative to the ambient current conditions should be refurled before it is moved.

7. DEPLOYMENT MODEL.

The length of time that a silt curtain can remain deployed in its initial configuration before the enclose area must be enlarged or the curtain moved to a new location to prevent siltation along the lower edge of the curtain depends on the accumulation of fluid mud inside the curtain relative to the deployment geometry, the discharge rate, and the initial bottom gap (i.e., the distance between the lower skirt edge and the bottom sediment at the beginning of the operation) as shown in Fig. 7. Although the size of the enclosure is limited by the total length of the curtain available for the project, as the area of the enclosure increases, the length of time before the curtain must be moved also increases. In addition, as the gap between the lower skirt edge and the bottom sediment increases, the frequency of curtain movement decreases. Since it may be necessary to move a silt curtain during an operation, and this involves manpower, the following procedure can be used to develop a general schedule for curtain movement and deployment.

To illustrate the use of the nomograph (Fig 8) used in this procedure, let us assume that approximately 3200 ft. of curtain with a skirt depth of 5 ft. surrounds an open-water pipeline

disposal operation located in a quiescent environment with a water depth of 9 ft. The circular configuration has a radius of approximately 500 ft. The dredged material slurry with a solids content of 15 percent (by weight) is discharged from an 18-in. pipeline at a velocity of 18 ft/sec. To determine when the fluid mud dredged material will build up to the lower edge of the silt curtain:

- a. Enter graph I (upper left, Fig. 8) at “A” for a 500 ft radius.
- b. Proceed vertically to “B”, the planned initial bottom gap (e.g., 4 ft) between the silt curtain and the existing bottom sediment.
- c. Move horizontally through the axis indicating the approximate volume of the fluid mud dredged material mound (e.g., 16 million cu ft) to “C” (graph II).
- d. Draw a vertical line from “C” through the axis indicating the amount of a slurry pumped (20 million cu yd) and into graph IV.
- e. Enter graph III (lower left) at “D”, the appropriate flow velocity (e.g., 18 ft/sec.).
- f. Proceed vertically to the curve indicating the appropriate pipeline diameter (e.g., 18 in.).
- g. Draw a horizontal line from “E” through the discharged rate axis (e.g., at 2.7 million cu ft/day) and into graph IV until it intersects the vertical “total volume of a slurry pumped” line at “F”. The length of time (before the curtain needs to be moved) is estimated from the diagonal time line that goes through “F”.

In this example the operation can probably continue for approximately 7 to 8 days before the curtain must be moved due to sediment buildup to the depth of the lower skirt edge. Fig. 9 shows that the mound will be approximately 6.5 ft thick under the discharge and will extend radially approximately 1300 ft. If the configuration were semicircular, the above procedure would be performed in the same manner (using the radius of the semicircle) and the derived time divided in half. Similarly, if the curtain is deployed in a square configuration with sides of length L , assume that the curtain is circular or elliptical in shape with a radius of $L/2$.

As pointed out previously, this procedure can be used to calculate a very approximate schedule for moving silt curtains. Because of the varying characteristics of an operation (i.e., slurry density, pumping time, etc.) And the settling/consolidation characteristics of the fluid mud, there may be a great deal of variability associated with the rates of dredged material

accumulation. However, this model does provide a conservative (i.e., a shorter length of time between curtain movements than might be necessary at an actual operation) time framework for planning the silt curtain operation. Additional data and experience should indicate the degree of accuracy of this methodology and possible modifications that might improve its usefulness.

8. MAINTENANCE.

To maximize the effectiveness of a silt curtain operation, maintenance is extremely important. This entails moving the curtain away from the turbidity source just before the fluid mud layer reaches the lower edge of the skirt, replacing worn or broken anchor lines, and maintaining the integrity of the curtain by repairing leaking connectors and/or tears in the curtain fabric. Tears in the flotation pocket can be repaired in the water with a hand type pop rivet gun. Moderate tears in the skirt may be repaired on land with a vinyl repair kit or a special heat gun. Because extensively torn sections must be returned to the manufacturer for immediate substitution in the field. Improper maintenance not only will decrease the curtain's effectiveness on a particular operation but also will increase the cost of reconditioning the curtain for reuse.

9. RECOVERY AND STORAGE.

After the operation has been completed, the curtain should be refurled, the anchor/mooring system recovered, and the curtain returned to the launching site for repacking and subsequent storage. If properly stored in a location that is unexposed to the elements, years and reused on a subsequent operations.

10. REMARKS.

The discussion above provides very general information and basic guidelines that should help in evaluating the feasibility of using silt curtains on a particular operation. Experience with their use is necessary to become really proficient in the selection, handling, relocation, maintenance, repair and storage of these devices.

LIST OF ILLUSTRATIONS

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4.	Recommended Aluminum Extrusion Connector for joining Silt Curtain sections.
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6.	Recommended Silt Curtain mooring system.
7.	Parameters effecting the schedule for moving and redeploying Silt Curtains.
8.	Curtain relocation interval rate.
9.	Dimensions of a fluid mud mound with a slope of 1:200.

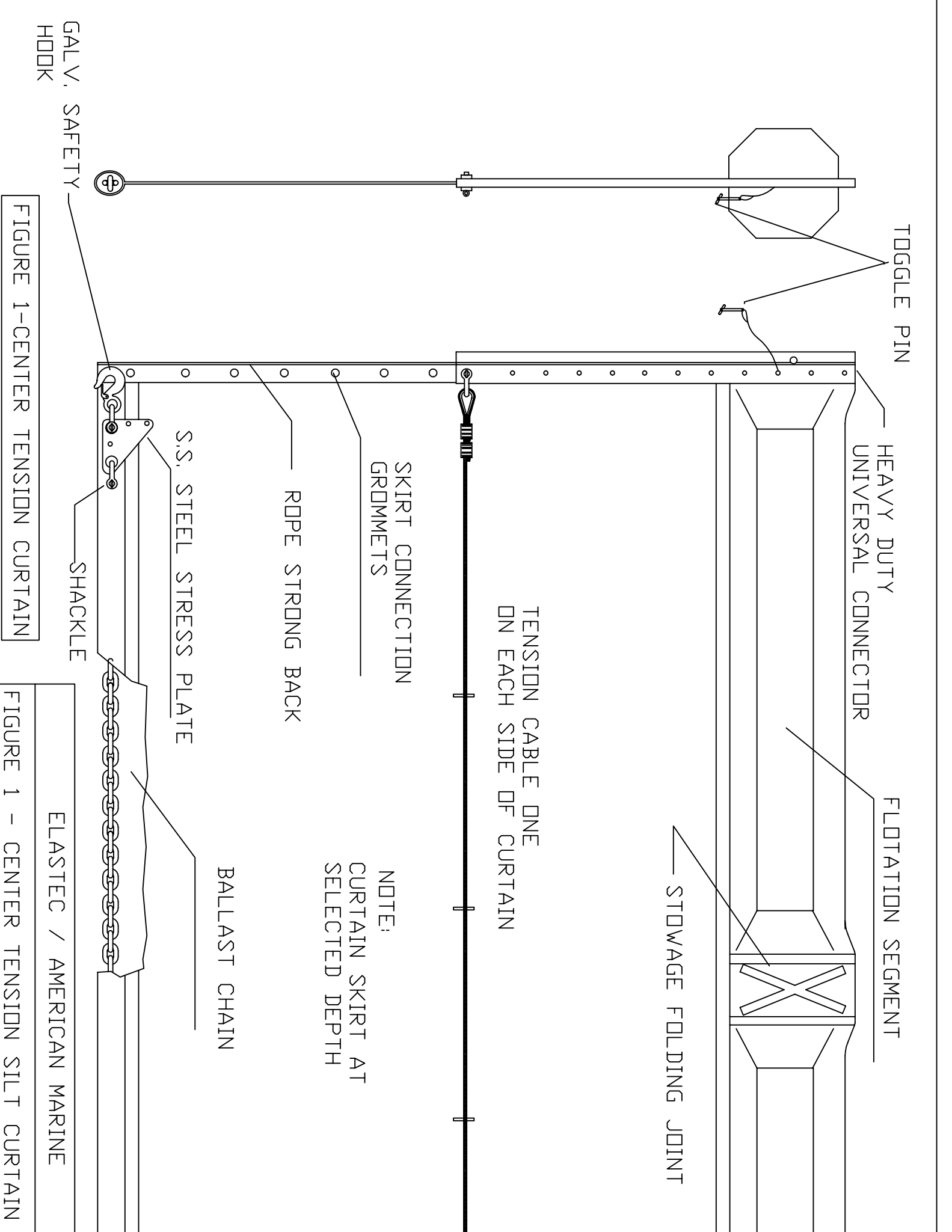


FIGURE 1-CENTER TENSION CURTAIN

FIGURE 1 - CENTER TENSION SILT CURTAIN

PIPE LINE

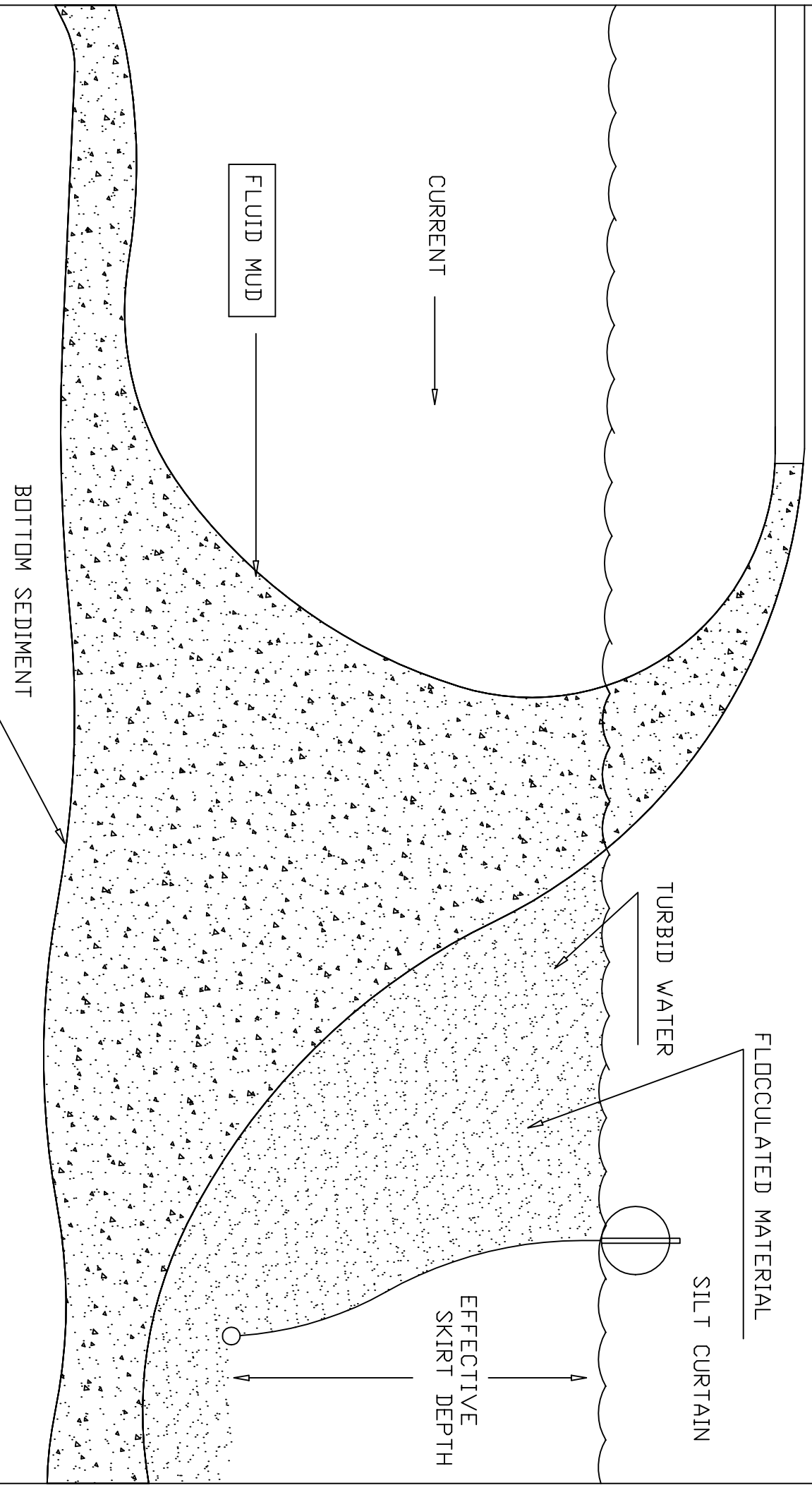


FIGURE 2-PROCESSES AFFECTING THE PERFORMANCE OF SILT CURTAIN CONTROLLING DREDGED MATERIAL DISPERSION.

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FIGURE 2 - SILT CURTAIN PERFORMANCE

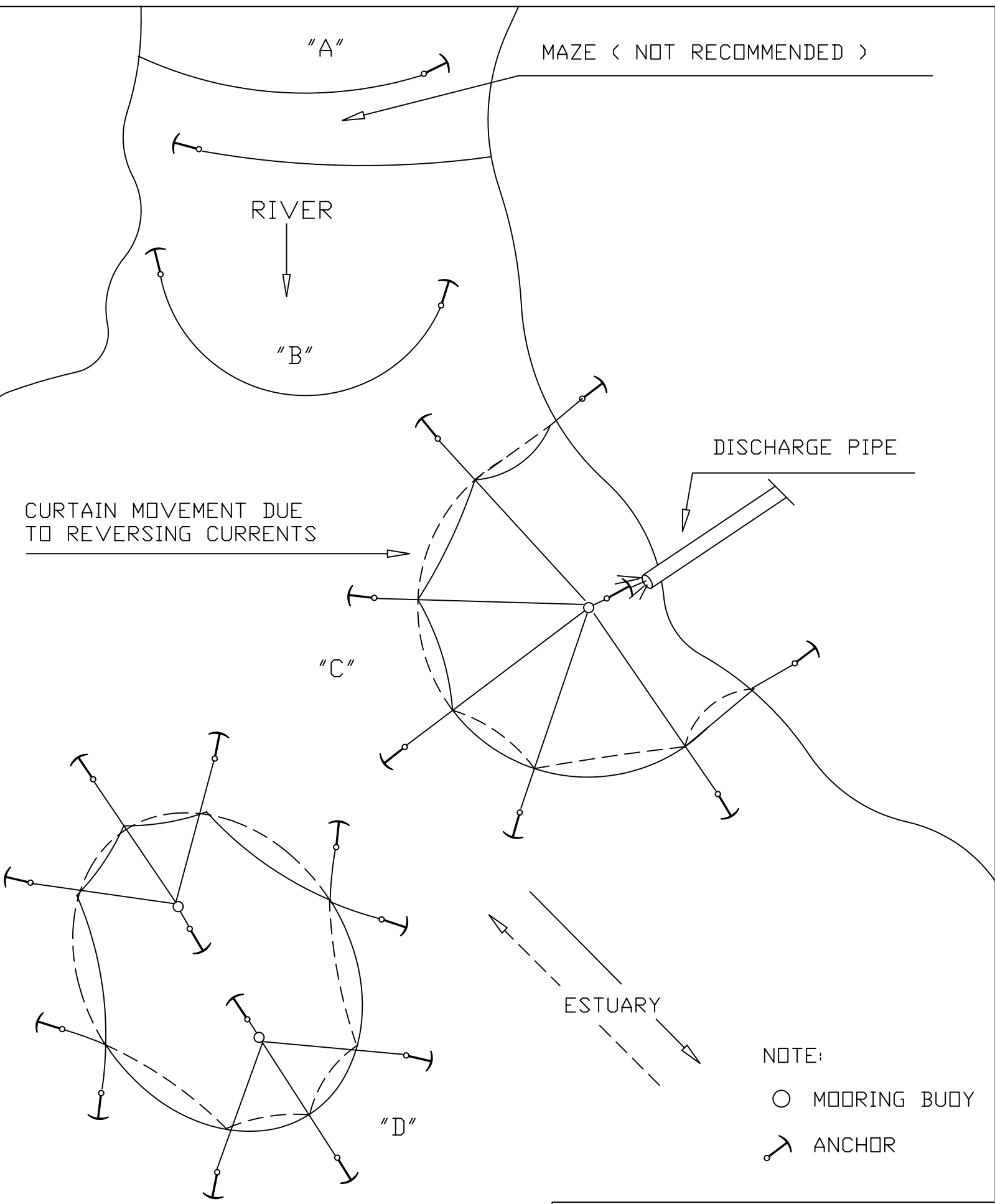
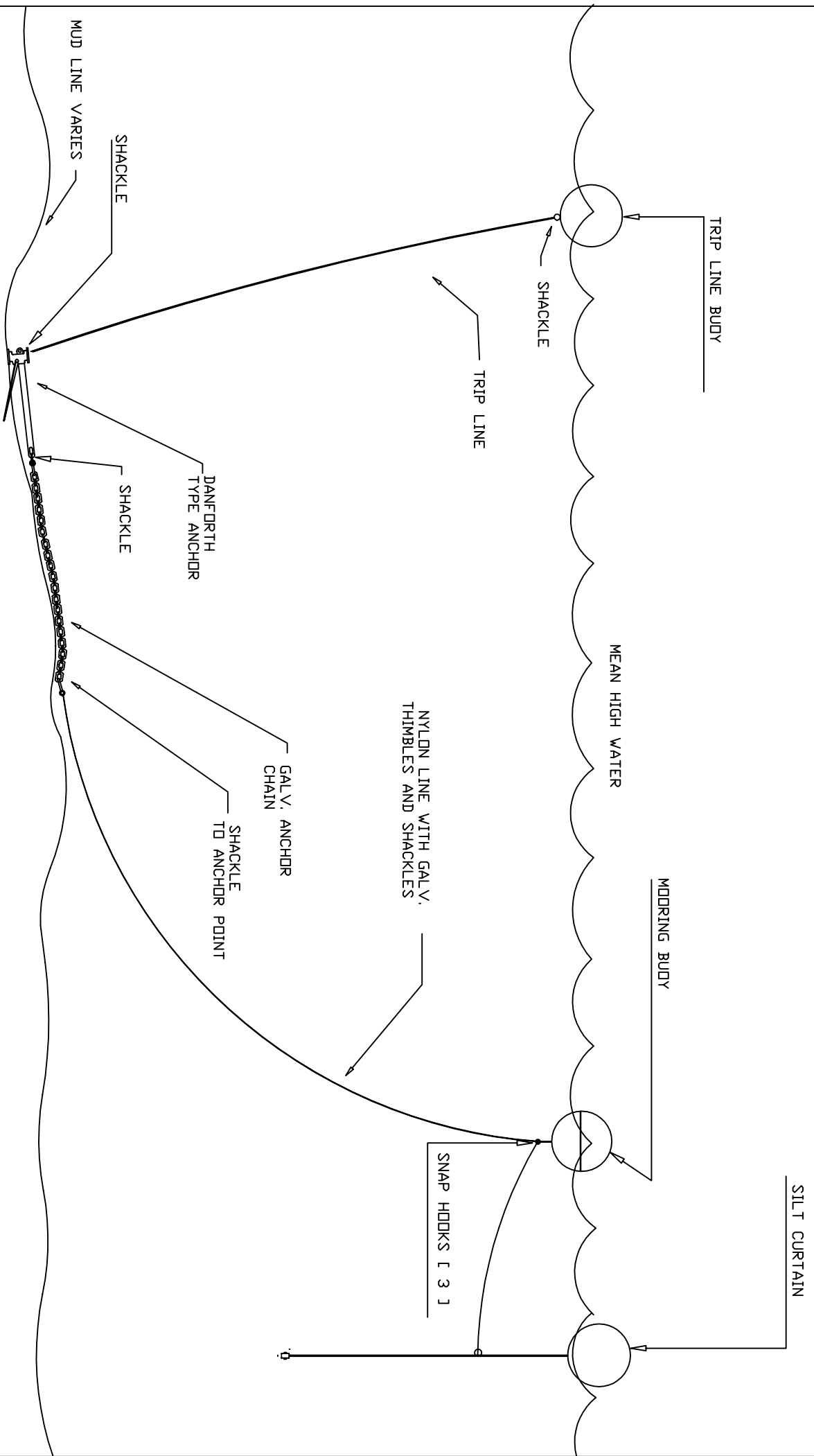


FIGURE 3
 TYPICAL SILT CURTAIN CONFIGURATION



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ANCHOR SYSTEM

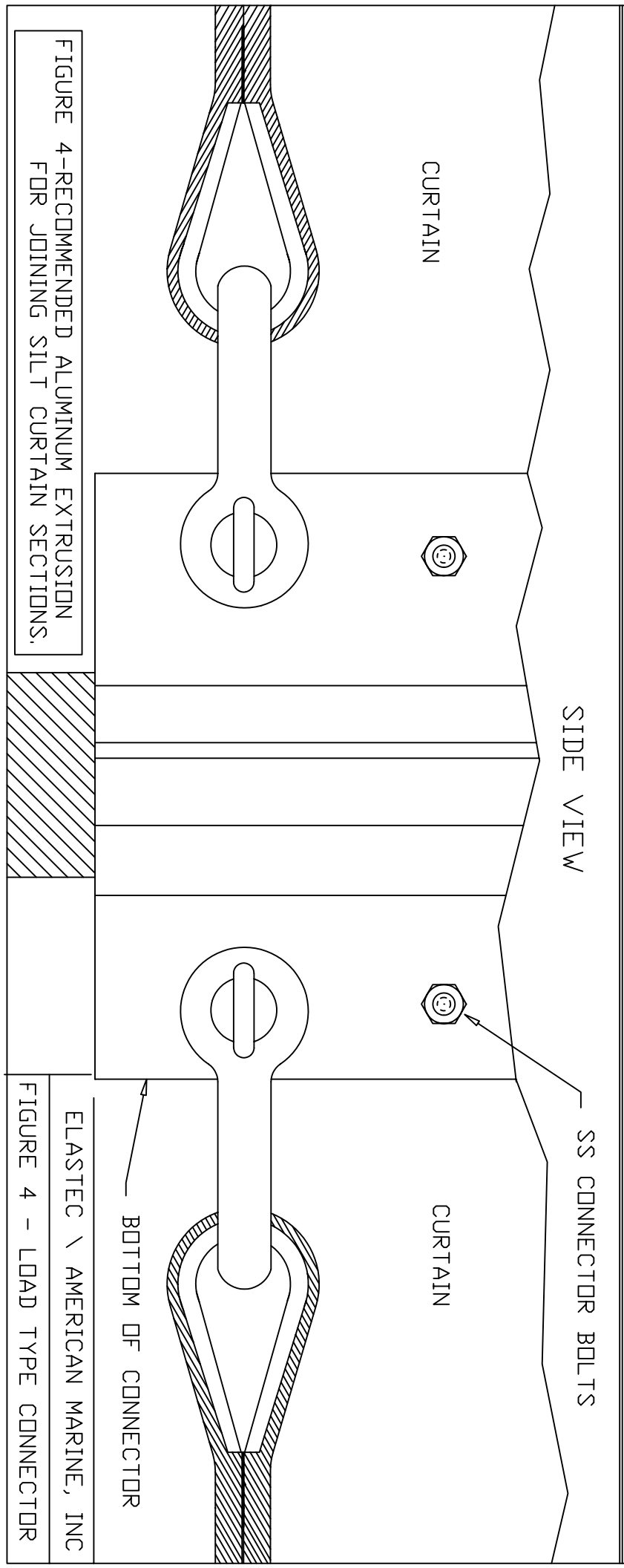
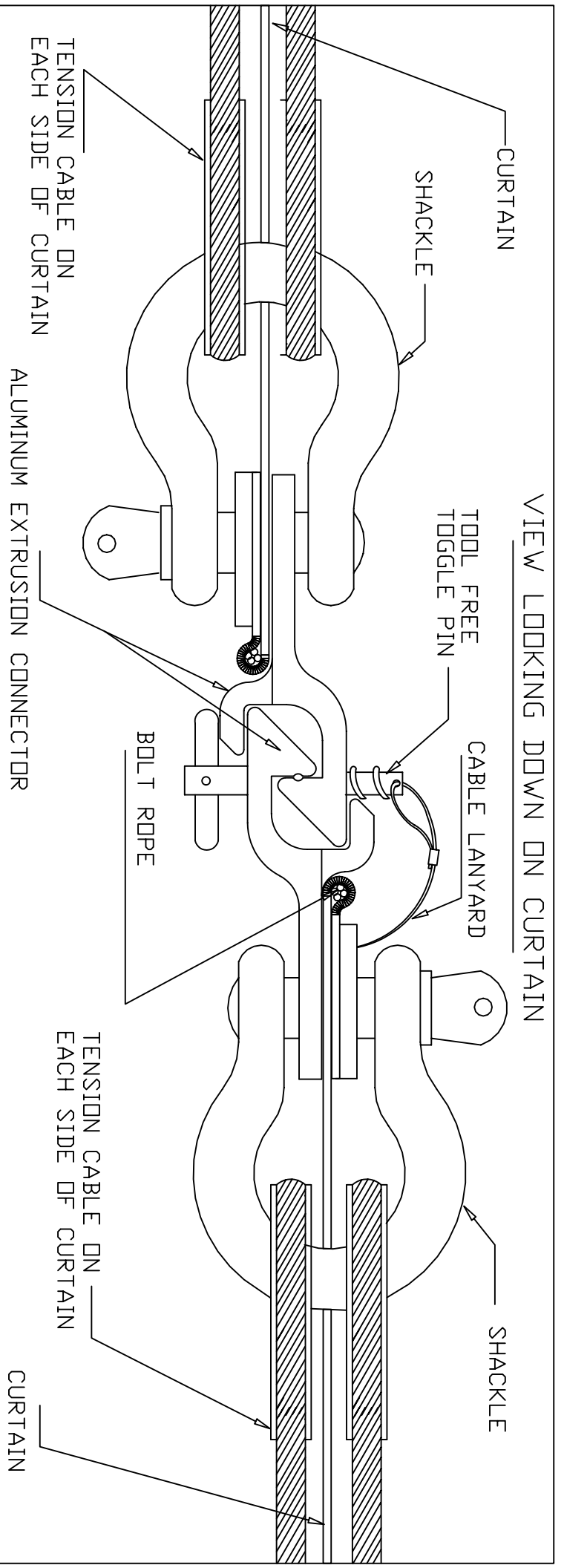
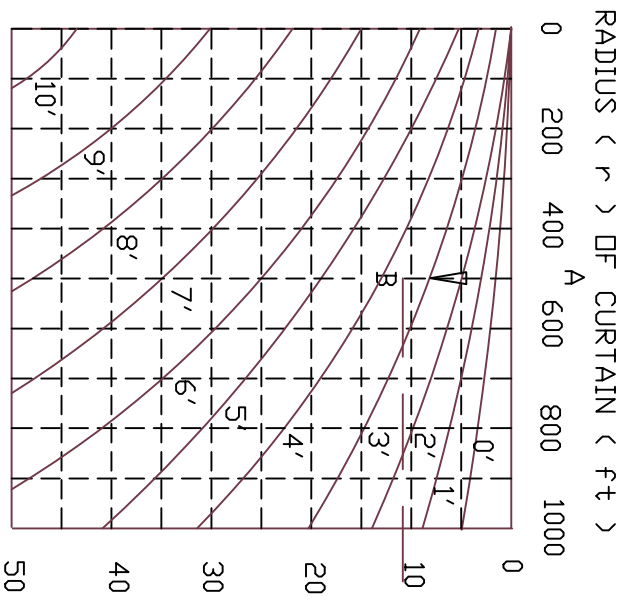
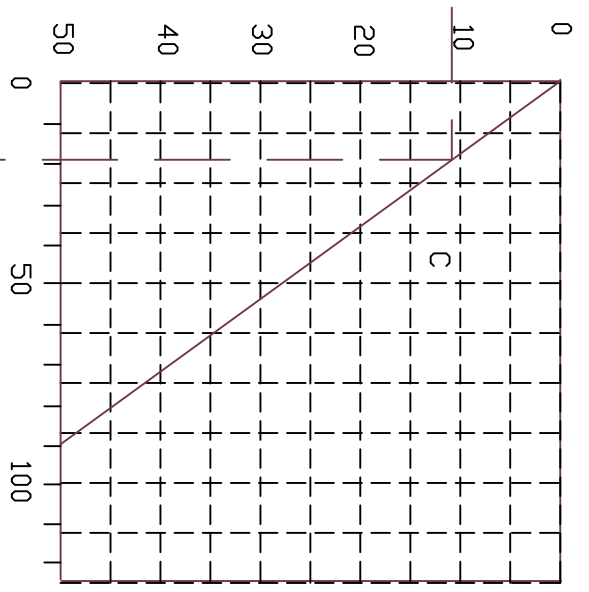


FIGURE 4-RECOMMENDED ALUMINUM EXTRUSION FOR JOINING SILT CURTAIN SECTIONS.

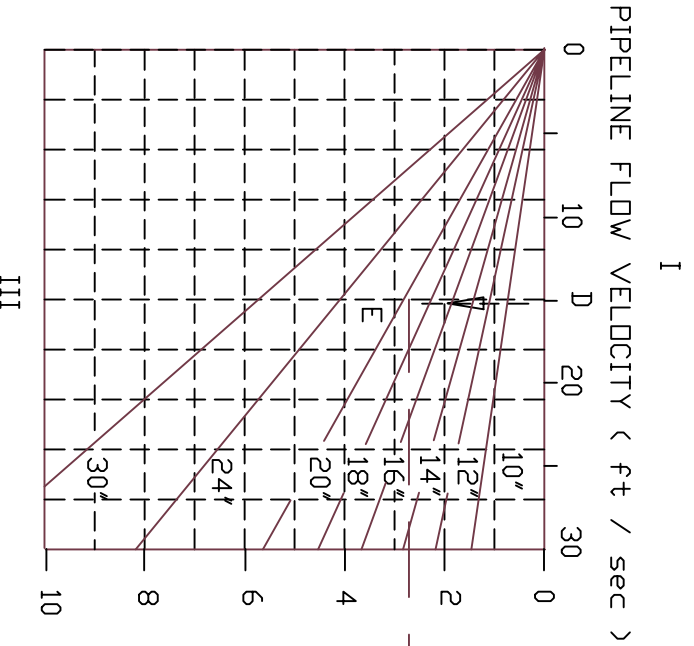
ELASTEC \ AMERICAN MARINE, INC
FIGURE 4 - LOAD TYPE CONNECTOR



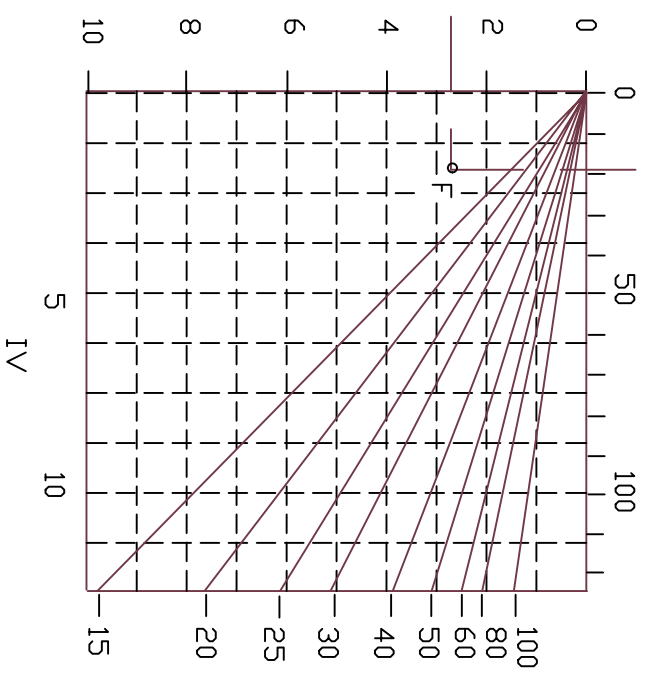
VOLUME OF MOUND (10⁶ FT³)



TOTAL VOLUME OF SLURRY PUMPED (10⁶ FT³)



DISCHARGE RATE (10⁶ FT³ / DAY)



RELOCATION INTERVAL (DAYS)

ASSUMPTION :
 DREDGED MATERIAL - 15% BY WEIGHT
 FLUID MUD - 25% BY WEIGHT
 FLUID MUD MOUND SLOPE - 1 : 200

FIGURE 8 - CURTAIN RELOCATION INTERVAL RATE

ELASTEC / AMERICAN MARINE
 FIGURE 8 - RELOCATION RATE

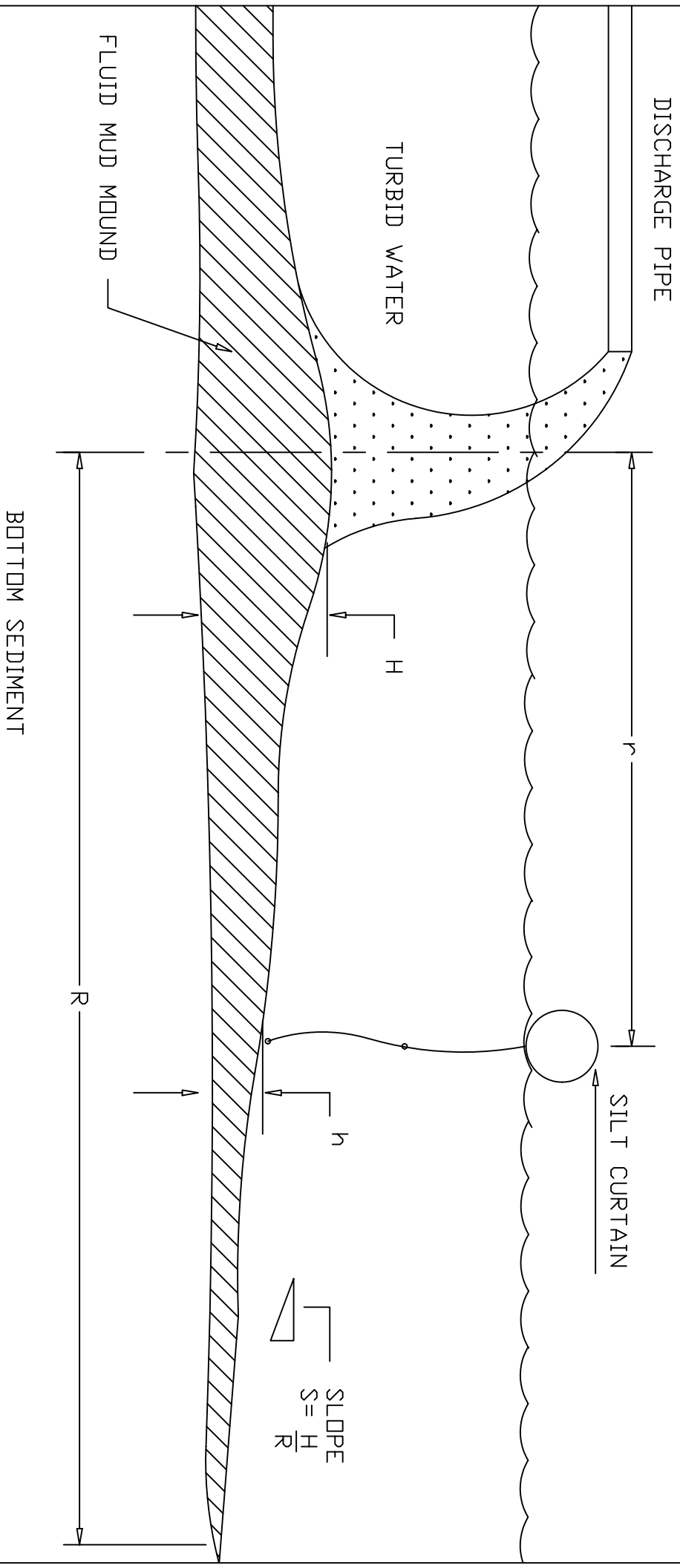


FIGURE 7-PARAMETERS AFFECTING THE SCHEDULE FOR MOVING AND REDEPLOYING SILT CURTAINS

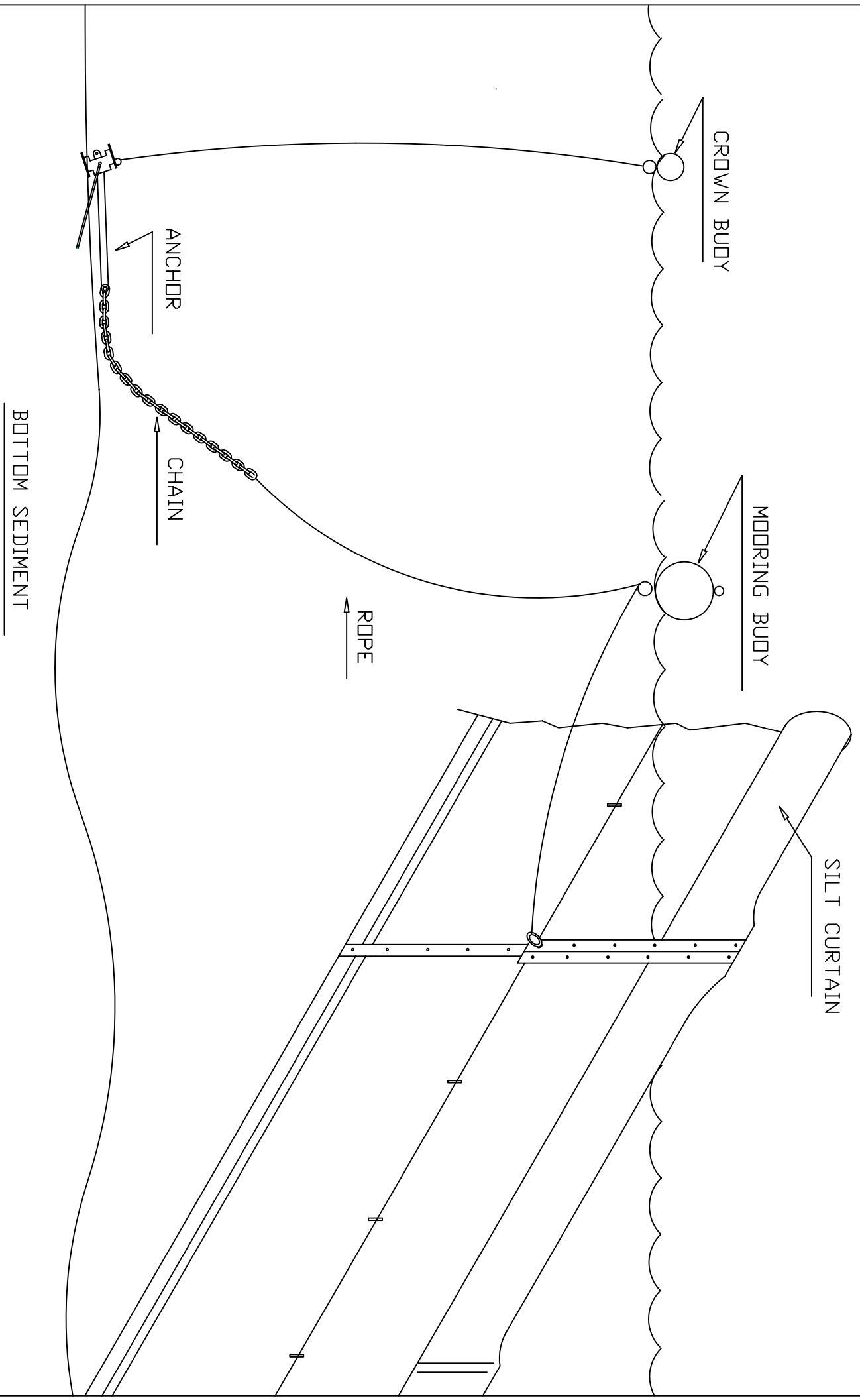
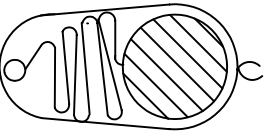
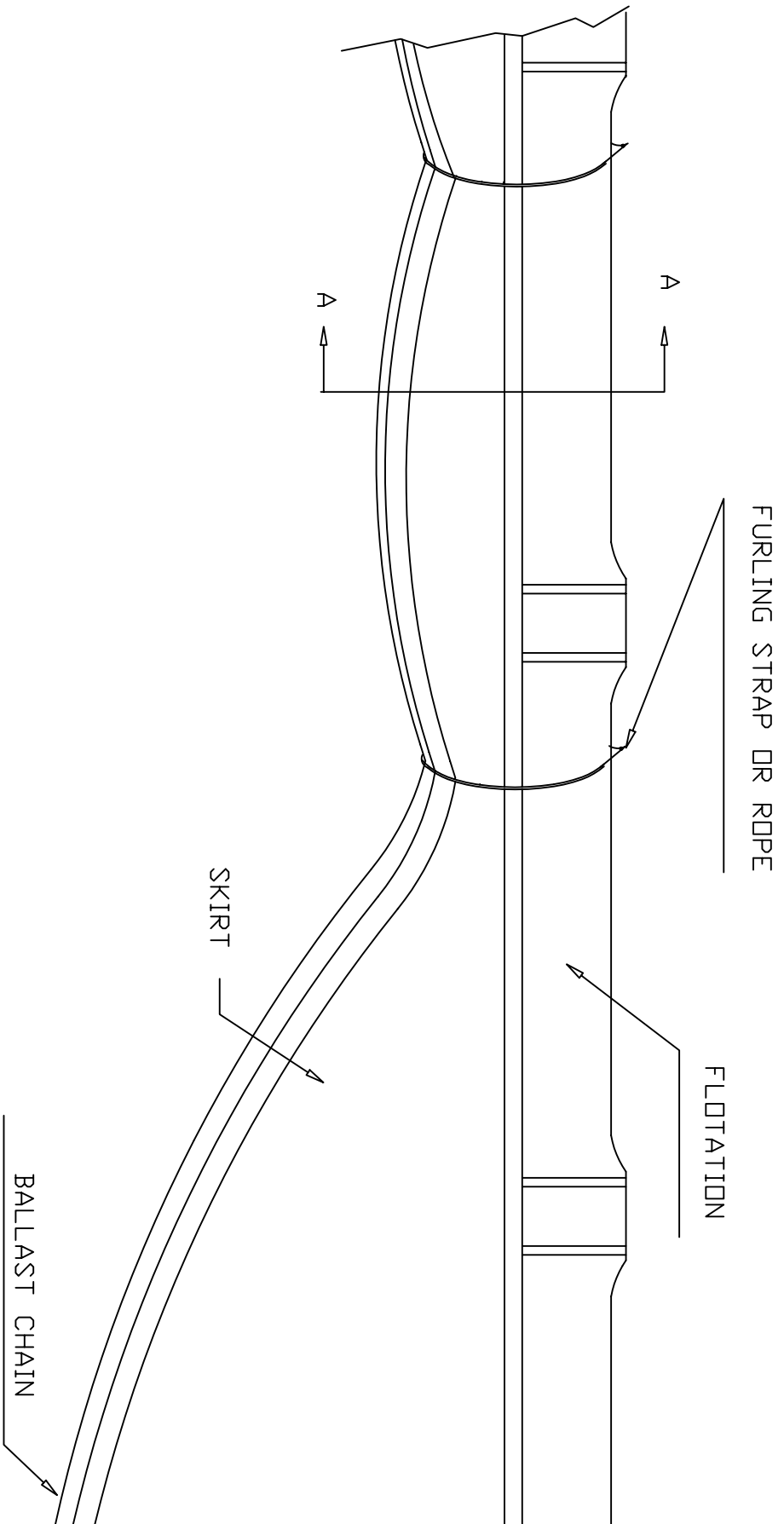


FIGURE 6-RECOMMENDED SILT CURTAIN MOORING SYSTEM

ELASTEC / AMERICAN MARINE INC.
 FIGURE 6 - SILT CURTAIN MOORING



SECTION AA



FURLING STRAP OR ROPE

FLotation

SKIRT

BALLAST CHAIN

FIGURE 5-FURLING OF THE CURTAIN SKIRT FOR DEPLOYMENT AND/OR RECOVERY OF SILT CURTAIN

ELASTEC / AMERICAN MARINE INC.

FIGURE 5 - SILT CURTAIN DEPLOYMENT

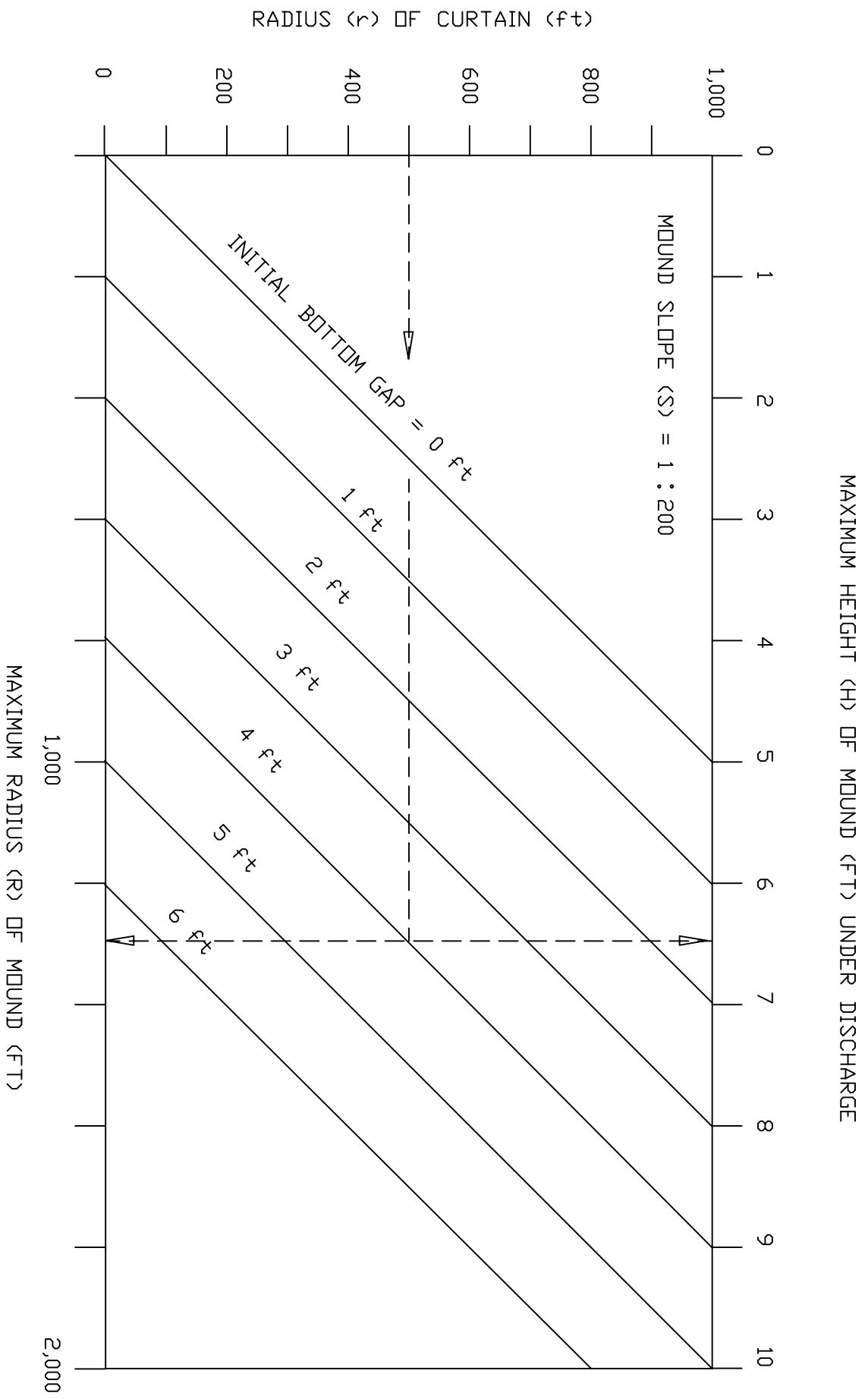


FIGURE 9 - DIMENSIONS OF A FLUID MUD MOUND WITH A SLOPE OF 1 : 200

PRODUCT GUIDE FOR CURTAINS
SELECTION, INSTALLATION, REMOVAL AND MAINTENANCE

BARRIER SELECTION:

American Marine turbidity control curtain is fabricated in three styles to accommodate varying current and wind conditions.

TYPES OF CURTAIN:

STILLWATERSCREEN - is designed for use in protected waters where there is no current and the area is sheltered from wind and waves.

FASTWATERSCREEN - is designed for use in areas where there may be some small current running and/or wind and waves can effect the curtain.

RUFFWATERSCREEN - is designed for use in areas where considerable (1-2 knot) current may be present, where tidal action occurs and/or where the curtain is liable to be subject to wind and wave force.

CURTAIN DEPTH: Curtain depth selection depends upon the depth of the water, the type of bottom and the current prevailing in the area. The curtain should not be so long as to touch the bottom. If it does touch bottom, two unsatisfactory consequences may result:

(1) The skirt may become buried in the pump-in fill, sink the flotation and ultimately make it impossible to remove the curtain.

(2) Movement of the lower skirt over the bottom due to tidal reverses or due to wind or wave action on the flotation may fan and stir silt already settled out.

A rule of thumb pertaining to the proper depth of a silt curtain in still water is to keep it at least two feet above the bottom. In moving water the curtain acts more as a downward deflector of silt laden water and hence it may be more effective to employ two relatively shallow curtains, one behind the other than to attempt to settle the silt via the use of a single deep curtain. It must be remembered that a curtain cannot slow up or stop the flow of water and that very sizeable loads can be built up in a large curtain anchored in moving water. In moving water it is seldom practical to extend curtain depth below 10 to 12 feet below the surface even in deep water. Curtains deeper than this will be subject to very large loads with consequent strain on the material and the mooring systems. Furthermore, the curtain will billow up toward the surface under the pressure of the moving water which will result in an effective depth considerably less than the skirt depth, anyway.

CURTAIN INSTALLATION:

Every turbidity curtain installation has its own set of unique conditions to be considered during installation. In the calm water of lakes or ponds it is usually sufficient to merely set the curtain end anchor points or stakes, using anchor buoys when anchors are employed, then tow the curtain in the furled condition out and attach it to these anchor points or stakes. Following this, any additional buoyed anchors or stakes required to maintain the desired exact location of the curtain may be set and these anchor points made fast to the curtain. Only then the furling lines should be cut to let the curtain skirt drop.

In rivers or in other moving water installations it is important to set all the curtain anchor points, being sure they are of sufficient holding power to retain the curtain under the current conditions existing, before putting the furled curtain into the water. Again, anchor buoys should be employed on all anchors to prevent the current from submerging the flotation at the anchor points. If the moving water into which the curtain is being installed is tidal and will hence subject the curtain to currents in both directions as the tide changed, it is important to provide

anchors on both sides of the curtain for two reasons:

- (1) so curtain movement will be minimized during tidal current reversals and
- (2) so the curtain will not overrun the anchors and pull them out when the tide reverses.

When the anchors are secure the furled curtain should be secured to the upstream anchor point and then sequentially attached to each next downstream anchor point until the entire curtain is in position. At this point, and before unfurling, the “lay” of the curtain should be assessed and any necessary adjustments made to the anchors. Finally, when the location is ascertained to be as desired, the furling lines should be cut to allow the skirt to drop.

An effective way to employ a turbidity curtain in moving water is to locate it at less than 90 degrees to the current direction so as to provide a “deflector” along which the silt laden water will move dropping out its sediment in the desired area along one side of the curtain while the water on the other side is protected.

Turbidity curtain has also been used effectively in large areas of moving water by forming a very long sided, sharp “V” to deflect clean water around a work site and confine a large part of the silt laden water to the work area inside the “V” as it moves downstream with the sediment settling as it moves.

REMOVAL OF CURTAIN:

The most significant precaution to be observed in removing a turbidity curtain is to protect the skirt from damage as the curtain is dragged out of the water. If the curtain has a deep skirt it can be protected by running a small boat along its length with a crew installing furling lines before attempting to remove the curtain from the water. Also, the site (beach, ramp, etc.) Selected to tow the curtain ashore should be free of sharp rocks, broken cement, debris, etc. so as to minimize damage when hauling the curtain over the area.

CLEANING OF CURTAIN:

If the curtain has been in the water long enough to collect barnacles and other marine growth, it should be cleaned immediately upon removal from the water. If allowed to dry out before cleaning, the barnacles and growth become considerably more difficult to remove and the chance of damaging the fabric during cleaning is increased. The curtain should be spread onto as flat and smooth a surface as possible for cleaning and the growth removed with a piece of wood or other object not likely to tear the vinyl. A stiff bristle brush may be used to remove most of the accumulation (except barnacles) and the curtain should then be rinsed off before

being dried, furled and stowed for storage or re-use.

STORAGE OF CURTAIN:

When the curtain has been cleaned, rinsed and allowed to dry it should be “accordianed up”, tied and covered to protect it from the sun.

REPAIRS:

Should repairs become necessary, American Marine, Inc. has repair kits. Clean the area to be repaired with acetone. Cut a patch larger than the damaged area. Apply glue, then put on the patch and roll vigorously with a bottle or can until dry. Approximately ten minutes is required to dry. Pop rivets and fender washers may also be used for repair jobs.

ANCHOR SYSTEMS FOR BOOMS AND BARRIERS

1) A 24 pound DANFORTH type galvanized steel anchor.

2) An 8 foot long 3/8 inch galvanized steel chain lower rode.

3) A 60 foot long 5/8 inch polypropylene rope upper rode.

4) A 12 inch diameter polypropylene painter.

** The anchor to chain rode attachment is by a safety wired galvanized steel shackle.

** The chain to rope rode connection is also by a safety wired galvanized steel shackle
(All ropes have thimble terminations.)

** The upper rode - buoy - painter attachment is via a loop of 5/16 inch galvanized steel wire rope.

** Attachment of the painter to the boom or barrier is by galvanized steel shackle.