ENVIROTUBES®
A Geotextile Tube

STRUCTURAL
APPLICATION GUIDE



A product by Industrial Fabrics, Inc.

Industrial Fabrics, Inc. has been one of the pioneers in the United States in the manufacturing and installation of structural and dewatering tubes both nationally and internationally. For over 20 years, ENVIROTUBES have been the most practical and cost effective choice. Industrial Fabrics designs custom DEWATERING and STRUCTURAL tube applications specific to a clients needs.



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Envirotubes® Applications

Structural applications for Envirotubes® include but are not limited to:

- Storm event protection for beaches, shorelines, marshes, wetlands, islands, etc.
- Protection from erosion caused by waves and wake.
- Restoring and creating islands.
- Creating peninsulas to re-direct river channels.
- Prevent scouring and erosion of river banks.
- Re-enforcing seawalls and armored shorelines.
- Flood event protection.
- Coring dikes, levees, and earthen dams.
- Creating stilling ponds for construction runoff water release.
- Constructing breakwaters for marinas and entrances.
- Re-enforcing and repairing dikes for holding and aerating lagoons.
- Creating off-shore spoil areas.

Overview



The following sections address the preparation and placement of the Envirotubes® as well as the filling procedure.

These guidelines do not purport to address the safety issues associated with the use of Envirotubes® and or Envirotube® systems, including the use or handling of hazardous materials, mechanical equipment and operations.

It is the responsibility of the contractor to establish and adopt appropriate safety and health practices. Also, the contractor shall comply with prevalent regulatory codes such as OSHA regulations while using these guidelines.

Sizing & Designing



Envirotubes are sized for each application. This will depend on the protection or structure needed. The size and design requirements will be given in each application section.

Contact your Envirotubes™ Technical Representative for design support.

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BEACH DUNES FOR STORM EVENT PROTECTION

These are installed on the dry beach away from the water. The regulations governing these installations varies from state to state but the application procedures and protection needed is fairly constant. In many cases the application is designed by engineers as a first time project and no experience with the application or installation procedures.

Many of the "text book" procedures are outdated and have been improved upon with experience and history.

These tubes are usually 30' circumference filled to 5' finished height.

The anchor tubes on the scour apron are usually from 4' circumference to 7' circumference. The scour apron usually extends half the circumference of the tube on both sides.

Site Preparation for Beach



Site Preparation

Site preparation is one of the most important parts of a successful protective dune application.

Step 1:

Excavate or grade the laydown area level and of the full width of the tube and scour apron.

Cover the entire laydown area with plastic sheet to prevent erosion.

This will also help maintain the elevation of the scour apron during a storm event.

Sometimes the plastic sheet is laid over the scour apron to protect berms that can be pushed up on the sides to hold the tube in place while filling and assist achieving proper elevation.





Step 2:

Roll out the first scour apron and enough of the second scour apron so the first apron can overlap the second.

Usually the first scour apron extends out past the end of the tube placement and has a crosswise anchor tube. The other end will lap over the second scour apron.

Fill the crosswise anchor tube and then the lengthwise anchor tubes on the first scour apron.

The anchor tube will have at least three fill ports, one at each end, and at least one centered.

Site Preparation for Beach (cont.)



Fill from one end.

Tie the center ports off and hold the far end elevated so the water has to come up to exit. The anchor tube will fill like discharge hose sanding shut. A delta will form down the anchor tube eventually sanding it shut.

The end ports can then be tied off.

Often the first Envirotube will extend onto the second scour apron, if so the second scour apron will have to be rolled out and the anchor tubes filled before first tube is pumped.

Some applications call for an anchor tube on both sides of the Envirotubes® and some call for only the outside or seaside.



Step 3:
Roll out the tube.

All Envirotubes® have side seams with handles. These can be used to straighten and even restrain the Envirotube®.

It is important to pull the Envirotube® straight so there are no kinks or creases in the Envirotube® when filling.

Usually the Envirotube® is filled from one end.

To begin: Tie off all the other ports to bring the Envirotube® to full height. When the Envirotube® comes to full height, open the end port to let the water out.

Site Preparation for Beach (cont.)



The sandy fill will form a delta or a series of deltas in the tube, filling it the full length of the Envirotube®.

The end fill port can be held vertical of even closed off to maintain the proper height and shape of the Envirotube®.

If the pumping system being used to fill the Envirotube® is too small to fill a long Envirotube® from one end, a plug can be pumped into the center of the Envirotube® and each end or half can be filled independently.

There are several methods used to fill a structural Envirotube® for storm event protection.

Methods of Filling ENVIROTUBES® on the Beach



Method 1: Where permitted, a hole in the beach can be used to slurry sand with a submersed pump and a water supply to pump sand into the Envirotube®.

Sand from the beach can be used, or sand can be hauled to the hole.

Method 2: A mixer box with a submersed pump built in or a dredge pump attached can be fed sand and water to be pumped into the Envirotube®.

This requires a feeder pump in the ocean and a loader, excavator or conveyor to feed the sand. An 8" system is usually the most desirable to fill 30' circumference Envirotubes®.

Method 3: A gravel silo [huge funnel] can be suspended over the tube fill port, water pumped in, and sand fed to the system.

The sand can be fed with a loader or an excavator, but the most efficient is a variable speed conveyor supplied by a loader from a pile of hauled-in sand. This can be set to supply the exact slurry mix of the water being pumped into the mixer box.

See picture below.



The fill rate of these 8" systems is between 1 and 2 CY (cubic yards) per minute.

Two CY is needed to fill each linear foot of 30' circumference tube to 5' height.

When possible it is best to fill each Envirotube® with one continuous process.

Deploying Scour Aprons & ENVIROTUBES® in Water



Step 1: The site is normally prepared by the surveyor.

Step 2: Transporting & Positioning the Scour Apron and the Envirotube®

A floating transporter pontoon boat or barge with uprights to support a pole through the Envirotube® core should be used to transport and deploy scour apron the Envirotube®.

A piece of plywood with a hole in it should be placed on both ends of the rolls to prevent telescoping of the scour apron or the Envirotube® rolled on the core.

Remove protective covering before transporting. The Envirotube® can be held from unrolling with a piece of rope or a large bungee.

The first scour apron is loaded on the transporter barge and unwrapped. Take special care the apron is on the transporter in the correct direction with the anchor tube on the correct side and the end anchor tube on the outside corresponding to the submittal drawing.

This is transported to the laydown area.



Unroll the scour apron approximately 20 feet into the water. It is unfolded and the end is staked in place with the corner stake handles connected by a rope. [1/4" sisal is sufficient]



A bowline and a "Cajun come-along" at the stake can be used.

As the scour apron is unrolled along the survey stake line, stakes are driven at the side handles and connected by rope.

There should be a side handle every 10' the length of the apron and a stake handle at each corner.

The stake handles on the scour apron anchor tube side should be sewn to the anchor tube seam under the apron so the connecting rope is under the anchor tube, not over it.

On a side without an anchor tube the handle is sewn to the edge of the apron.

Where the apron has an anchor tube on one side and the apron does not extend beyond the tube on the other side [see submittals] the connecting rope needs to be long enough to place the tube without removing the scour apron stake.

Step 3: Pump the anchor tube.

A sandy fill works best.

There will be a port at each end of the anchor tube and at least one centered between.

Tie off the center ports.

Pump the anchor tube from one end and hold the other end up to get the solids to stay in the tube while the water exits the elevated end tube. When filling with sand the anchor tube will fill like a pipeline sanding shut.

A delta or several deltas will form the length of the tube and fill it full length.

When filling with insitu material the pumping rate must be slowed to help the solids settle in the anchor tube. The outlet port must be elevated as much as possible and even closed at times to retain solids.



If the first apron needs to overlap the second apron the second needs to be deployed next before the Envirotube® is placed.

Usually the second scour anchor tube is filled at this time as it needs to be filled anyway.

The Envirotube® will normally cover this overlap. Depending on how the specs are written, the third Envirotube® can sometimes overlap the 2nd scour apron. This makes for an easier application but sometimes requires a change order. Regardless, the Envirotube® usually covers this scour apron overlap.

The Envirotubes® must be butt-joined , and NEVER overlapped.

Step 4: Deploy the Envirotube®.

The Envirotube® is deployed the same as the scour apron.

The Envirotube® is concentric with handles on both sides so there is no directional difference.

The 15′ circumference Envirotube® only has handles on one side so the initial tether will be on one side only. You can choose which side to have the handles. The tether ropes can go over top of the 15′ Envirotubes®.





It is often easier to walk on the side of the scour apron anchor tube. Position the transporter barge and rollout approximately 20' of the Envirotube®. Unfold it into place [usually 10' from the end of the scour apron].

Tie off the corner handles and roll out the Envirotube® tying off the handles to stakes as you go. Stretch the Envirotube® as tight and straight as possible. This makes for an easier fill and a neater installation.

Step 5: Filling the Envirotube®

When filling with sandy material follow the same pumping instructions as filling the Envirotube® on the beach.

When dredging insitu fill material to fill the tubes a different process is either needed or used.

- All the ports are closed except the fill port.
- Fine grain and organic material will not dewater in a tube under water.
- The tube will only dewater with the weight of the tube extending above the water level.



If the water is 4′ deep and the Envirotubes® are pumped to 6′ there is 2′ of elevation to dewater the Envirotube®.

When the Envirotube® dewaters to the water level it must be pumped again to get the 2′ of head to dewater the Envirotube®. This process must sometimes be repeated many times.

Envirotubes® can be pumped to a higher elevation in water than free standing.

Some thought to a manifolding system makes this process easier as does longer Envirotubes®.

Filling ENVIROTUBES® in Water



The first and easiest method is to dredge directly into the Envirotube® with insitu material nearby.

If this material is predominantly coarse or large grain, it will be a onetime fill. The fines will carry through and exit with the decant water.

If fine grain, clays or organic material is used, repeated fills will be needed to finish to height.

On the fill end of the Envirotube®, a void will form under the inlet connection. This can be filled by using a tee to make a bypass connection.

Pumping from a mixer pocket barge method.

Sometimes the fill material is brought in by barge. The material [usually sand] can be mixed with water right in the barge and pumped into the tube with a submerged pump.

This can be done by pumping water into the pocket of the barge and mixing with a jetting ring on the pump, or using a firehose to jet the sand to the pump.



Closing the Fill Port



Methods of closing fill ports vary according to job specification. The ports are usually tied shut, tucked into the Envirotube®, and with a patch glued over.

Frequently Asked Questions (FAQ)

1. **WHAT SIZE, PUMP OR DEREDGE SHOULD BE USED TO FILL STRUCTURAL ENVIROTUBES®?**

   8" pumps & dredges are most common — normal fill rate is 1.5 CY per min or about 100 CY per pumping hour. Too small of a pump is sometimes difficult to get proper elevation or height. Too large of a pump and too much fill material is carried through the Envirotube® and out the end port.

2. **HOW WOULD I FILL AN ENVIROTUBE® WITH A LARGER PUMP?**

   A 12" pipeline can be split into 2 8" pipelines and fill 2 Envirotubes® at once. The flow will divide evenly because of pipe friction.

3. **CAN I STOP PUMPING WHEN PARTIALY FILLED AND RETURN LATER TO COMPLETE?**

   When filling with sand it is best to fill non-stop. When filling with soft material the Envirotube® normally has to be pumped multiple times; therefore, not an issue.

4. **WILL I HAVE TO FILL FOR MORE THAN ONE PORT?**

   Usually not. Only if the heavy material will not carry all the way to the end of the Envirotube®.

Frequently Asked Questions (FAQ) cont.

5. HOW DO I KNOW WHICH SCOUR APRON AND ENVIROTUBE® IS PROPERLY LOCATED?

The scour aprons and Envirotubes® are numbered corresponding to the job plan.

7. HOW ARE STRUCTURAL ENVIROTUBES® DIFFER FROM DEWATERING ENVIROTUBES®

The Envirotubes® themselves are basically fabricrated the same. The difference is in the job specifications not the tube specs.

8. CAN STRUCTURAL ENVIROTUBES® BE STACKED TO GAIN ADDED ELEVATION?

Yes. The normal method is a pyramid stack with two Envirotubes® on the bottom and one on top. The bottom Envirotubes® need to be against each other without any gaps.

IF YOU HAVE ANY QUESTIONS PLEASE CONTACT:

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Notes

Notes

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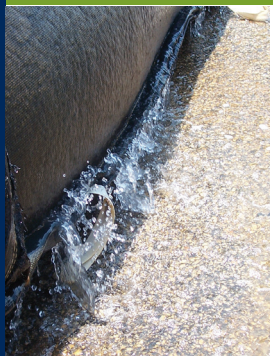
The leading expert in dewatering and ENVIROTUBE® technology answers the most frequently asked questions.

Dean Wickoren has over 50 years of experience in the structural applications of Envirotubes®.

Dean is prepared to assist you with your project. His extensive in-field training has made him the best in the business.



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