SILT CURTAIN Design and Quotation Guide

IMPORTANT NOTICE: This is an informational guide only. Configurations are determined by known hydrodynamic conditions such as tidal movement, wind velocity and wave height. Apex Envirocare does not recommend a purchase decision be made solely by referencing this guide. Advice should be obtained from project specific guidelines and environmental experts to determine Silt Curtain design requirements. Apex Envirocare will not be held liable for errors or omissions. All products must be quoted to ensure clarity and accuracy.

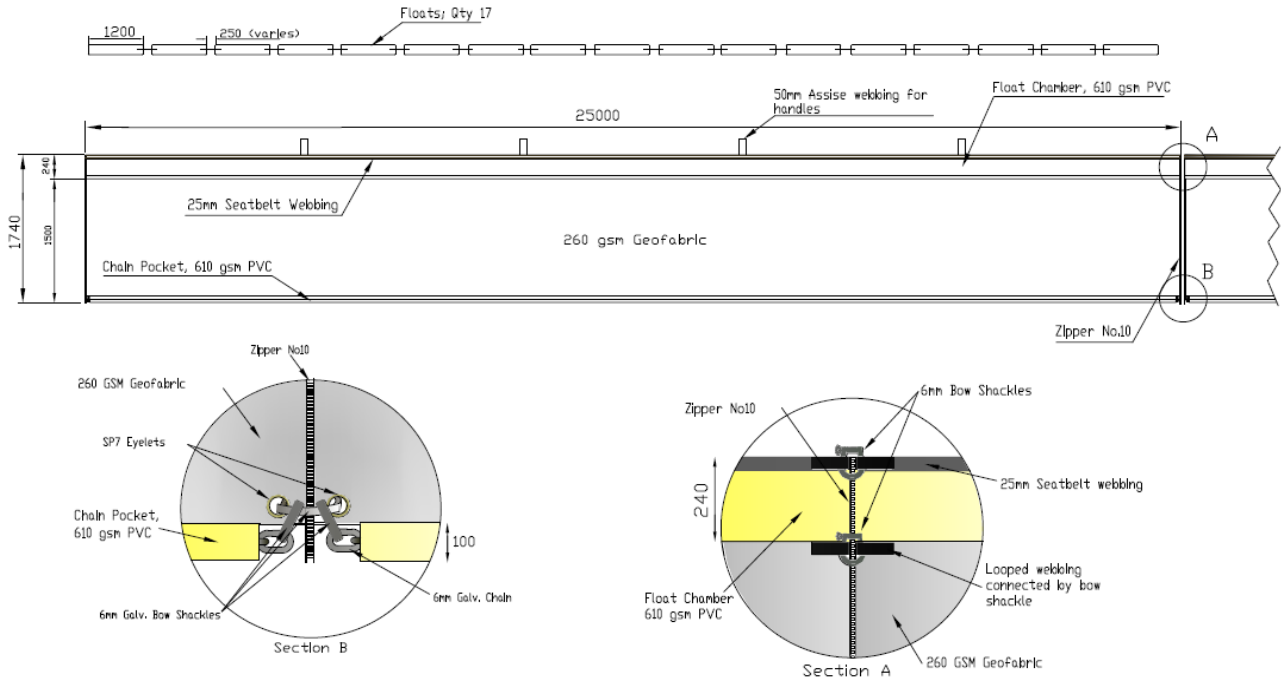
Introduction

A silt curtain is either a permeable or impervious structure that sits suspended in the water column to control migrating water borne sediment. Also known as a *turbidity curtain* or *silt screen*, the silt curtain's function is to contain disturbed sediment about one to two metres from the surface. This allows suspended sediment to settle and drop within the water column by controlling dispersion. A silt curtain provides the necessary environment and time for the suspended sediment to settle to the bottom.

Drawings and Instructions

Drawings of the intended curtain can be submitted by Apex Envirocare, if required, for approval prior to manufacture. Complete specifications and material descriptions of all components can be supplied. Due to the degree of technicality, drawing sign-off by the client is a requirement for all of our customised and heavy duty permanent curtain designs.

Sample drawing:



Silt Curtain Components

FREEBOARD
The portion of the silt curtain that sits above the water line.

DRAFT
The submerged portion of the silt curtain.

FLOTATION
Flotation consists of high density closed cell, polyethylene foam. These floats are crumble resistant and oil resistant, ensuring continued flotation. We offer various sizes and configurations.

SKIRT
The material used will depend on the conditions in which the curtain will be installed. Our most commonly used option is a 260gsm non woven geotextile fabric that stops anything larger than 90 microns.

BALLAST
The curtain is maintained in position by applying a ballast of galvanised chain sewn into a chain pocket at the base of the curtain. This ballast extends consistently for the full length of the curtain allowing for continuous tension.

STRENGTH WEBBING
Seat belt webbing will be installed along each section of curtain. Depending on the class of curtain, it's installed on top of the float, directly below the float and, for large curtains, one between the ballast and skirt. The webbing will assist in supporting horizontal forces placed on the curtain.

CONNECTORS
The curtains shall be connected using specially molded ASTM962 Z-connectors to attach the freeboard section of the curtain. These connectors provide strength and durability in the water. For offshore conditions opt for heavy duty molded connectors.

Heavy duty marine zipper is utilised to connect the lengths of skirt which allows for identical sections of curtain to be replaced if necessary. Further, a selection of bow shackles will be used to ensure the connection of the curtains.

ANCHOR POINTS
Attachment points are present on all ASTM962 connectors via stainless steel eye nuts and furnished with a galvanised steel chain, attached with a bow shackle on one side of the skirt and floating buoys.

How to Choose Your Curtain

Silt curtain effectiveness is considered as the degree of turbidity reduction achieved within the controlled area relative to the turbidity levels outside of the area. Factors which affect this effectiveness are:

- The quantity and type of material in suspension
- The characteristics, design and construction of the silt curtain
- The mooring and square metre area of the silt curtain deployed
- The hydrodynamic conditions experienced such as tidal movement, wind velocity and wave height.

In the instance of typical construction projects and pipeline disposals where suspended solid concentrations are high, a vast majority of the silt will drop to the bottom while only about 5% of the sediment remains suspended in the water column.

The silt curtain is not designed to dam the turbid water but instead provides a control for the dispersion of the sediment laden water and allowing it to settle.

CONSIDERATIONS

1. Is the curtain to be deployed in open water or stable (enclosed) waterways?

OPEN WATER – ensure the curtain is robust enough to handle all sea states, tidal flow and wind conditions. You may require external (foam filled LDPE) floats and/or heavier duty geotextile to ensure appropriate buoyancy and longevity.

ENCLOSED WATER - internal floats will generally suffice however you should understand the tidal influences on variable water depths, currents and winds. Internal floats are available in sizes 100mm x 100mm, 150mm x 150mm or 200mm x 200mm. The degree of currents and winds within the water column will also affect the weight of ballast required and connector types.

2. Is the curtain to be deployed for a time period greater than 12 months?

SHORT TERM DEPLOYMENT – standard PVC construction will generally have sufficient UV stabilisation for short term deployment (<12 months in water).

LONG TERM DEPLOYMENT – the construction material may need to be of a higher grade than standard PVC. We generally recommend polypropylene coated fabric which provides greater intrinsic strength than a standard PVC.

3. Is there vessel traffic in the area of deployment?

YES – you may need to gain approval from waterways authorities and consider options to facilitate night time visibility, navigation markers, exclusion zones and more.

NO – a standard curtain with standard installation should be approved.

4. How deep should the curtain be?

As a rule of thumb, turbidity is most active in the top two metres of the water column. Since the purpose of a silt curtain is to disrupt the water flow and allow the suspended solids to settle, your curtain should be deep enough to:

- Provide sufficient disruption to the water flow (current),
- Remain clear from the sea bed (or river bed) at low tide, and
- Take into consideration any EPA or other environmental requirements.

Unless required by regulatory or project requirements, a silt curtain does not need to go down to the sea or river bed to be effective. Allow a minimum half metre gap between the curtain and the sea bed at low tide. If the silt curtain is too deep, slack can be generated in the curtain skirt at low tide. This can create issues during periods of high wind as the curtain slack will billow and cause considerable forces against the curtain and mooring systems. Examples of airborne silt curtains have been cited due to incorrect skirt depths in wind prone areas. Some other issues arising with silt curtains that incorporate full depth skirts are:

- In calm water, sediment could build up over the ballast chain and start to drag the curtain down. This is also known as ‘making sand’ as the curtain moves back and forth over the bottom.
- In moving water, the curtain needs to be able to move freely allowing the forces of the water to pass through and under the curtain.
- A totally contained area through total depth silt curtains may have an adverse affect on marine fauna.

Design Recommendations Related to Hydrodynamic Conditions

A basic overview categorising how various classes of Silt Curtain may suit different conditions.

Suggested Silt Curtain		Still Water				River / Port			
	Skirt Depth	**1-2m**	**2-6m**	**6-12m**	**>12m**	**1-2m**	**2-6m**	**6-12m**	**>12m**
Class 1	50 mm Float Width	●							
Class 2	100 mm Float Width	●	●			●			
	150 mm Float Width			●	●	●	●		
Class 3	150 mm Float Width						●		
	200 mm Float Width							●	●
Permanent	External HDPE Floats			●	●			●	●

		Harbour				Open Water / Ocean			
	Skirt Depth	**1-2m**	**2-6m**	**6-12m**	**>12m**	**1-2m**	**2-6m**	**6-12m**	**>12m**
Class 1	50 mm Float Width								
Class 2	100 mm Float Width								
	150 mm Float Width	●	●						
Class 3	150 mm Float Width	●	●			●	●		
	200 mm Float Width			●	●	●	●	●	●
Permanent	External HDPE Floats			●	●			●	●

Design Summary

CLASS 1
Low Risk Applications

Little to no tidal wave and/or wind forces.

Example: lagoon, pond, stream

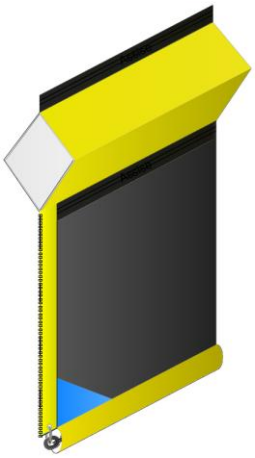
Chain	6mm
Float	50mm x 100mm
Strips of Webbing	1 x 25mm
Connector	Eyelets & Zip

CLASS 2
Medium Risk Applications

Moderate wind and/or water forces.

Example: river, calm harbour

Most Popular Design

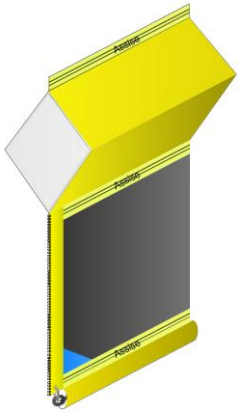


Chain	6mm – 8mm
Float	100mm x 100mm or 150mm x 150mm
Strips of Webbing	2 x 50mm
Connector	Standard Z-Connector & Zip
Strengthening Triangle	2 patches

CLASS 3
High Risk Applications

Strong wind and water forces.

Example: open ocean, harbour, river mouth



Chain	8mm - 13mm
Float	150mm x 150mm or 200mm x 200mm
Strips of Webbing	3 x 50mm (Load straps)
Connector	Heavy Duty Z-Connector & Zip
Strengthening Triangle	2 patches

Curtain Comparison

	CLASS 1	CLASS 2	CLASS 3
Application of Project	Short term projects in still water	Medium term projects in sheltered water	Long term projects in open water
Float Chamber Material	610gsm PVC	610gsm PVC	900gsm PVC
Float Size	50mm x 100mm	100mm x 100mm or 150mm x 150mm	150mm x 150mm or 200mm x 200mm
High Tensile Webbing Strips	1 above float chamber	1 above float chamber 1 below float chamber	1 above float chamber 1 below float chamber 1 above chain pocket (uses updgraded load strap)
Skirt	Up to 2m depth	Up to 8m depth	Up to 20m depth
Ballast Thickness	6mm	6mm - 8mm	8mm -13mm
Connectors	Marine grade #10 zipper on skirt Eyelets on float chamber	Marine grade #10 zipper on skirt Standard ASTM962 extruded aluminium Z-connectors on float chamber	Marine grade #10 zipper on skirt Heavy duty ASTM962 extruded aluminium Z-connectors on float chamber
Triangle Patch Stitching (for tensile strengthening)	None	2 patches	2 patches
Other	Handles Shackles	Handles Shackles Anchoring points Optional Toggle pins Reflective bouys	Handles Shackles Anchoring points Optional External floats Toggle pins Reflective bouys

Options & Accessories

- External Floats
- Hi-Vis (solar lights, reflective floats)
- Woven Geotextile
- Reinforce With Added Webbing
- Heavy Duty Moulded Connectors
- Anchor Set
- Tidal Riser
- Towing Bridle
- Installation / Removal

Deployment

Silt curtains supplied by Apex Envirocare are packed with the skirt furled and multiple sections connected up to a length of 105 metres per pallet. This allows the silt curtain to be immediately deployed on site.

In projects that require a large length of silt curtain and hence numerous pallets, each pallet will be clearly identified and numbered. Pallet sections will be joined in consecutive fashion and pallets should be laid down as near as possible to the deployment zone.

Once the desired length of silt curtain is connected, the furled curtains can be towed to site at a maximum two to three knot speed. Ensure the curtain remains furled and is only unfurled once the silt curtain is secured to the anchoring system and in the desired position.

After the furled curtain has been anchored, the curtain should be checked to confirm the skirt is not twisted around the flotation chamber. Once the furled and untwisted curtain is anchored in the right location, remove the ties furling the curtain and allow the silt curtain system to drop into place. In the instance where the curtain needs to be manoeuvred back to its correct deployment position, refurl the curtain before dragging the silt curtain through the water. The movement of a silt curtain with its skirt deployed through water places undue pressure on the system.

Maintenance

If the silt curtain system is to be deployed for an extended period (greater than 12 months), it is recommended that a maintenance schedule be implemented to maximise the effectiveness and longevity of the silt curtain.

Typical maintenance activities include:

- Monitoring the curtain skirt against the sea bed to ensure it is free moving and not anchored under sand or dispersed mud.
- Replacing worn or broken anchor lines.
- Reviewing the integrity of the PVC flotation chamber and connection points such as ASTM connectors and zips.
- Removal of marine growth from the curtain.
- Hardware is often placed under pressure, especially at anchoring points and the wear and tear on these parts should also be considered.

Recovery

To recover the silt curtain, refurl the curtain skirt and remove the mooring systems. Tow the system back to the launching site for removal from the waterway and disposal.

If the curtain is to be reused, it can be cleaned down with a high pressure washer to remove silt and sediment from the filter media. Once dry, the curtain can be packed on a pallet and stored. If serviced and stored properly, a high quality silt curtain system can be reused numerous times.

Deployment at Barangaroo, Sydney Harbour, NSW
Custom Heavy Duty Silt Curtain

Silt Curtain Design Questions

1) What is the duration of the project? .....

2) What is the curtain delivery deadline? .....

3) Body of water where curtain is to be installed?

Open Water	☐	Pond/Lake	☐
River/Canal	☐	Pond with liner	☐
Bay/Harbour	☐	Ocean shore	☐

4) Are there any specific EPA or other environmental requirements? .....

5) Where is the location of the silt curtain? (give approximate details if in remote areas) .....
.....

6) What is the length of curtain required? .....

7) What is the depth of water where the curtain is to be deployed? .....

8) Do you know the depth of curtain required? If so, please advise. .....

9) What is the average speed of water currents? (if known) .....

10) What is the average wind velocity in the area? (if known) .....

11) What is the highest possible wind velocity in the area? (if known) .....

<u>Answer only if water has tidal influences.</u>

12) What is the depth of water at
a) low tide and
b) high tide?
a).....b).....

13) What is the width of the river/canal where the curtain is to be deployed? .....