Water and Effluent Treatment

StaticOrb Screens

Screen Services
Specialty screens and equipment for industrial, petrochemical, mining, and water treatment applications

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Passive Screens for Surface Water Intake

Passive screens are the most economical and reliable system for fish protection and contaminant removal from surface water supplies. StaticOrb intakes are designed to admit water at a low, uniform velocity, such that debris and aquatic life remain in the water source.

StaticOrb screens have no moving parts, and are constructed from corrosion resistant materials for a long service life. Debris is excluded by the smooth screen surface and remains in the water source, eliminating the need for on-shore handling of debris. The screens may be placed away from the shoreline, in an area of optimum water quality, remote from sensitive marine organisms.

In particularly adverse conditions or where required to meet DFO specifications, an air backwash system can remotely clear accumulated debris from the screen surface, employing manual or automatic controls.

Advantages of StaticOrbs

- Reliable water delivery
- Lower initial screen system costs
- Simpler intake system and pump station construction
- Lower maintenance costs
- No debris handling or disposal
- Superior protection of aquatic fauna

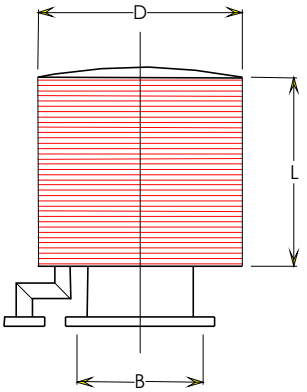

Figure 1: Drum intake with air backwash line.

Key Factors in Intake Design

The key to effective intake screening is maintaining a uniform, low inlet velocity at the screen surface. Uneven flow and/or high velocities will cause debris in suspension to cling to the screen at the areas of highest flow. This blockage shifts the area of high flow, causing more blockage, until the entire screen is clogged.

If it were not impractical, the ideal screen shape to achieve uniform flow would be a sphere with an outlet at the center of the sphere, such that equidistant lines of flow converge in the center.

Screen Services StaticOrb intakes provide the best alternative to a sphere by using precisely designed cylinders incorporating flow modifiers. Flow rates are very nearly uniform over the entire screen surface, and we calculate the optimum size for the required flow volume so that flow velocities are low. High open area percentages provide minimum head loss.

Design Parameters

The following parameters should be considered in the design of an intake system:

1. What is the source of the water? River? Lake? Reservoir? Ocean?
2. What slot opening is required (please consult with local environmental authorities) for fish protection? Or, what size particles must be excluded?
3. What are the normal low, high, and mean water depths?
4. How often does the low and high water depth occur?
5. Is *in situ* cleaning required?
6. What is the direction and velocity range of the prevailing currents?
7. What is the intake line size?
8. What type of connection will be used?
9. What are the normal, minimum, and maximum pumping rates?
10. What is the water quality? Clean? High silt content? High degree of biofouling?

11. What is the salinity and pH of the water?
12. Where are the pumps in relation to the screen site?
13. Are the pumps in a wet well or directly connected to the screens?

Select and Specify

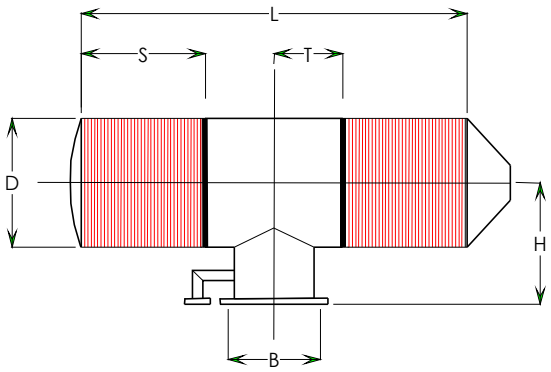

Figure 2: Tee screen with air backwash line

There are two basic configurations of STATICORBS: drums and tees. Drums have an outlet for each screen (see figure 1). Tees combine the flow of two screens in a single outlet (see figure 2). In some applications arrays of tees or drums may be necessary.

Both drums and tees have some advantages over the other. Drums are generally less complex than tee assemblies, and therefore less expensive. A tee will have a higher pressure drop than a drum, but will have a smaller diameter, allowing a shorter pipeline to reach adequate water depth, or the tee screen can be farther from the bottom and/or surface, reducing susceptibility to damage from debris floating on the surface or rolling on the bottom.

Screens should be placed where the water depth is at least twice the diameter of the screen. If water depth is limited, tee assemblies are preferred.

We design for the through-slot velocity as dictated by provincial/federal guidelines, or a maximum of 150mm (6 inches) per second. This velocity has been shown to provide optimum, virtually maintenance-free performance; a velocity low enough to keep debris from collecting on the surface, but high enough to keep the slots clear.

What is a Profile Wire Screen and Why is it Better?

Profile Wire is Economical

Economy is achieved through the simple design, which results in a screen with low initial cost, no moving parts, minimum maintenance needs and simplified installation.

Profile Wire is Environmentally Friendly

SCREEN SERVICES STATICORB systems protect aquatic life and make compliance with environmental regulations easier.

Profile Wire is Non-Clogging

Profile wire screens are fabricated by helically wrapping parallel support rods with a continuous V-shaped wire. The un-interrupted slot formed with

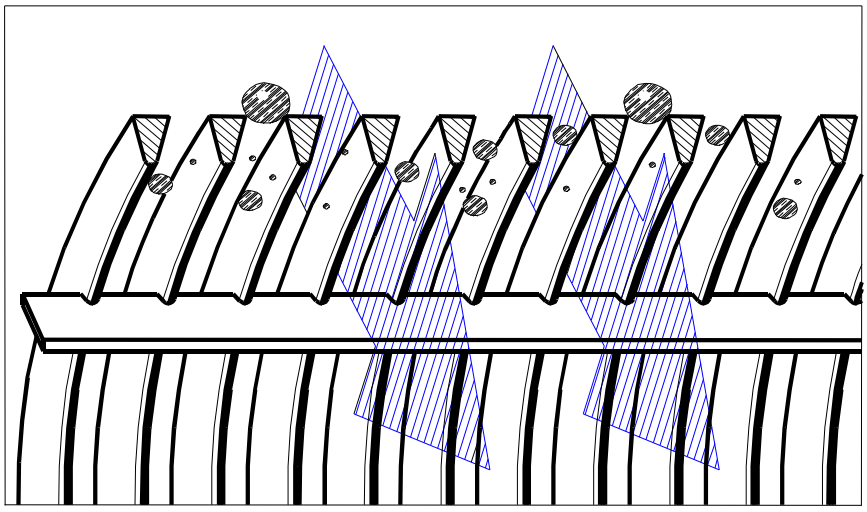

Figure 3

Profile wire screen allows only two-point particle contact, which prevents clogging.

this procedure allows only two-point contact of particles in the screen slot to minimize clogging. This means:

- Maximum effective flow area and operating efficiency is maintained.
- Costly downtime for cleaning plugged screens is minimized.

Profile Wire Screens are All-Welded for Strength

Each intersection of rod and wire in a profile wire screen is welded. The strength achieved by this method offers several vital benefits:

- Reduced costs, since profile wire screens have a very long life.
- Greater resistance to stresses of installation and cleaning.

Standard STATICORBS are designed to withstand a differential load of 30 kilopascals across the screen surface. If greater collapse strength is considered necessary, a custom screen design can be employed.

Profile Wire has Precise Slot Sizes

Precise slot sizes are available to meet system and site conditions. STATICORBS can be fabricated with slot openings from 1mm to 12.5mm in 0.05mm increments.

Slot size selection should be based on a consideration of equipment and aquatic life protection, desired water quality, and government regulations. In most locations government regulations specify a maximum allowable slot width to protect one or more species of aquatic life. Slot sizes of one or two millimeters are typical for eggs and larvae; 2.5 millimeters is used for juvenile and adult fish.

Profile Wire has Low Head Loss

The head loss through a drum screen is approximately 1.5 kilopascals, and approximately 2.5 kilopascals through a tee screen. If head loss is critical, some reduction may be realized by altering the design of the screen.

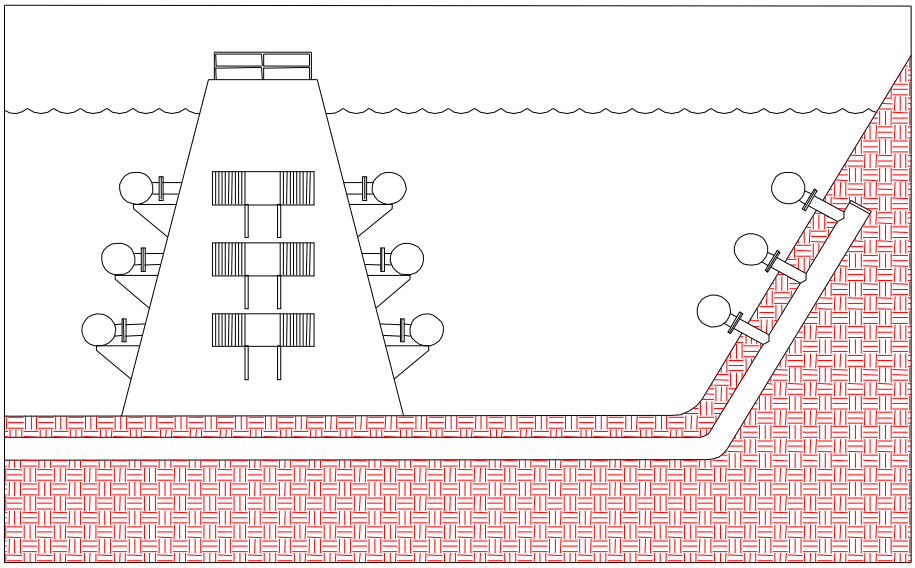

Figure 4

Reservoir intakes mounted on tower and on dam face.

APPLICATION

Clearance Requirements for Screens

The absolute minimum recommended screen submergence is one-half the screen diameter (one diameter is preferable) below the water surface at design low water. Design low water is commonly the water level at 100 year low, or in areas where ice forms, the water level at the bottom of the floe ice during break up. In essence the screens must be below floating debris that might cause damage.

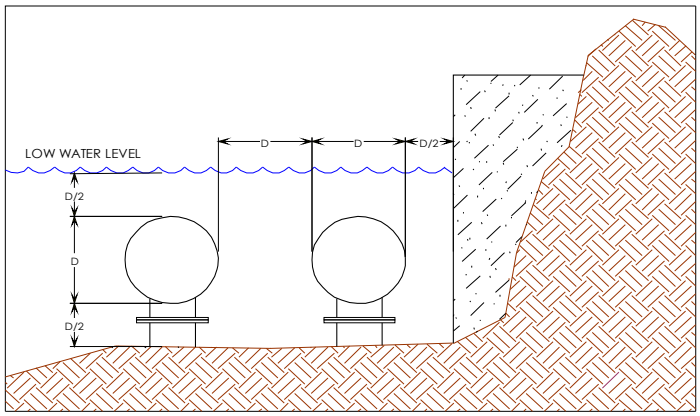

Figure 5

Minimum spacing between screens and boundaries.

The absolute minimum recommended clearance from the bottom of the screen to the water source bottom is again ½ the screen diameter (one diameter is preferable). This is to allow debris rolling along the bottom to roll past the screen and to minimize the chance that a standing eddy would be formed at the bottom, sucking debris up to the screen surface.

Clearance from a wall is also recommended to be at least ½ screen diameter and clearance between screens is recommended to be at least one screen diameter.

The primary factor in these recommendations is to minimize problems with debris. A secondary factor is the influence these boundaries can have on the velocity through the screen. If the screens are placed too close together or too close to a boundary then the flow field into the screen can be distorted and may result in accelerated accumulation of debris on the screen surface.

Additional Protection Requirements

STATICORB screens have good strength and are designed to withstand many of the forces that can be anticipated in a natural water source. If the screens are placed in a rapidly flowing river or in a lake with strong storm currents, then additional protection may be advisable. When protection for the intake line is desirable then it is appropriate to provide protection for the screen as well.

This protection is generally in the form of one or more pilings located in the water source in the near vicinity of the screens. The pilings should be the smallest necessary to withstand anticipated impact and extend 150mm to 300mm above the top of the screen. Too many piles, however, can cause standing eddies over the screen, or material to be scoured from around the piles which could deposit on the screens.

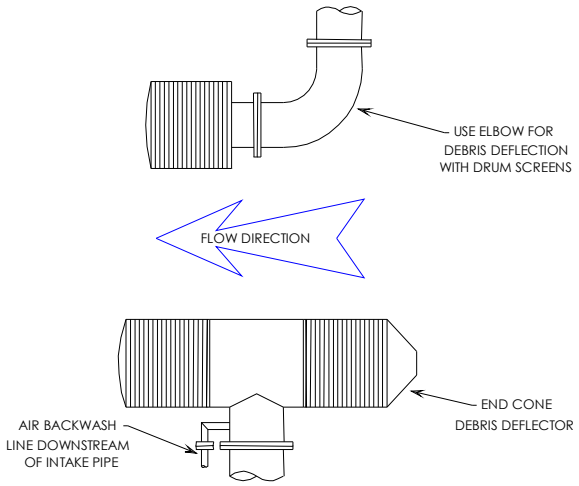

Figure 6

In tidal waters end cones are recommended on both ends of screens for debris deflection.

Screen Support

Smaller units are often hung unsupported off the end of the metal intake pipe. Larger units (or where plastic pipe is used) are supported from a concrete pad, or with pilings. Various stand designs may also be incorporated with the screen. Please call SCREEN SERVICES for our recommendations.

Ice Considerations

Four types of ice create problems for intake screens: surface ice, floe ice, anchor ice, and frazil ice. Ice that forms on the surface of bodies of water can accrete about screens and pipes that are too shallow. When the ice moves, screens and pipes can be torn from position. Screens must be positioned below potential surface ice levels.

Upon break up, surface ice becomes floe ice, which are large plates up to several feet thick. These plates, pushed by flowing water or wind and wave action, can turn on edge and plow through the water at depths of 6 meters or more. Intake screens and pipes should be placed below the anticipated plow depth, if possible. Trash racks, pilings, and dolphins are also practical for preventing floe ice damage.

Anchor ice forms on the bottom. As the sun warms it, it will float upwards. Screens and piping and supports must be designed to withstand the lifting forces if anchor ice can freeze to the intake.

Frazil is granular or spiky ice formed in agitated water during long cold spells. If possible, locate the intake where frazil ice is not expected or near a heated water discharge.

In lakes and reservoirs, agitating the water in the vicinity of the screen can be very effective in reducing ice formation.

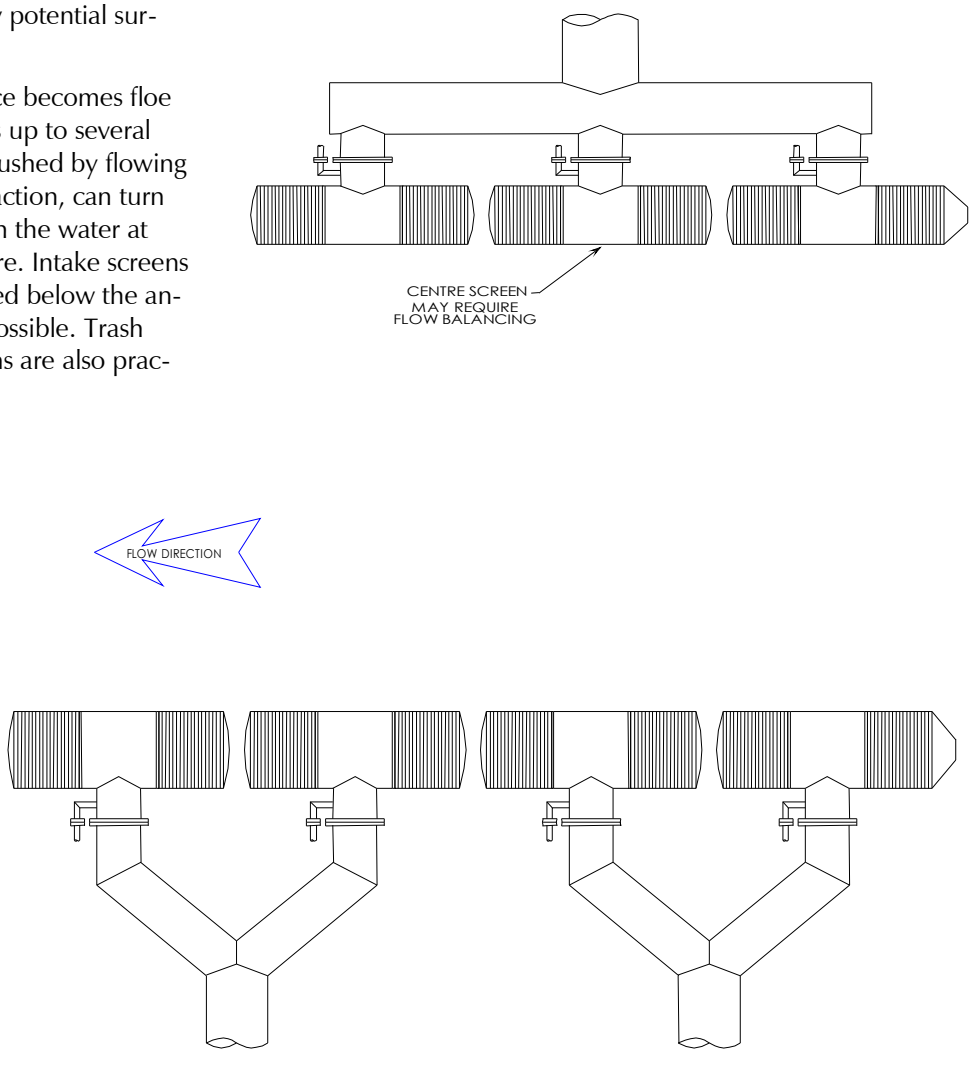

Figure 7: Multiple intakes inline with flow.

ZEBRA MUSSELS AND OTHER BIOFOULING AGENTS

Algae growth occurs on screens in fresh water but is generally not harmful and does not affect performance. The rate of growth depends on the clarity of the water, temperature and sunlight penetration. Algae growth is seasonal in temperate climates and algae dies or lies dormant at low temperatures. On fine slot screens, 1.0mm or less, algae growth accelerates the buildup of fine sediment and such systems may require more frequent cleaning.

Salt-water installations are subject to biofouling problems. The use of copper-nickel alloys will reduce biological growth and make cleaning easier.

In recent years zebra mussels have become a concern in eastern North America waters by blocking water intakes. Zebra mussels are indigenous to the Caspian Sea, but were introduced into the Great Lakes in 1987 in the ballast water of ocean-going ships. No local predators capable of controlling the population have emerged, and with each female able to produce 30,000 eggs per breeding cycle (up to 1,000,000 per year), it is expected that zebra mussels may soon infect any waterway east of the Rocky Mountains.

Special copper-bearing alloys can be effective in Zebra mussel control. Call SCREEN SERVICES for solutions.

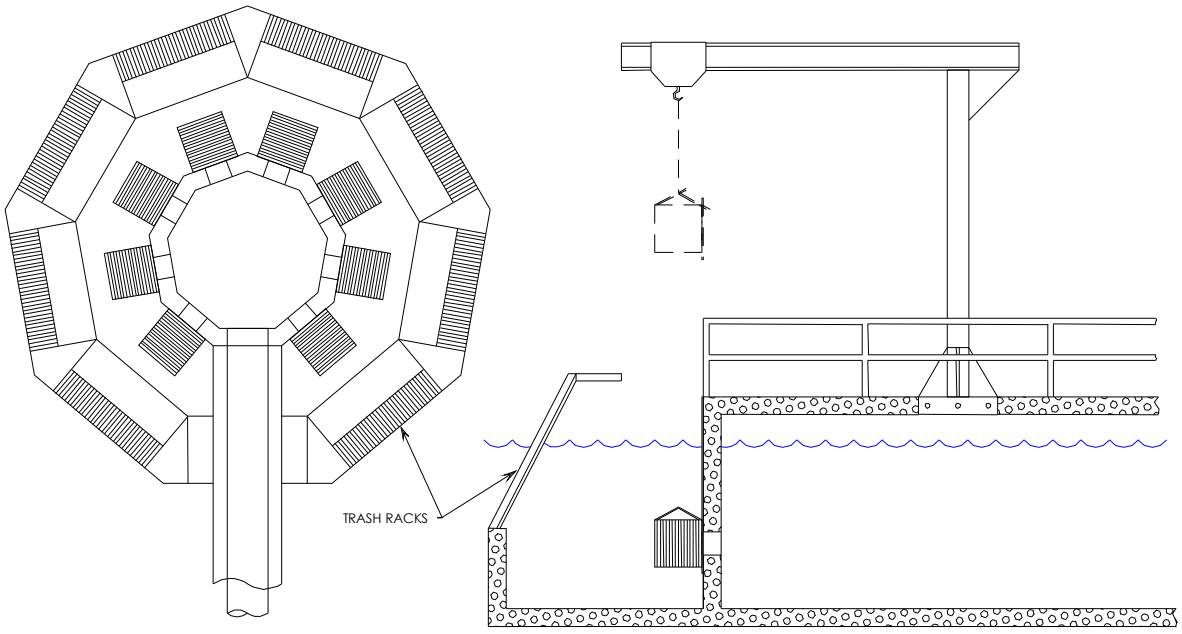

Figure 8

Bulkhead mounted screens on vertical rails are recommended for installations where biofouling may be a problem as they are easily removed for maintenance and manual cleaning with brushes or pressurized water.

STATICORB CAPACITIES TO MEET DFO GUIDELINES[1]

DRUM	Subcarangiform		Anguilliform (Pike)		TEE	Subcarangiform		Anguilliform (Pike)	
Model	cfs	l/s	cfs	l/s	Model	cfs	l/s	cfs	l/s
S12	0.75	21.32	0.27	7.54	T12	1.51	42.64	0.53	15.08
S14	0.94	26.74	0.33	9.46	T14	1.89	53.49	0.67	18.92
S16	1.23	34.93	0.44	12.35	T16	2.47	69.86	0.87	24.71
S18	1.52	42.99	0.54	15.20	T18	3.04	85.98	1.07	30.41
S20	1.93	54.58	0.68	19.30	T20	3.85	109.16	1.36	38.61
S22	2.11	66.04	0.82	23.36	T22	4.66	132.09	1.65	46.72
S24	2.78	78.60	0.98	27.80	T24	5.55	157.20	1.96	55.60
S26	2.26	92.24	1.15	32.63	T26	6.51	184.49	2.30	65.26
S28	3.78	106.98	1.34	37.84	T28	7.55	213.96	2.67	75.69
S30	4.34	122.81	1.53	43.44	T30	8.67	245.62	3.07	86.89
S32	4.93	139.73	1.75	49.43	T32	9.87	279.46	3.49	98.86
S34	5.25	157.74	1.97	55.80	T34	11.14	315.49	3.94	111.60
S36	6.24	176.85	2.21	62.56	T36	12.49	353.70	4.42	125.12
S38	6.96	197.04	2.46	69.70	T38	13.91	394.09	4.92	139.41
S40	7.71	218.33	2.73	77.23	T40	15.42	436.67	5.45	154.47
S42	8.50	240.71	3.01	85.15	T42	17.00	481.42	6.01	170.30
S48	11.10	314.40	4.61	111.21	T48	22.20	628.80	7.85	222.43
S54	14.05	397.91	4.97	140.76	T54	28.10	795.83	9.94	281.52
S60	17.35	491.25	6.14	173.78	T60	34.69	982.50	12.27	347.56
S66	20.99	594.41	7.42	210.27	T66	41.98	1188.83	14.85	420.55
S72	24.98	707.40	8.84	250.24	T72	49.95	1414.81	17.67	500.48
S78	29.31	830.21	10.37	293.69	T78	58.63	1660.43	20.74	587.38
S84	34.00	962.85	12.03	340.61	T84	67.99	1925.71	24.05	681.22
S90	39.03	1105.32	13.81	391.00					
S96	44.40	1257.61	15.71	444.87					

Indicative "cleaned" screen capacities are based upon 2.54mm (0.100") slot, #60 profile wire screen, 62.5% open area. All capacities listed over 4.456 cfs or 125 l/s are extrapolations from criteria provided by the Department of Fisheries and Oceans, and are shown for reference only. Any intake design over these flow rates **must** be approved by local DFO offices and other appropriate regulatory agencies before the start of the project. Contact Screen Services for capacities of screens with alternate constructions or under alternate criteria.

cfs = cubic feet per second · l/s = litres per second.

[1] Department of Fisheries and Oceans, *Freshwater Intake End-of-Pipe Fish Screen Guideline*, March 1995, ISBN 0-662-23168, Catalogue No. Fs 23-270 / 1995E

SCREEN
SERVICES

StaticOrb™ Intake

Client Data

Name: Project Name:

Company:

Address:

City: Province: Post Code:

Phone: Fax:

Email:

Application Data

What is the source of the water? ☐ river ☐ lake ☐ reservoir ☐ ocean Tidal? ☐ yes ☐ no

What is the character of the water? ☐ fresh ☐ brackish ☐ salt

What slot opening is required? ☐ mm ☐ inches

What is the maximum flow velocity specified by authorities? ☐ m/s ☐ fps ☐ ips
average ☐ maximum ☐ approach ☐ through-screen ☐ Not applicable ☐ (no fish to protect)

What are the water depths at the screen location? low: high: ☐ m ☐ ft

How far will the end-of-pipe be off the bottom? ☐ m ☐ ft line orientation ☐ vert. ☐ hor.

How often does the low and high water depth occur?

How fast are the prevailing currents? low: high: ☐ m/s ☐ fps ☐ ips

What is the planned intake line size? ☐ mm ☐ inches ☐ actual ☐ pipesize

What type of connection should the intake have? ☐ flange ☐ stub ☐ Victaulic Other

What is the maximum pumping rate? ☐ m^3/hr ☐ L/s ☐ USgpm

What is the required material of construction? ☐ 304ss ☐ 316ss ☐ CuNi

Is air backwash cleaning required? ☐ yes ☐ no

How far from the air tank to the screen site? ☐ m ☐ ft

If a chemical injection port is required: Size? ☐ mm ☐ inches Type? ☐ NPT ☐ flanged

Comments:

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