EVALUATE

Key Factors in Correct Evaluation

Step 1: Match the Screening Technology to the Project and Site Requirements

For most surface water intake systems, passive intake screening is the best choice. Primary application of the screen system is when the water source is a river, lake, stream, reservoir or pond. The screens are placed directly in the water source, either offshore or at the face of a shoreline structure (*See Figures 1 and 2*).

One key to correct application of passive intake screens is recognition of the basis of the design approach -- to allow water into the intake system while passively permitting debris and aquatic life to remain in the water source. Screen location is part of this process. When the screens are placed in the water source (rather than at the end of a canal) the result is that the screens are away from natural debris accumulation areas and, often, away from fish breeding areas.

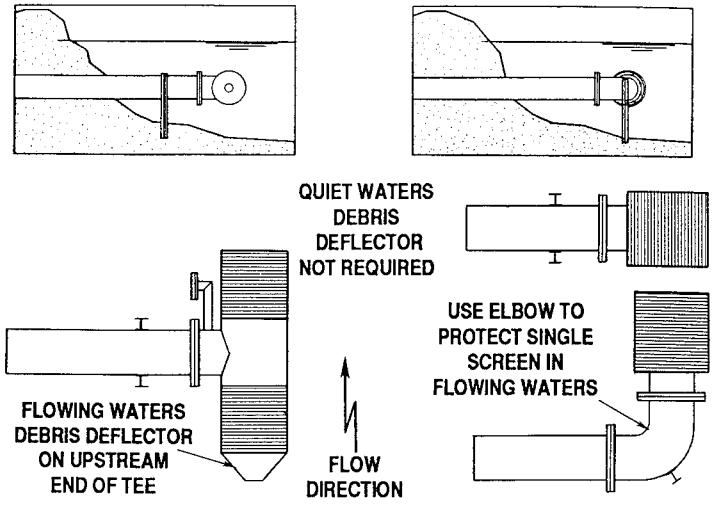
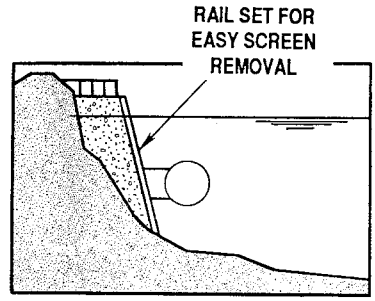


FIGURE 1



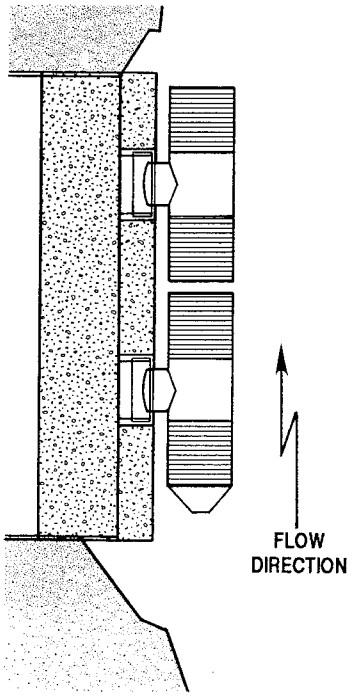
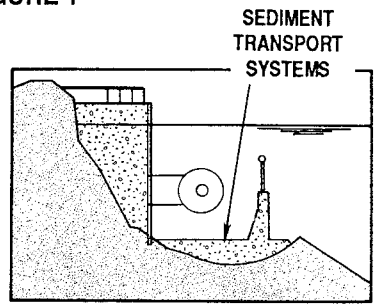


FIGURE 2

Low, uniform intake velocity is a second key to successful passive screen application. Clogging of screens is a result of debris being forced against the screen by high velocity through the screens. Low, uniform velocity is important in creating a minimum maintenance operation. In quiet waters the only force carrying and holding debris to the screen is the velocity through the screen. If the maximum velocity is low, then the amount of debris held to the screen surface will be low. In moving waters debris is carried to the screen by the passing water. If the maximum velocity through the screen is low, then the current will carry the debris away.

If easy access to the screen assemblies is important, shoreline screens can be used. For site conditions where silt, sediment, and sand transport are serious design issues a special adaptation of the shoreline intake can be used (*See Figure 3*). This adaptation incorporates special air bubbling and flow inducing jets in the bottom of a side stream channel to help ensure that bed materials keep moving past the screens and intake structure.

There are some water or site conditions that make selection of an alternate screening technology appropriate. This handbook will focus on passive screening. Information on alternate technologies is discussed briefly below to assist you in your evaluation. Non-passive screens are available from



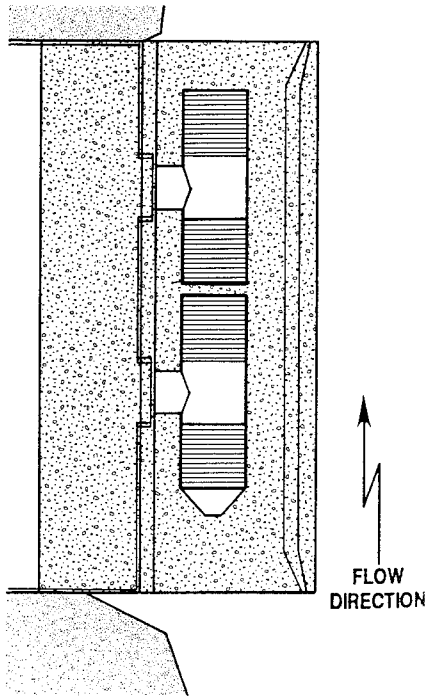


FIGURE 3

APPLICATION

Once the decision has been made to select **Johnson Intake Screen Systems** for your water intake and a screen has been chosen there are a number of design factors that often must be considered in the design. These factors include:

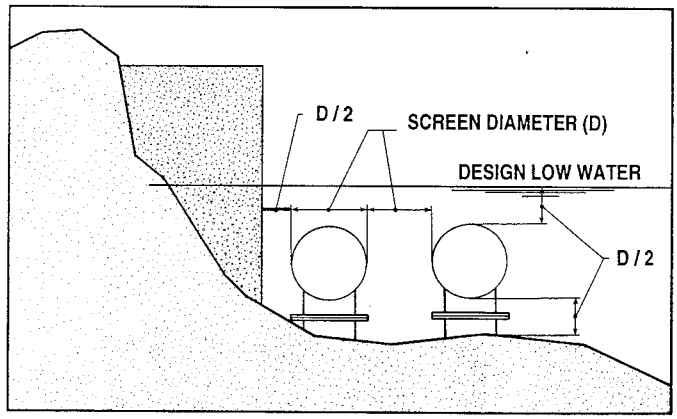
- *How close should the screen be placed to water surface?*
- *How far should the screens be from the bottom?*
- *How close together should the screens be?*
- *Do the screens require additional protection?*
- *How are the screens supported in the water?*
- *Where should the Hydroburst connection be?*
- *How should multiple screen assemblies be piped?*
- *How are the screens used when multiple level withdrawal is required?*
- *What about retrofit of vertical traveling screens?*
- *Is there a system for easy screen removal?*
- *How or where should the chemical feed line be located?*
- *How much space is required for a Hydroburst System? and, for Zebra Mussel systems?*
- *What about ice?*

Each of these questions is addressed briefly in the following pages.

How close should the screens be to the water boundaries and to each other?

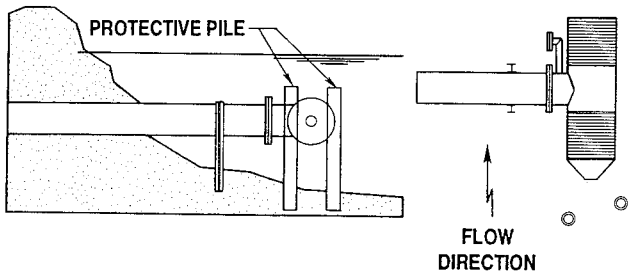
The minimum recommended screen submergence is 1/2 screen diameter below the water surface at design low water. The design low water is commonly the water level at 100 year low water or, in areas where ice exists, the water level at the bottom of the floe ice during breakup. The basic idea is, get the screens below floating debris that might cause damage. The recommended clearance from the bottom of the screen to the bottom of the water source is again 1/2 screen diameter. 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 1/2 screen diameter and clearance between screens is recommended to be at least 1 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.



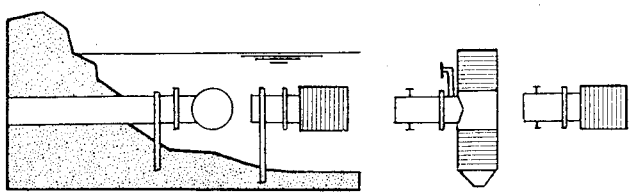
Do the Screens require additional protection?

The screens are designed to be strong, to withstand many of the forces that can be anticipated in a natural water source. If the screens are to be placed in a rapidly flowing river or in a lake where the lake currents during a storm can be strong then additional protection may be advisable. One guideline that might be useful is, if it would be good engineering judgement to provide protection for the intake line then it would be 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 as small as possible to withstand anticipated impact and extend 6" to 12" above the top of the screen. It should be noted that using too many protective piles or barriers should be avoided because they can create standing eddies over the screen or result in material being scoured from around the pile and deposited on the screens.

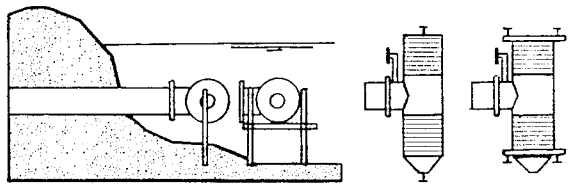


How are the Screens supported in the water?

The most common practice is to support the screens from the flange on the connecting piping. Some alternate support techniques have been employed. These alternate techniques include cradles under the tee body, strapping the screens to an "H pile" arrangement or securing the screens to piles driven adjacent to the tee body or to piles at either end. Site conditions and good engineering judgment will define what is best for any given location.



SCREEN ASSEMBLY SUPPORTED from FLANGE



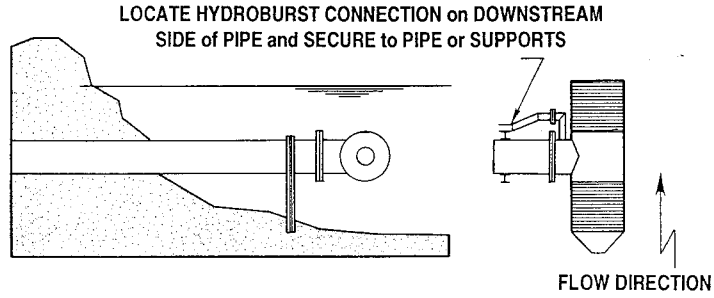
SCREEN ASSEMBLY SUPPORTED with H PILES or CRADLE

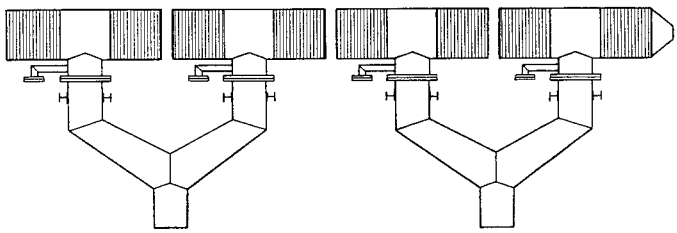
Where should the Hydroburst connection be made?

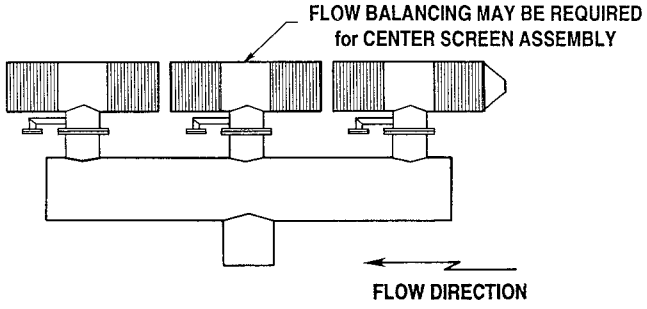
We recommend that in lakes the Hydroburst connection be made below the screen assembly; in flowing conditions we recommend that it be on the downstream side. This location provides additional protection to the smaller pipe, reducing the likelihood of impact damage from debris in the water source and the chance of the hydroburst line being snagged by a boat anchor.

How should multiple screen assemblies be piped?

The specific details of connecting multiple screen assemblies to the intake chamber are beyond the scope of the handbook. The following information is provided for guidance. The connecting piping should be designed to produce a uniform inflow from each screen assembly. Symmetrical systems tend to be close to balanced by design. Asymmetrical systems or systems with one screen directly opposite the intake line tend to need additional flow balancing efforts. The specific head loss for the screen assembly can be obtained from application engineers or from your local representative. As a guide, the head loss through a single screen is approximately equal to the entrance loss through a connecting pipe the same diameter as the connecting pipe to the screen. The headloss through a tee assembly will generally be in the range of 1/3 to 3/4 feet of water.

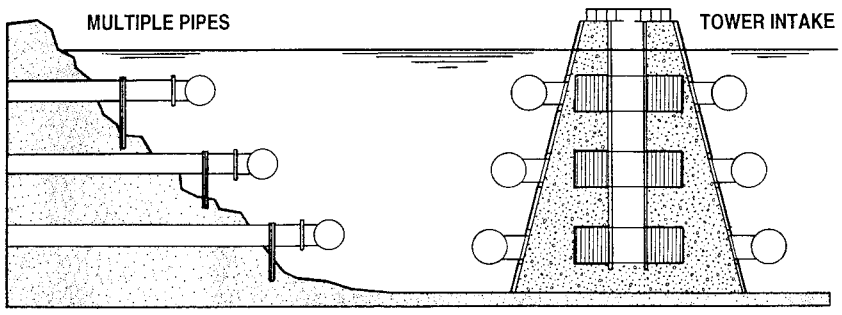






How are the Screens used when multiple level withdrawal is required?

Johnson Intake Screen Systems make multiple level withdrawal particularly easy. One or more screens are used at each level to provide the required capacity. Multiple level withdrawal is accomplished by opening valves on the piping from the desired level and closing valves on the other levels. Positioning of the screens can be accomplished by running pipelines to various levels or by securing the screens to an intake tower at the desired elevations.



APPLY