

## Screening

Screening is a unit that removes suspended matter from water.

Screens may be classified as coarse or fine screens depending on the size of material that is removed.

## Coarse Screens.

Also known as *bar racks*, these screens are provided to prevent leaves, sticks, and other large pieces of debris from entering the tower.

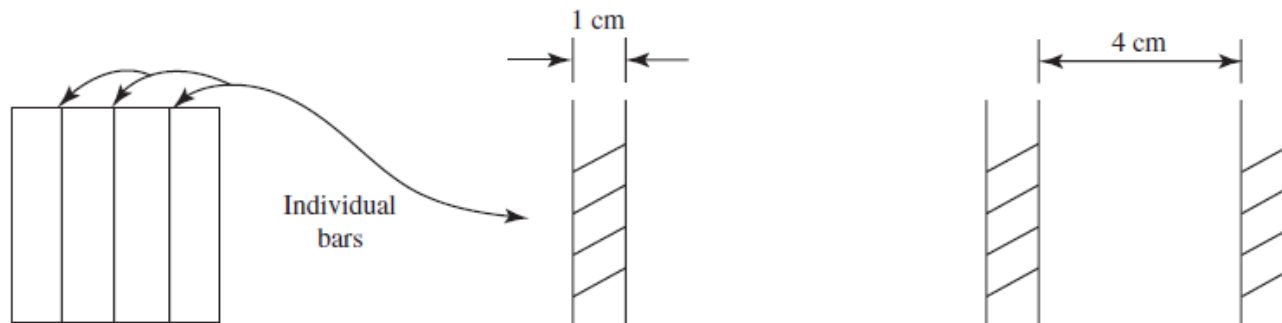
To maintain the desired inlet design velocity, the design of the port must take the area occupied by the bars into account.

Using an intake velocity of 0.08 m/s and a design flow rate of 6,000 m<sup>3</sup>/d the area is

$$A = \frac{Q}{v} = \frac{6,000 \text{ m}^3/\text{d}}{(0.08 \text{ m/s})(86,400 \text{ s/d})} = 0.868 \text{ or about } 0.9 \text{ m}^2$$

The unit space occupied by a bar and the adjacent opening is 4 cm + 1 cm = 5 cm. The fraction of the area occupied by the bar is 1 cm/5 cm = 0.20 or 20 percent. To account for the bars, the area of the port opening must be increased by 20 percent or

$$A = (1.20)(0.9 \text{ m}^2) = 1.08 \text{ or } 1.1 \text{ m}^2$$



The velocity through the coarse screen is generally less than 8 cm/sec (to avoid fish to be trapped).

## Fine Screens.

A fine screen is placed downstream of the coarse screen.

Its purpose is to collect smaller material that has passed through the coarse screen but is still large enough to damage downstream equipment.

Generally, it is placed in the low-lift pump station ahead of the pump intake.

### Typical rack and screen characteristics

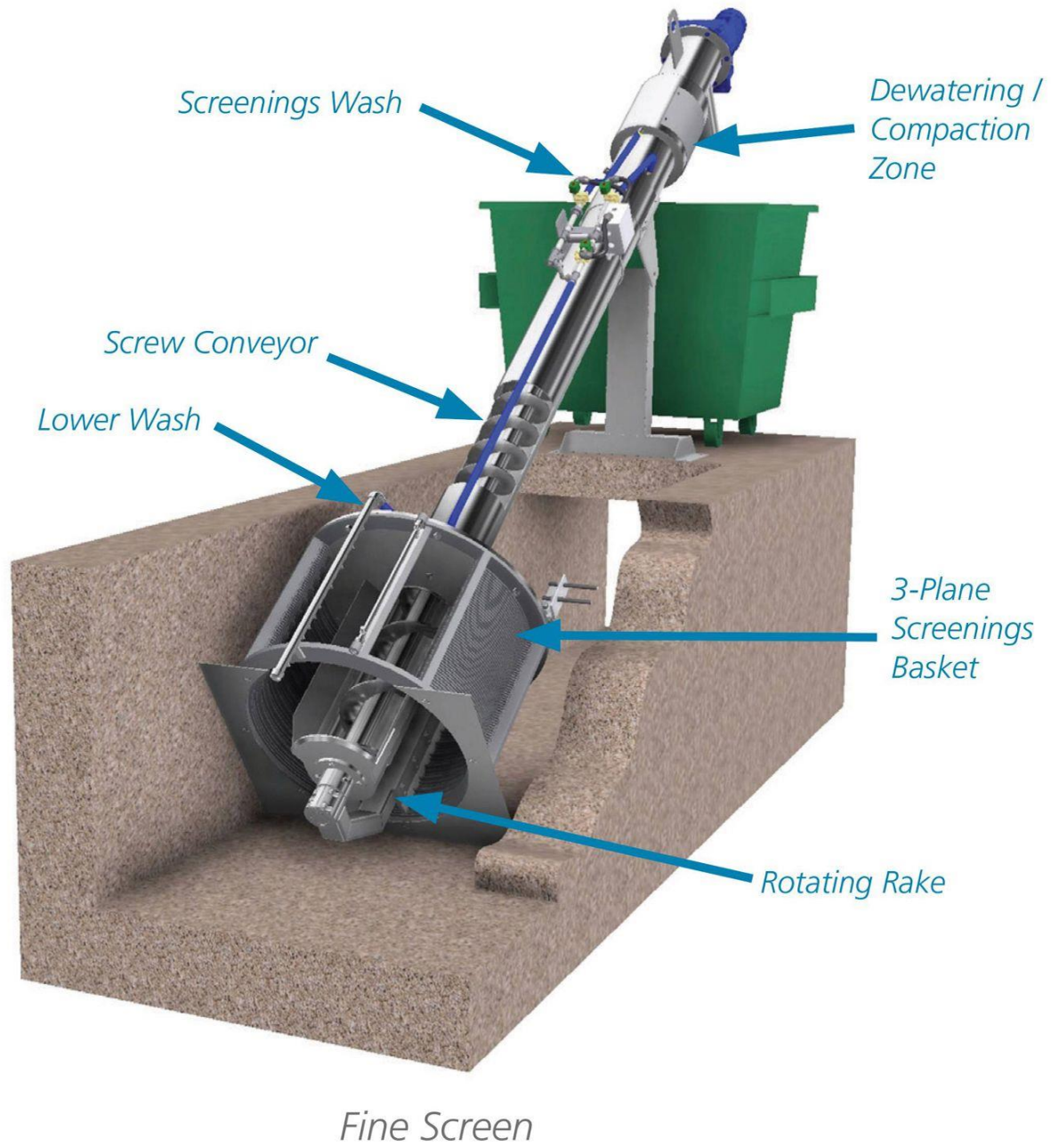
Type	Remarks
<b>Coarse screens</b>	
Bar racks	Clear opening 2 to 8 cm between bars Steel bars 1 to 2 cm in diameter Inclined or vertical; if inclined, angle is 20 to 30° from vertical
Trash racks	Clear opening 8 to 10 cm between bars Steel bars 2 to 4 cm in diameter Inclined or vertical; if inclined, angle is 20 to 30° from vertical
<b>Fine screens</b>	Clear opening 0.5 to 1 cm between elements Mechanically cleaned on either a continuous or intermittent schedule Inclined or vertical; equipment supplier specifies angle Provide head space or other means to raise the screen entirely out of the water for inspection and maintenance

## **Microstrainers:**

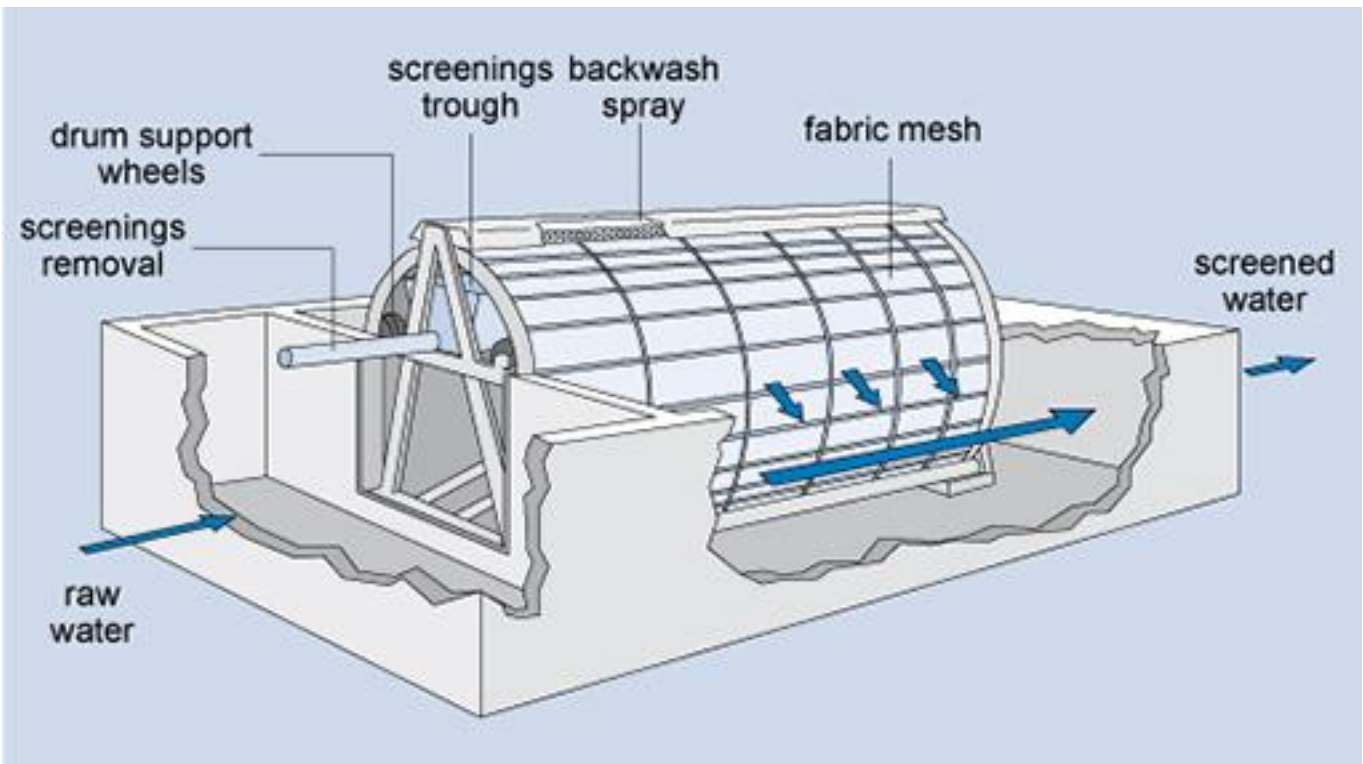
Microstrainers are used for the removal of plankton and algae from impounded waters.

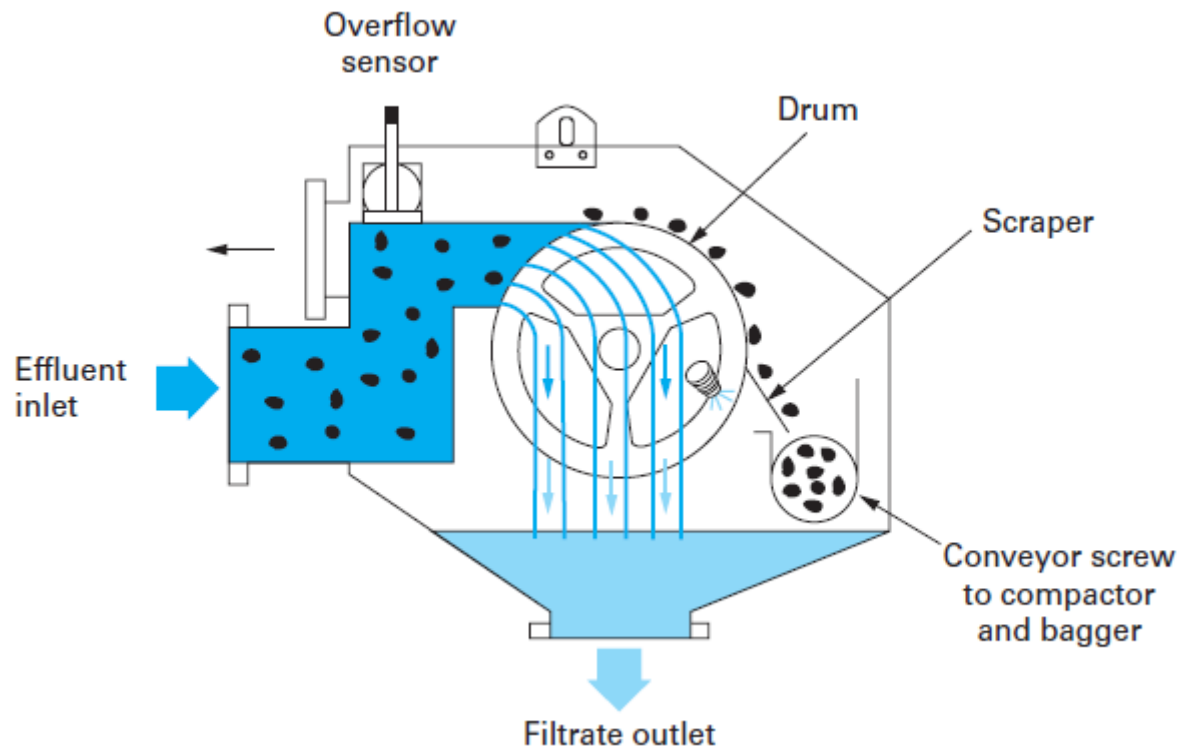
A microstrainer consists of a rotating cylindrical frame covered with fine water mesh fabric.

Water enters the cylinder and moves radially out. Deposited solids are removed by a jet of water from the top and discharged into a trough.









## Grit Chamber

Abrasive materials such as silt, sand, and shells is called *grit*.

This material is very abrasive and will result in excessive wear to mechanical equipment as well as potentially settling out during low-demand flows.

When the source water bottom is soft and subject to scour or when flood conditions result in a high sediment load and turbidity, grit chambers are provided.

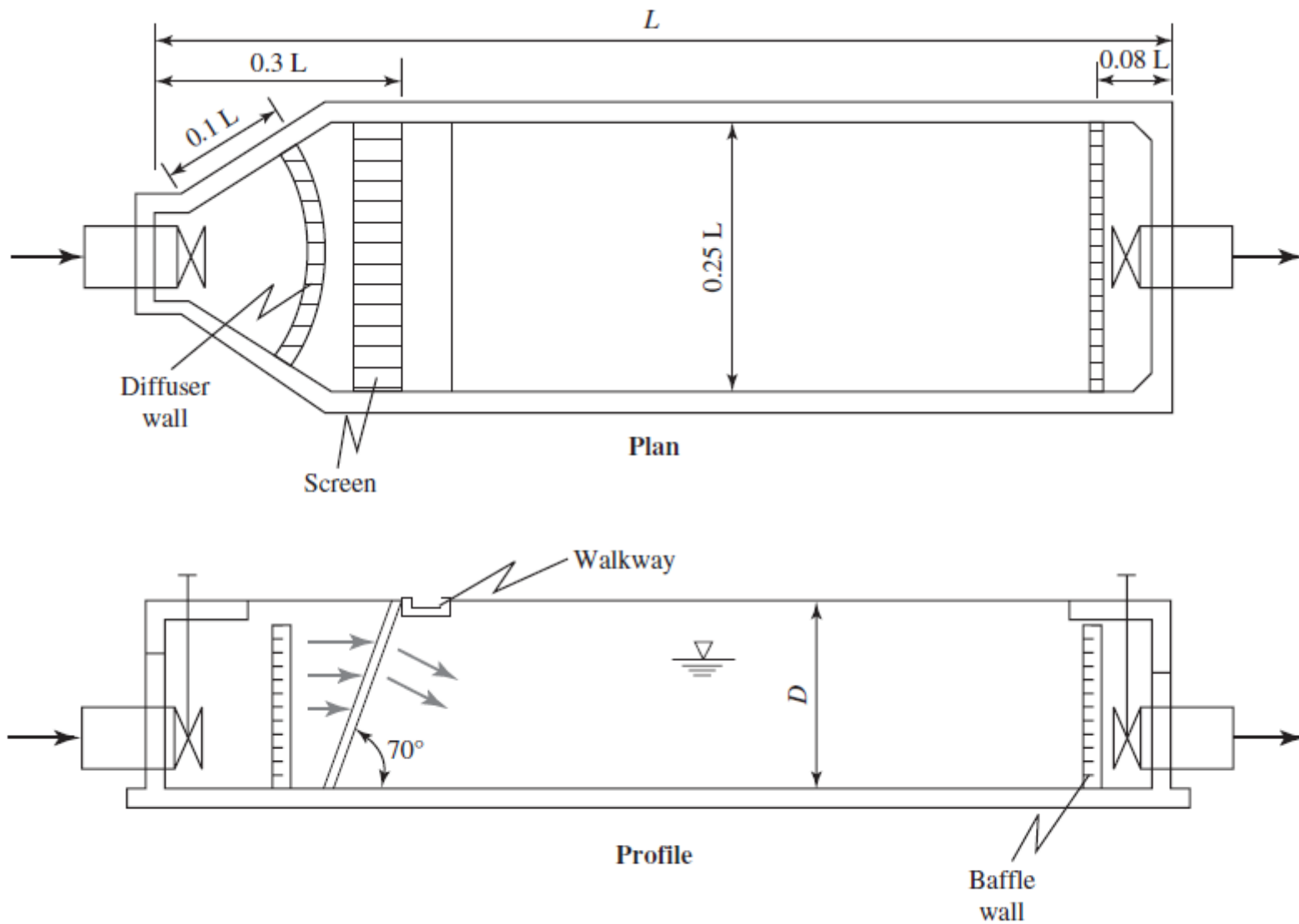
The design objective of the grit chamber is to remove sand or silt particles greater than 0.1 mm in diameter.

Generally, particles smaller than this do not pose a hazard to pumps and pipelines.

The grit chamber is a horizontal flow settling tank (Figure 3-19).

### **NOTE**

The design objectives for raw water grit chambers are significantly different from those used for wastewater treatment. Thus, wastewater treatment plant designs should not be used for raw water grit removal.



**FIGURE 3-19**  
Grit chamber.

## Water intake grit chamber design criteria

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Parameter	Range of values
Location	Downstream of the fine screen and upstream of the raw water pumps
Number of chambers	2
Water depth	
Mechanical grit removal	3 to 4 m
Manual grit removal	4 to 5 m
Length to width	4:1
Length to depth	6:1
Velocity	0.05 to 0.08 m/s
Detention time	6 to 15 min
Overflow rate <sup>a</sup>	10 to 25 m/h.

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<sup>a</sup>Overflow rate =  $Q$ /surface area of water in tank.