c) Weir overflow rate:

$$Weir\ \ overflow\ \ rate\left(\frac{gpd}{ft}\right) = \frac{\frac{11\cancel{MG}}{day} * \frac{10^6 gal}{\cancel{MG}}}{3.14 * 90 ft} = \boxed{38,924 gpd/ft}$$

4.7.4 Removal Efficiency

Primary sedimentation removes suspended wastewater solids which includes BOD. The efficiency of the primary is established as the percentage of the amount of parameter removed. The parameter may quantified as mass (lbs) or as concentration (mg/l).

$$Removal\ \ efficiency(\%) = \frac{Parameter\ \ In - Parameter\ \ Out}{Parameter\ \ In} * 100$$

For TSS removal:

$$TSS\ \ Removal\ \ efficiency(\%) = \frac{TSS_{In}\ \ (mg/l) - TSS_{Out}\ \ (mg/l)}{TSS_{In}\ \ (mg/l)} * 100$$

For BOD removal:

$$BOD\ \ Removal\ \ efficiency(\%) = \frac{BOD_{In}\ \ (mg/l) - BOD_{Out}\ \ (mg/l)}{BOD_{In}\ \ (mg/l)} * 100$$

4.7.5 Solids Removal

Type 1 Problems: These involve calculating lbs of solids removed given any two of the following TSS parameters - inlet concentration, outlet concentration and removal efficiency.

a. If the inlet and outlet concentrations are given, calculate the mg/l of TSS removed using:

$$TSS_{removed} = TSS_{in}(mg/l) - TSS_{out}(mg/l)$$

Then knowing the flow, use the lbs formula to calculate the lbs solids removed.

b. If either inlet or outlet concentration is given along with the clarifier removal efficiency, using the removal efficiency calculate the unknown outlet concentration (if only the inlet is given) or the inlet concentration (if only the outlet is given)

i) If inlet and removal efficiency is given, calculate the outlet by subtracting the product of inlet and removal efficiency from the inlet.

$$TSS_{out} = TSS_{in} - (TSS_{in} * \%Removal)$$

Example if the removal efficiency is 60% and the inlet concentration is 300mg/l:

$$TSS_{out} = 300 - 300 * 0.6 = 120 mg/l$$

ii) If outlet and removal efficiency is given, calculate the inlet concentration by dividing the outlet by (1-removal efficiency).

$$TSS_{in} = \frac{TSS_{out}}{1 - \%Removal}$$