

Example Problem 3.3
Final Clarifier

Batch settling tests have been performed using an acclimated activated sludge to give the data in Table 3.3.

Table 3.3. Concentrations, Settling Velocities, and Solids Flux for Various Tests

Test no.	C (mg/l)	V (ft/hr)	G = CV (lb/hr-ft ²)
1	12460	0.409	0.318
2	9930	0.817	0.506
3	7450	1.525	0.709
4	5220	3.281	1.068
5	3140	9.646	1.900
6	1580	13.710	1.351

The design mixed liquor flow to the final clarifier is 2530 gpm (gallons per minute), the MLSS is 2500 mg/l, and the underflow concentration is 12,000 mg/l. Determine the diameter of the final clarifier.

Solution

The settling curve showing the settling velocity versus solids concentration is shown in Figure 3.21. The flux curve showing the solids flux versus solids concentration is shown in Figure 3.22. A tangent to the curve drawn from $C_u = 12,000$ mg/l gives a G_L value of 1.80 lb/hr-ft². Using a scale-up factor of 1.5 gives $G_L = 1.80/1.5$ or 1.20 lb/hr-ft². The rate at which the solids settle, M_r , is equal to $Q_0 C_0$, or $M_r = (2530 \text{ gal/min})(60 \text{ min/hr})(8.34 \text{ lb/gal})(2500/10^6)$ or 3165 lb/hr. From Eq. (3.42) the area required is M_r/G_L , or $A = (3165 \text{ lb/hr})/(1.20 \text{ lb/hr-ft}^2)$ or 2638 ft². The required diameter is given by

$$D = \left[\frac{4}{\pi} (2638 \text{ ft}^2) \right]^{1/2}$$

$$= 58.0 \text{ ft} \quad \text{Use 60 ft for standard size.}$$

Figure 3.21. Example Problem 3.3

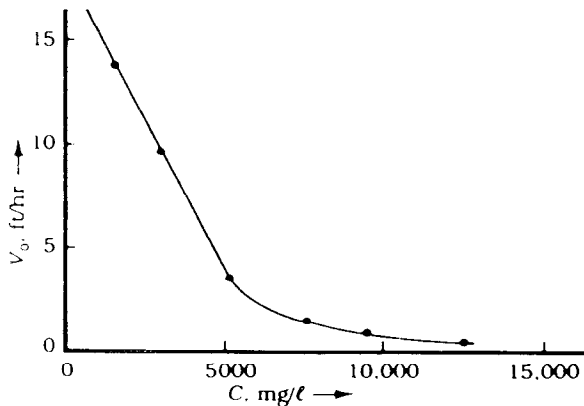


Figure 3.22. Example Problem 3.3

