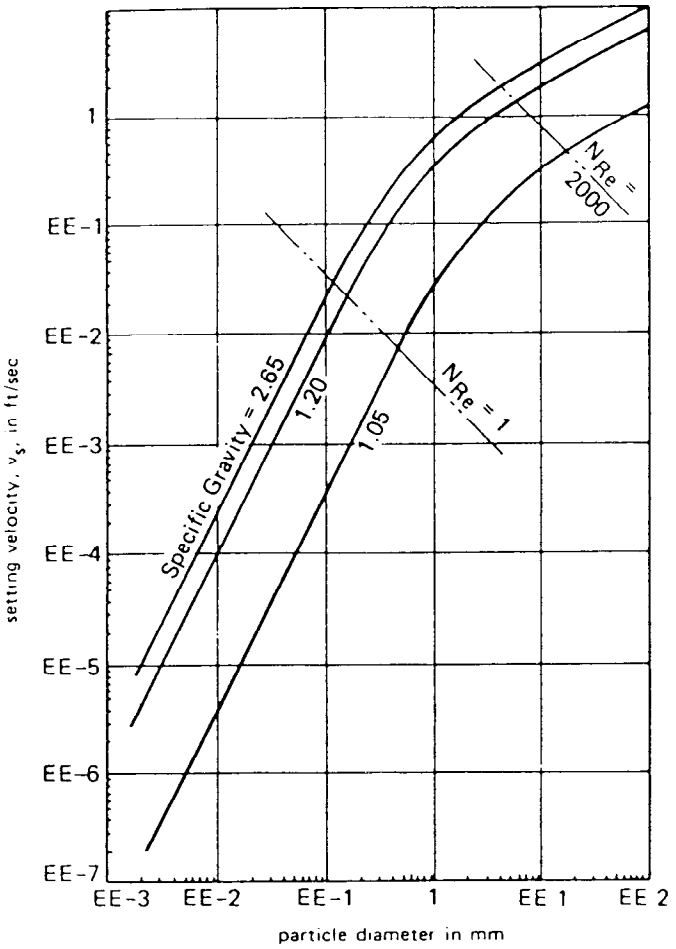

Figure 7.6 Settling Velocities (spherical particles, 68°F water)

Table 7.20
Approximate Drag Coefficients for Spheres

N_{Re}	C_D
2000	0.4
10,000	0.4
50,000	0.5
100,000	0.5
200,000	0.4

If it is assumed that the water velocity is a uniform v_f, then all particles with $v_s > v^*$ will be removed. v^* is known as the *overflow rate* (*surface loading* or *critical velocity*) and typically has a value of 600 to 1000 gpd/ft^2 for rectangular basins. For square and circular basins, the surface loading should be within 500–750 gpd/ft^2. B is the tank width, typically 30 to 40 feet, and L is the length, typically 100 to 200 feet. (For radial flow circular basins, a typical diameter is 100 feet.)

$$v^* = \frac{Q}{A_{surface}} = \frac{Q}{BL} \qquad 7.40$$

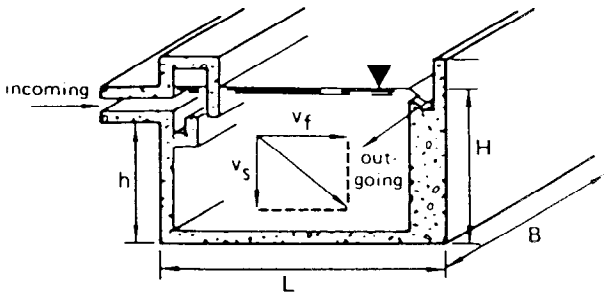

Figure 7.7 Rectangular Settling Basin

If water enters at some level other than the surface, such as at level h in figure 7.7, all particles will be removed that have

$$v_s > \frac{hQ}{HBL} \qquad 7.41$$

Rectangular basins are preferred, even if sludge removal means emptying and taking them out of service. Rectangular basins should be constructed with aspect ratios of greater than 3:1, and preferably in excess of 4:1. Slope the bottom toward the drain at no less than 1 percent. Use multiple inlets along the entire inlet wall, if possible. If fewer than four ports are used, an inlet baffle should be provided.

In the case of square or circular basins, the slope toward the drain should be greater, typically on the order of 1 : 12. A baffled center inlet should be provided. Square and circular basins are appropriate when space is limited. Otherwise, rectangular basins or solid contact units are preferred.

In using equation 7.40, divide the total flow to be treated into at least two basins. That way, one basin can be out of service for cleaning without interruption of operation.

Basins should be constructed from concrete for all permanent installations. Steel should be used only for small or temporary installations. Where steel parts are unavoidable, as in the case of internal parts of rotors, adequate corrosion resistance is necessary.

The time spent by water in the basin is known as the *detention* (or *retention*) *time* (or *period*). The detention time is given by equation 7.42. A minimum time recommended is 3–4 hours, although periods from 1 to 10 hours are used.[12]

$$t = \frac{\text{tank volume}}{Q} \qquad 7.42$$

[12] Long detention times, up to 12 hours, are required to remove fine particles.