With this value of t_u, the area required for the thickening is computed using Eq. (5–41). The area required for clarification is then determined. The larger of the two areas is the controlling value. Application of this procedure is illustrated in Example 5–8.

EXAMPLE 5–8 Sizing an Activated-Sludge Settling Tank The settling curve shown in the following diagram was obtained for an activated sludge with an initial solids concentration C_0 of 3000 mg/L. The initial height of the interface in the settling column was at 0.75 m (2.5 ft). Determine the area required to yield a thickened solids concentration, C_u of 12,000 mg/L with a total flow of 3800 m^3/d (1 Mgal/d). Determine also the solids loading ($kg/m^2 \cdot d$) and the overflow rate ($m^3/m^2 \cdot d$).

Solution

1. Determine the area required for thickening using Eq. (5–42).
   a. Determine the value of H_u

$$H_u = \frac{C_0 H_0}{C_u} = \frac{(3000 \text{ mg/L})(0.75 \text{ m})}{(12{,}000 \text{ mg/L})} = 0.188 \text{ m}$$

On the following settling curve, a horizontal line is constructed at $H_u = 0.188$ m. A tangent is constructed to the settling curve at C_2, the midpoint of the region between hindered and compression settling. Bisecting the angle formed where the two tangents meet determines point C_2. The intersection of the tangent at C_2 and the line $H_u = 0.188$ m determines t_u. Thus $t_u = 47$ min, and the required area is

$$A = \frac{Qt_u}{H_0} = \left[\frac{(3800 \text{ m}^3/\text{d})}{(24 \text{ h/d})(60 \text{ min/h})}\right]\left(\frac{47 \text{ min}}{0.75 \text{ m}}\right) = 165 \text{ m}^2$$

2. Determine the area required for clarification.