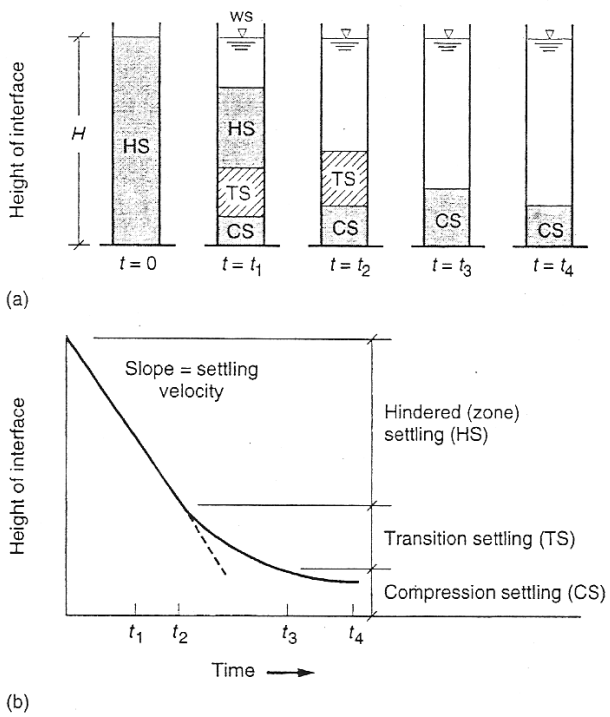

Figure 5–28

Definition sketch for hindered (zone) settling: (*a*) settling column in which the suspension is transitioning through various phases of settling and (*b*) the corresponding interface settling curve.

ture in which there is close physical contact between the particles. As the compression layer forms, regions containing successively lower concentrations of solids than those in the compression region extend upward in the cylinder. Thus, in actuality the hindered settling region contains a gradation in solids concentration from that found at the interface of the settling region to that found in the compression settling region.

Because of the variability encountered, settling tests are usually required to determine the settling characteristics of suspensions where hindered and compression settling are important considerations. On the basis of data derived from column settling tests, two different design approaches can be used to obtain the required area for the settling/thickening facilities. In the first approach, the data derived from one or more batch settling tests are used. In the second approach, known as the solids flux method, data from a series of settling tests conducted at different solids concentrations are used. Both methods are described in the following discussion. The solids flux method is considered further in Sec. 8–8 in Chap. 8. It should be noted that both methods have been used where existing plants are to be expanded or modified. These methods are, however, seldom used in the design of small treatment plants.

Area Requirement Based on Single-Batch Test Results. For purposes of design, the final overflow rate selected should be based on a consideration of the following factors: (1) the area needed for clarification, (2) the area needed for thickening, and (3) the rate of sludge withdrawal. Column settling tests, as previously described, can be used to determine the area needed for the free settling region directly. However, because the area required for thickening is usually greater than the area required for the settling, the rate of free settling rarely is the controlling factor. In the case of the activated-sludge