

Hazardous soil conditions

Expansive soils occur in every state of the United States. Impacts of expansive soils may be extensive cracking of sidewalks, foundation failures, retaining wall failure, and so on. Expansive soils are defined as described in Table 2.3.

Liquification is associated with earthquakes. It refers to the condition in which solid ground can turn mushy when soils are vibrated. Under certain conditions soils lose all bearing capacity, and buildings and bridges can slip or sink (as in quicksand) or buried structures (such as tanks) can float to the surface. These conditions have been associated with fine- to medium-grained sands and silts found in loosely packed layers. In general, the greater the soil density, the lower the liquification risk. A clay content of 15 percent or more is believed to be adequate protection from liquification (Borcherdt and Kennedy 1979).

Another form of liquification is found in quick clays. These are clays that can become “quick”—that is, they can liquefy. Confined to northern states and Canada (New York and Vermont have had quick-clay failures), these are very fine, flourlike clays formed as sediments in shallow waters and later raised above sea level. Collapse of quick clays has been associated with high water content, as the material weight exceeds its shear strength, resulting in slope failure.

Hydrology

The presence of water on the site and the general pattern of drainage are important concerns of the site analysis. Water is often the key feature of a site.

TABLE 2.3 Recognition of Expansive Soils in the Field

Under Dry Conditions
<ul style="list-style-type: none"> ■ Soil is hard and almost rocklike; difficult to impossible to crush by hand. ■ Glazed, almost shiny surface where previously cut by shovel or scraper. ■ Very difficult to penetrate with pick or shovel. ■ Ground surface displays cracks occurring in a more or less regular pattern. Crack width and spacing are indicative of relative expansion potential in horizontal plane. ■ Surface irregularities such as tire tracks cannot be obliterated by foot pressure.
Under Wet Conditions
<ul style="list-style-type: none"> ■ Soil very sticky. Exposed soil will accumulate on shoe soles to a thickness of 2–4 in when walked upon for a short distance. ■ Soil can be molded into a ball by hand. Hand molding will leave a nearly invisible powdery residue on hands after they dry. ■ A shovel will penetrate soil quite easily, and the cut surface will be smooth and tend to be shiny. ■ Freshly machine scraped or cut areas will tend to be smooth and shiny. ■ Heavy construction equipment such as bulldozers and compacting rollers will develop a thick soil coating, which may impair their function.

SOURCE: Reprinted with permission from Gary Griggs and John A. Gilcrest, *Geologic Hazards, Resources and Environmental Planning*, 2d ed (Belmont, Calif.: Wadsworth Publishing Company).