

EXPLANATION

- Areas underlain by geologic units that contain clays having swelling pressures higher than 2,500 pounds per square foot P.V.C. (potential volume change). Preconstruction investigations in these areas should include engineering laboratory swell-shrink tests.
- Areas underlain by 5 or more feet of nonswelling surficial deposits which in turn are underlain by geologic units which may have swelling pressures higher than 2,500 lbs. per sq. foot P.V.C. For any construction involving foundation excavation through the surficial deposits, preconstruction investigations should include engineering laboratory swell-shrink tests.
- Areas underlain by geologic units having no or slight swelling pressures. Preconstruction swell-shrink tests unnecessary.

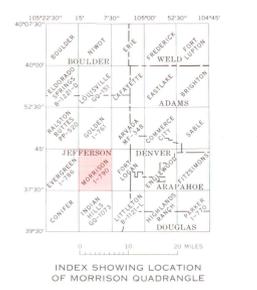
NOTE

Formations that contain clays having swelling pressures higher than 2,500 pounds per square foot (as measured by the Potential Volume Change meter) are listed in order of decreasing swelling pressure: Denver Formation, Pierre Shale, Laramie Formation, Green Mountain Conglomerate, Fox Hills Sandstone, and Arapahoe Formation. Some landslides derived from these formations also contain swelling clay and are mapped with the bedrock formations listed above. Each of these bedrock formations has some beds having swelling pressures, some as high as 9,000 pounds per square foot. Bentonite beds in the Graneros Shale, Greenhorn Limestone, Castle Shale, Smoky Hill Shale Member of the Niobrara Formation, and Pierre Shale have swelling pressures as high as 11,000 lbs. sq. foot, but these white clayey beds are less than 1 foot thick and are easy to remove before building. Alluvial and colluvial deposits derived from these bedrock units have inherited swelling pressures as high as 4,000 pounds per square foot, but generally less than one-half the swelling pressure of the original bedrock. Montmorillonite and mixed-layer clays are the clays that swell when wetted and shrink when dried; of the two, montmorillonite has the greatest swelling potential. Swell-shrink tests should be made by an engineering laboratory before construction is begun on any of the formations listed above and which constitute the group having the highest swelling pressure.

CATEGORIES OF SWELLING PRESSURE

Very critical	above 4,700 psf
Critical	3,200 to 4,700 psf
Marginal	2,700 to 3,200 psf
Noncritical	0 to 2,700 psf

^a Pounds per square foot



Base from U.S. Geological Survey, 1965
Photorevised in 1971
10,000-foot grid based on Colorado coordinate system, central zone
1000-meter Universal Transverse Mercator grid ticks, zone 13

SCALE 1:24,000
1 MILE
1 KILOMETER

CONTOUR INTERVAL 40 FEET
DATUM IS MEAN SEA LEVEL

QUADRANGLE LOCATION

Interpretation from geologic map of Morrison quadrangle (I-790-A). Swelling tests of clay performed by Stephen S. Hart

**MAP SHOWING AREAS CONTAINING SWELLING CLAY IN THE MORRISON QUADRANGLE,
JEFFERSON COUNTY, COLORADO**

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