



UNIFIED SOIL CLASSIFICATION SYSTEM

UNIFIED SOIL CLASSIFICATION AND SYMBOL CHART

| COARSE-GRAINED SOILS (more than 50% of material is larger than No. 200 sieve size.) | | |
|--|--|---|
| Clean Gravels (Less than 5% fines) | | |
| GRAVELS More than 50% of coarse fraction larger than No. 4 sieve size | | GW Well-graded gravels, gravel-sand mixtures, little or no fines |
| | | GP Poorly-graded gravels, gravel-sand mixtures, little or no fines |
| | Gravels with fines (More than 12% fines) | |
| | | GM Silty gravels, gravel-sand-silt mixtures |
| | | GC Clayey gravels, gravel-sand-clay mixtures |
| Clean Sands (Less than 5% fines) | | |
| SANDS 50% or more of coarse fraction smaller than No. 4 sieve size | | SW Well-graded sands, gravelly sands, little or no fines |
| | | SP Poorly graded sands, gravelly sands, little or no fines |
| | Sands with fines (More than 12% fines) | |
| | | SM Silty sands, sand-silt mixtures |
| | | SC Clayey sands, sand-clay mixtures |
| FINE-GRAINED SOILS (50% or more of material is smaller than No. 200 sieve size.) | | |
| SILTS AND CLAYS Liquid limit less than 50% | | ML Inorganic silts and very fine sands, rock flour, silty or clayey fine sands or clayey silts with slight plasticity |
| | | CL Inorganic clays of low to medium plasticity, gravelly clays, sandy clays, silty clays, lean clays |
| | | OL Organic silts and organic silty clays of low plasticity |
| SILTS AND CLAYS Liquid limit 50% or greater | | MH Inorganic silts, micaceous or diatomaceous fine sandy or silty soils, elastic silts |
| | | CH Inorganic clays of high plasticity, fat clays |
| | | OH Organic clays of medium to high plasticity, organic silts |
| HIGHLY ORGANIC SOILS | | PT Peat and other highly organic soils |

LABORATORY CLASSIFICATION CRITERIA

| | | |
|----|---|--|
| GW | $C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3 | |
| GP | Not meeting all gradation requirements for GW | |
| GM | Atterberg limits below "A" line or P.I. less than 4 | Above "A" line with P.I. between 4 and 7 are borderline cases requiring use of dual symbols |
| GC | Atterberg limits above "A" line with P.I. greater than 7 | |
| SW | $C_u = \frac{D_{60}}{D_{10}}$ greater than 4; $C_c = \frac{D_{30}}{D_{10} \times D_{60}}$ between 1 and 3 | |
| SP | Not meeting all gradation requirements for GW | |
| SM | Atterberg limits below "A" line or P.I. less than 4 | Limits plotting in shaded zone with P.I. between 4 and 7 are borderline cases requiring use of dual symbols. |
| SC | Atterberg limits above "A" line with P.I. greater than 7 | |

Determine percentages of sand and gravel from grain-size curve. Depending on percentage of fines (fraction smaller than No. 200 sieve size), coarse-grained soils are classified as follows:

Less than 5 percent GW, GP, SW, SP
 More than 12 percent GM, GC, SM, SC
 5 to 12 percent Borderline cases requiring dual symbols

PLASTICITY CHART

