

## **Unified Soil Classification System (USCS) Guide**

The Unified Soil Classification System uses a two-letter system to name different soil types. The chart below also includes a plasticity chart that is used to determine the classification of fine-grained soils.

Note that some specifications described in the following content may not be the same as the specifications followed by your agency. Always check with your State agency's standards and specifications when using these guidelines.

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### **Unified Soil Classification System (USCS) Guide**

- The first letter in the naming describes the major constituents of the soil (G-gravel, S-sand, M-silt, C-clay, O-organic).
- The second letter describes characteristics of the soil. For coarse-grained, the second letters are: P-poorly graded (uniform particle sizes), W-well-graded (diversified particle sizes), M-silty fines, and C-clayey fines.
- For fine-grained soils, the second letters are: H-high plasticity (fat soil) and L-low plasticity (lean soil).
- Atterberg lab test results are plotted: silts fall below the “A” line and clays lie above the “A” line.
- High plasticity soils have a Liquid Limit greater than 50 and low plasticity soils have a Liquid Limit less than 50.

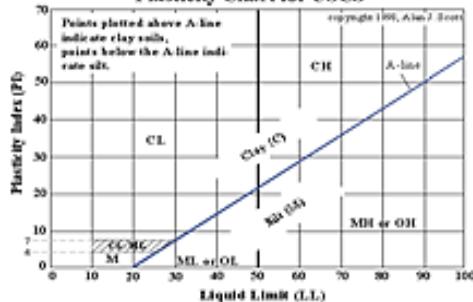
## UNIFIED SOIL CLASSIFICATION SYSTEM

Soils are visually classified for engineering purposes by the Unified Soil Classification System. Grain-size analyses and Atterberg Limits tests often are performed on selected samples to aid in classification. The classification system is briefly outlined on this chart. Graphic symbols are used on boring logs presented in this report. For a more detailed description of the system, see "Standard Practice for Description and Identification of Soils (Visual-Manual Procedure)" ASTM Designation: 2488-84 and "Standard Test Method for Classification of Soils for Engineering Purposes" ASTM Designation: 2487-85.

		MAJOR DIVISIONS		GRAPHIC SYMBOL	GROUP SYMBOL	TYPICAL NAMES	
COARSE-GRAINED SOILS  (Less than 50% passes No. 200 sieve)	GRAVELS  (50% or less of coarse fraction passes No. 4 sieve)	CLEAN GRAVELS (Less than 5% passes No. 200 sieve)			GW	Well graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures	
		GRAVELS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart		GP	Poorly graded gravels, gravel-sand mixtures, or sand-gravel-cobble mixtures	
					GM	Silty gravels, gravel-sand-silt mixtures	
		SANDS  (50% or more of coarse fraction passes No. 4 sieve)	Limits plot above "A" line & hatched zone on plasticity chart		GC	Clayey gravels, gravel-sand-clay mixtures	
					SW	Well graded sands, gravelly sands	
	SANDS  (50% or more of coarse fraction passes No. 4 sieve)	CLEAN SANDS (Less than 5% passes No. 200 sieve)			SP	Poorly graded sands, gravelly sands	
		SANDS WITH FINES (More than 12% passes No. 200 sieve)	Limits plot below "A" line & hatched zone on plasticity chart		SM	Silty sands, sand-silt mixtures	
					SC	Clayey sands, sand-clay mixtures	
		SILTS  Liquid limit below "A" line & hatched zone on plasticity chart	SILTS OF LOW PLASTICITY (Liquid Limit less than 50)		ML	Inorganic silts, clayey silts of low to medium plasticity	
					MH	Inorganic silts, micaceous or diatomaceous silty soils, elastic silts	
FINE-GRAINED SOILS  (50% or more passes No. 200 sieve)	CLAYS  Liquid limit above "A" line & hatched zone on plasticity chart	CLAYS OF LOW PLASTICITY (Liquid Limit less than 50)			CL	Inorganic clays of low to medium plasticity, gravelly, sandy, and silty clays	
		CLAYS OF HIGH PLASTICITY (Liquid Limit 50 or more)			CH	Inorganic clays of high plasticity, fat clays, sandy clays of high plasticity	
	ORGANIC SILTS AND CLAYS  Liquid limit above "A" line & hatched zone on plasticity chart	ORGANIC SILTS AND CLAYS OF LOW PLASTICITY (Liquid Limit less than 50)			OL	Organic silts and clays of low to medium plasticity, sandy organic silts and clays	
		ORGANIC SILTS AND CLAYS OF HIGH PLASTICITY (Liquid Limit 50 or more)			OH	Organic silts and clays of high plasticity, sandy organic silts and clays	
	ORGANIC SOILS	PRIMARILY ORGANIC MATTER (dark in color and organic odor)			PT	Peat	

NOTE: Coarse-grained soils with between 5% and 12% passing the No. 200 sieve and fine-grained soils with limits falling in the hatched zone on the plasticity chart have dual classifications.

Plasticity Chart for USCS



### DEFINITION OF SOIL FRACTIONS

SOIL COMPONENT	PARTICLE SIZE RANGE
Boulders	Above 12 in.
Cobbles	12 in. to 3 in.
Gravel	3 in. to No. 4 sieve
Coarse gravel	3 in. to 3/4 in.
Fine gravel	3/4 in. to No. 4 sieve
Sand	No. 4 to No. 200 sieve
Coarse sand	No. 4 to No. 10 sieve
Medium sand	No. 10 to No. 40 sieve
Fine sand	No. 40 to No. 200 sieve
Fines (silt and clay)	Less than No. 200 sieve

### Plasticity Chart for USCS

- The Liquid Limit is the water content of the soil at which it changes from a plastic to liquid consistency.
- The Plastic Limit is the water content of the soil at which it changes from a brittle/crumble consistency to a plastic consistency.
- The Plasticity Index is the range over which a soil has a plastic consistency and is calculated as the Liquid Limit minus the Plastic Limit.

