The well-graded (GW or SW) or poorly-graded (GP or SP) symbols are used only when fines are less than 5% of the total weight of the sample.

* If the fines are between 5% and 12% of the total sample weight, a dual classification with two group symbols is used. The first symbol is GW, GP, SW, or SP, and the second is GC, GM, SC, or SM. The group name corresponds to the first group symbol, plus the modifying words "with clay" or "with silt" to indicate the plasticity characteristics. If the fines plot as CL-ML on the plasticity chart, the second group symbol should be GC or SC.

**Possible combinations:**

* GW-GM: Well-graded gravel with silt
* GW-GC: Well-graded gravel with clay
* GP-GM: Poorly graded gravel with silt
* GP-GC: Poorly graded gravel with clay
* SW-SM: Well-graded sand with silt
* SW-SC: Well-graded sand with clay
* SP-SM: Poorly graded sand with silt
* SP-SC: Poorly graded sand with clay

Symbols for clayey fines (GC or SC) and silty fines (GM or SM) are used when the clay or silt particles exceed 12% of the total weight of the sample.

* The modifier **G** is used when the plot of liquid limit versus plasticity index falls on or above the "A" line on the plasticity chart.
* The modifier **M** is used when the plasticity chart plot is below the "A" line or the plasticity index is less than 4.

If the fines are over 12% in a coarse-grained soil and the plot of liquid limit versus plasticity index falls in the hatched area in Figure 11-2, another dual symbol is used.

**Examples:**

* GC-GM: Silty, clayey gravel
* SC-SM: Silty, clayey sand

**Fine-Grained Soils**

Particles passing the No. 200 sieve are silts (M) and clays (C). Tests to differentiate between them can be run in the field or laboratory.

* **Field tests**: Dilatancy, dry strength, and toughness help identify fine-grained fractions of coarse-grained soils. Silts have little or no strength when dry, while clays have considerable strength.

The degree of plasticity modifies the classification of fine-grained soils.

* **Plasticity Index**: Estimated in the field, but best determined in the laboratory using the Atterberg limits test.

Fine-grained soils with a liquid limit **≥ 50** are modified by the symbol **H** (MH or CH), and those with a liquid limit **< 50** are modified by **L** (ML or CL).

Fine-grained soils containing **30% or more** coarse-grained fraction should be modified by descriptive terms like "gravelly" or "sandy."

* If the coarse fraction is between **15% and 30%**, use the words "with sand and/or gravel" as appropriate.

**Organic Soils**

To classify organic soils, an estimate of the percentage of non-organic fines and sand is made.

* **Organic content** ranges between **18% and 36%** in an organic silt or organic clay, labeled as muck or peaty muck (OL or OH).
* **Peat (PT)** is used when the organic content is between **90% and 100%**.

**Boundary Soils**

Many soils have characteristics of **two soil types**. A dual symbol is used when tests indicate a soil is borderline. In borderline cases, the **first symbol** is the more dominant type. Examples include: CL/CH, GM/SM, SC/CL, OL/OH.