Standard Specification for

Classification of Soils and Soil–Aggregate Mixtures for Highway Construction Purposes

AASHTO Designation: M 145-91 (2017)

Technical Section: 1b, Geotechnical Exploration, Instrumentation, Stabilization, and Field Testing

Release: Group 3 (August 2017)

AASHTO

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1. SCOPE

1.1. This recommended practice describes a procedure for classifying soils into seven groups based on laboratory determination of particle size distribution, liquid limit, and plasticity index. Evaluation of soils within each group is made by means of a "group index," which is a value calculated from an empirical formula. The group classification, including group index, should be useful in determining the relative quality of the soil material for use in earthwork structures, particularly embankments, subgrades, subbases, and bases. However, for the detailed design of important structures, additional data concerning strength or performance characteristics of the soil under field conditions will usually be required.

1.2. The values stated in SI units are to be regarded as the standard.

2. REFERENCED DOCUMENTS

2.1. *AASHTO Standards*:

- R 58, Dry Preparation of Disturbed Soil and Soil–Aggregate Samples for Test
- T 11, Materials Finer Than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing
- T 27, Sieve Analysis of Fine and Coarse Aggregates
- T 88, Particle Size Analysis of Soils
- T 89, Determining the Liquid Limit of Soils
- T 90, Determining the Plastic Limit and Plasticity Index of Soils

2.2. *ASTM Standard*:

- D1140, Standard Test Methods for Determining the Amount of Material Finer than 75-µm (No. 200) Sieve in Soils by Washing

Note 1— Prepare sample according to R 58. Either T 88, or T 11 and T 27, or ASTM D1140 will be used to determine the particle size distribution of soils or soil–aggregate mixtures as a basis for classification. T 89 and T 90 will be used to determine the liquid limits, plastic limits, and plasticity index of soils.

3. CLASSIFICATION

3.1. The classification is made by using the test limits and group index values shown in Table 1. If a more detailed classification is desired, a further subdivision of the groups shown in Table 1 may be made. An example of the classification with subgroups such as those shown in Table 1 may be made. An example of the classification with such subgroups is shown in Table 2. The liquid limit and plasticity index ranges for the A-4, A-5, A-6, and A-7 soil groups are shown graphically in Figure 2.

Table 1—Classification of Soils and Soil–Aggregate Mixtures

General Classification	Granular Materials (35 Percent or Less Passing 75 µm)			Silt–Clay Materials (More Than 35 Percent Passing 75 µm)			
Group Classification	A-1	A-3[a]	A-2	A-4	A-5	A-6	A-7
Sieve analysis, percent passing:							
2.00 mm (No. 10)	—	—	—	—	—	—	—
0.425 mm (No. 40)	50 max	51 min	—	—	—	—	—
75 µm (No. 200)	25 max	10 max	35 max	36 min	36 min	36 min	36 min
Characteristics of fraction passing 0.425 mm (No. 40):							
Liquid limit	—			40 max	41 min	40 max	41 min
Plasticity index	6 max	Nonplastic (NP)	[b]	10 max	10 max	11 min	11 min
General rating as subgrade	Excellent to Good			Fair to Poor			

[a] The placing of A-3 before A-2 is necessary in the "left to right elimination process" and does not indicate superiority of A-3 over A-2.

[b] See Table 2 for values.

Table 2—Classification of Soils and Soil–Aggregate Mixtures

General Classification	Granular Materials (35 Percent or Less Passing 75 µm)							Silt–Clay Materials (More Than 35 Percent Passing 75 µm)			
	A-1			A-2							A-7
Group Classification	A-1-a	A-1-b	A-3	A-2-4	A-2-5	A-2-6	A-2-7	A-4	A-5	A-6	A-7-5, A-7-6
Sieve analysis, percent passing:											
2.00 mm (No. 10)	50 max	—	—	—	—	—	—	—	—	—	—
0.425 mm (No. 40)	30 max	50 max	51 min	—	—	—	—	—	—	—	—
75 µm (No. 200)	15 max	25 max	10 max	35 max	35 max	35 max	35 max	36 min	36 min	36 min	36 min
Characteristics of fraction passing 0.425 mm (No. 40):											
Liquid limit	—		—	40 max	41 min	40 max	41 min	40 max	41 min	40 max	41 min
Plasticity index	6 max		NP	10 max	10 max	11 min	11 min	10 max	10 max	11 min	11 min[a]
Usual types of significant constituent materials	Stone fragments, gravel and sand		Fine sand	Silty or clayey gravel and sand				Silty soils		Clayey soils	
General rating as subgrade	Excellent to Good							Fair to Poor			

[a] Plasticity index of A-7-5 subgroup is equal to or less than $LL - 30$. Plasticity index of A-7-6 subgroup is greater than $LL - 30$. (See Figure 2.)