Backfill Soil Specification

The successful performance of reinforced soil wall structures is largely attributable to the quality of the soils involved and the contractor's experience with soils and structural fill construction. Many wall performance problems can be traced back to the quality, strength, moisture, and density of the in-situ or compacted backfill soils.

The US Bureau of Public Roads introduced the first soil classification system in 1928 attempting to classify soils based on engineering behavior with designations of A-1, A-2, etc. After this system had been use for about 15 years, AASHO (AASHTO) reviewed and adopted a similar system with designations of A-1-a, A-2-4, etc. In 1952, the Unified Soil Classification System (USC) with designations of GW, SM, ML, CL, etc. was adopted by the US Corps of Engineers and the Bureau of Reclamation. The chart references below providea quick summary of the "granular" materials for use in structures:

"Granular" Backfill Soil Parameters

Group	Backfill Classification	Top Size 100% passing	#4 Sieve % passing	#40 Sieve % passing	#200 Sieve % passing	Plasticity Index (PI)	Liquid Limit (LL)
AASHTO	MSE Select	4" max	-	≤ 60%	≤ 15%	≤ 6	-
AASHTO	A-1-a	3" (tested)	-	≤ 30%	≤ 15%	≤ 6	-
AASHTO	A-1-b	3" (tested)	-	≤ 50%	≤ 25%	≤ 6	-
AASHTO	A-2-4	3" (tested)	-	n/a	≤ 35%	≤ 10	40 max
AASHTO	A-2-6	3" (tested)	-	n/a	≤ 35%	≤ 40	40 max
ASTM-USC	GW,GP	-	≤ 50%	-	≤ 5%	NP	NP
ASTM-USC	GM,GC	-	≤ 50%	-	12-50%	4 - 20	50 max
ASTM-USC	SW,SP	-	≥ 50%	-	≤ 5%	NP	NP
ASTM-USC	SM,SC	-	≥ 50%	-	12-50%	4 - 20	50 max
ASTM-USC	*ML,CL*	-	-	-	*≥ 50%*	*"A" line*	*50 max*

The amount of fine material (fine sand, silt and clay) as defined by the #40 and #200 sieves is generally a good indicator of favorable engineering and construction properties. The properties of the fine material as defined by its Atterberg limits (PI and LL) has also been a good indicator of a soil's engineering and construction properties. These soils properties should be clearly defined and limited by specification for any wall installation that is counted on to serve a structural purpose such as supporting a parking lot, building or roadway.

Recommended Backfill Parameters (Geogrid)

Designation	Top Size 100% passing	#40 Sieve % passing	#200 Sieve % passing	Plasticity Index (PI)	Liquid Limit (LL)
Select Backfill	2"	≤ 60%	≤ 15%	≤ 6	-
Semi - Select Backfill	2"	-	≤ 35%	≤ 10	≤ 40
Tolerable Silt/Clay	2"	-	≤ 65%	≤ 20	≤ 40
Unacceptable Silt/Clay	2"	-	≥ 65%	> 20	> 50

Note: It is easy to consider poor site soils for economic reasons but is not so easy to construct with such soils nor to expect high performance from marginal soils even though a design can be done on paper. The Owner should be advised and make informed choices regarding these issues.