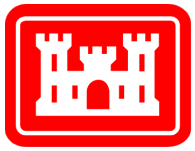
ERDC/GSL TR-05-7

Geotechnical and Structures Laboratory



US Army Corps of Engineers®
Engineer Research and Development Center

Expedient Repair Materials for Roadway Pavements

James E. Shoenberger, Wayne D. Hodo, March 2005
Charles A. Weiss, Jr., Philip G. Malone, and Toy S. Poole

Strength

The strength of a mixture is important because of the traffic loads that it may be required to carry. The strength of a mixture can be measured in many ways, with Marshall stability being the most common for asphalt paving materials. Another method of measuring the strength and even the workability of the various materials is to observe their behavior during a triaxial test. Both unconfined and confined tests were conducted.

Table 7 GTM Compaction and Marshall Test Results

Material	Spec. No.	Specific Gravity[1]	Theor. Maximum Specific Gravity	Stability kN (lbf)	Flow 0.25-mm (0.01-in)	Gyratory Stability Index (GSI)
Control	1			13.92 (3130)	13.0	1.0
	2			9.56 (2150)	12.5	1.0
	3			9.99 (2245)	12.5	1.0
	Average	2.308	2.528	11.16 (2508)	13	1.0
Product 1	1			5.07 (1140)	8.5	1.0
	3			5.43 (1220)	9.0	1.0
	3			5.12(1150)	9.0	1.0
	Average	2.274	2.533	5.20(1170)	9	1.0
Product 2	1			8.83 (1985)	14.5	1.0
	2			13.28 (2985)	14.5	1.0
	3			13.32 (2995)	14.0	1.0
	Average	2.134	2.465	11.81 (2655)	14	1.0
Product 3	1			3.25 (730)	7.0	1.0
	2			6.02 (1354)	6.5	1.0
	3			6.92 (1555)	7.5	1.0
	Average	2.347	2.679	5.50 (1213)	7	1.0
Product 4	1			7.30 (1640)	12.0	1.0
	2			8.38 (1885)	13.0	1.0
	3			7.98 (1795)	10.0	1.0
	Average	2.312	2.491	7.89 (1773)	12	1.0
EZ Street	1			9.67 (2175)	11.5	1.0
	2			9.45 (2125)	10.5	1.0
	3			11.45 (2575)	11.0	1.0
	Average	2.040	2.393	10.20 (2292)	11	1.0
Product 5	1			5.94 (1335)	15	1.0
	2			6.46 (1452)	13	1.0
	3			6.61 (1485)	12	1.0
	Average	2.201	2.461	6.33 (1424)	13	1.0

Table 7 GTM Compaction and Marshall Test Results

Material	Spec. No.	Specific Gravity[1]	Theor. Maximum Specific Gravity	Stability kN (lbf)	Flow 0.25-mm (0.01-in)	Gyratory Stability Index (GSI)
Product 6	1			7.94 (1785)	12.0	1.0
	2			6.52 (1465)	12.0	1.0
	3			8.19 (1841)	12.5	1.0
	Average	2.245	2.500	7.55 (1697)	12	1.0
Product 7	1			4.58 (1030)	9.0	1.0
	2			5.34 (1200)	9.0	1.0
	3			5.12 (1150)	8.5	1.0
	Average	2.278	2.693	5.01 (1127)	9	1.0
Product 8	1			5.58 (1255)	11.0	1.0
	2			6.04 (1385)	7.0	1.0
	3			5.85 (1315)	11.5	1.0
	Average	2.229	2.549	5.86 (1318)	10	1.0
Product 9	1			4.92 (1105)	13.0	1.0
	2			5.93 (1332)	12.5	1.0
	3			6.15 (1382)	12.5	1.0
	Average	2.253	2.545	5.66 (1273)	13	1.0
Product 10	1			7.92 (1780)	10.0	1.0
	2			4.40 (990)	9.5	1.0
	3			6.14 (1380)	10.0	1.0
	Average	2.139	2.600	6.15 (1383)	10	1.0

[1]Results shown are from the evaluation of one specimen, except where other results are given.

The specimens for the Marshall testing were not compacted using a Marshall compaction hammer but were instead compacted using the Corps of Engineers Gyratory Testing Machine (GTM). The GTM can compact to densities equivalent to those obtained with the Marshall hammer. The specimens were compacted to achieve a density equivalent to a 75-blow Marshall compaction. In order to be able to compact the mixtures for Marshall specimens, the specimens were cured and heated prior to compaction. The curing was required because these cold mixtures use either a cutback or an emulsified binder to provide workability at ambient temperatures. The method used was to place the mixture in a forced draft oven at 135 °C (275 °F) overnight (14 to 18 hr) and compact at that temperature. Speci-mens compacted under these conditions should represent the condition of the mix-tures after being in place for several months. Table 7 provides the results of the Marshall testing conducted on the materials, including stability and flow values.