



ACKENHEIL ENGINEERS, INC.

GEOTECHNICAL · CIVIL · INSPECTION · TESTING

1000 Banksville Road, Pittsburgh, Pennsylvania 15216

Ph 412-531-7111 · Fax 412-531-4334 www.ackenheil.com

LABORATORY AND FIELD TESTING SERVICES

The laboratory testing services in this document are services we routinely provide to our clients. Less routine services are available in-house or through third party analytical or materials testing laboratories.

Prices Available Upon Request

Your Project is Our Priority

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SOIL TESTING

<u>TEST OR SERVICE</u>	<u>TEST METHOD</u>
1. Classification and Index Properties (Soil)	
a. Engineering Classification of Soil (includes Items b. and c.)	D2487
b. Grain Size Distribution	
1) Sieve Analysis With No. 200 Wash	D422 or D6913 T88 D1140
2) Hydrometer Analysis	D422
c. Atterberg Limits (Liquid Limit, Plastic Limit, and Plasticity Index)	D4318 T89 T90
d. Shrinkage Limit (Wax Method)	D4943
e. Visual/Manual Description and ID	D2488
f. Portion of Soil Passing No. 200 Sieve (No. 200 Wash)	D1140
g. Specific Gravity	
1) Fine Aggregate	D854 T100
2) Coarse Aggregate	T85
h. Organic Content (Loss on Ignition)	D2974 T267

SOIL TESTING (Cont.)

<u>TEST OR SERVICE</u>	<u>TEST METHOD</u>
2. Aggregate	
a. Sieve Analysis of Aggregate	C136
b. Classification of Aggregate for Road Construction	D448
c. Specific Gravity	C127
d. Coarse Aggregate Soundness by Use of Sodium Sulfate or Magnesium Sulfate (Sieve Analysis Required at above cost)	C88 PTM 510 T104
1) With no extra sample Preparation	
2) With crushing sample to No. 57 size	
3) With crushing sample to No. 57, then to No. 8 size	
4) With crushing sample to No. 8 size	
e. Coarse Aggregate Resistance to Abrasion (LA Abrasion) (Sieve Analysis Required at above cost)	
1) Small Size	C131 T96
2) Large Size	C535
3) Crushing to Size	C131 / C535

SOIL TESTING (Cont.)

<u>TEST OR SERVICE</u>	<u>TEST METHOD</u>
3. Density and Moisture	
a. Moist Density and Moisture (Natural Density - specimen obtained using Shelby Tube)	T233
b. Moist Density and Moisture w/Strength or Consolidation Test (Natural Density - specimen obtained using Shelby Tube)	T233
c. Moisture Content	D2216 T265
d. Correction of Natural Density for Oversize Particles	D4718
4. Compaction (Maximum Dry Density at optimum moisture content)	
a. Proctor – Sieve Analysis Required to determine Proctor Method (Sieve Analysis D422 or D6913 T88)	
1) Standard Proctor (5.5 lb. hammer with 12" drop and 3 layers)	D698 T99 PM106
a) 4" Mold - Method A 4" Mold - Method B 6" Mold - Method C	
2) Modified Proctor (10 lb. hammer with 18" drop and 5 layers)	D1557 T180
a) 4" Mold - Method A 4" Mold - Method B 6" Mold - Method C	
3) Standard Soil/Cement Mixtures Proctor (5.5 lb. hammer with 12" drop and 3 layers)	D558 T134

SOIL TESTING (Cont.)

<u>TEST OR SERVICE</u>	<u>TEST METHOD</u>
b. Relative Density for Free-Draining Soils	
1) Maximum Density	D4253
a) Wet Method	
b) Dry Method	
2) Minimum Density	D4254
c. Correction of Maximum Density for Oversize Particles (excludes cost of Specific Gravity Test)	D4718
5. Pavement Design	
a. California Bearing Ratio (CBR) (includes Standard or Modified Proctor)	D1883 T193
1) 1 compaction point	PTM 113
2) Per additional point	
6. Settlement and Expansivity	
a. Consolidation (1/4, 1/2, 1, 2, 4, 8, 16 tsf) (includes: plot of strain vs. log pressure, strain vs. log of time)	D2435 T216
1) Rebound – Specified by Client	
2) Additional Loads beyond 16 tsf (each)	
b. One-Dimensional Swell or Collapse	D4546
1) Method A – 4 Points	
2) Method B – 1 Point	
3) Method C – 1 Point with D2435	

SOIL TESTING (Cont.)

<u>TEST OR SERVICE</u>	<u>TEST METHOD</u>
c. Expansion Index	D4829
d. Potential Expansion of Steel Slag	PTM 130
1) 1 Compaction Point	
2) Per Additional Point	
7. Strength	
a. Unconfined Compression (Soil) - Undisturbed	D2166 / T208
- Remolded	D2166 / T208
b. Direct Shear (CD type, test results will include plots of shear stress vs. normal stress and shear displacement)	D3080 T236
1) 3 Points	
2) Per Additional Point	
c. Triaxial Compression/Shear (Tests will include plots of Mohr circle with failure envelope and stress vs. strain, and a sketch of the failure)	T234
1) Unconsolidated undrained test (a.k.a. UU or Q)	D2850
2) Consolidated undrained test (a.k.a. CU or R)	D4767
3) Consolidated undrained test with pore pressure measurement	D4767
4) Consolidated drained (a.k.a. CD or S)	D7181

SOIL TESTING (Cont.)

<u>TEST OR SERVICE</u>	<u>TEST METHOD</u>
8. Permeability	
a. Constant Head (Coarse Material, $k > 1 \times 10^{-5}$ cm/sec)	D2434 T215
b. Flex Wall Permeability (Falling head rising tail water) (Fine Material, $k < 1 \times 10^{-5}$ cm/sec)	D5084
9. Corrosivity	
a. pH (Soil)	T289
b. Minimum Resistivity	T288
c. Sulfate (Soil)	T291
d. Chloride (Soil)	T290
e. pH (Water)	D1293
f. Sulfate (Water)	D516
g. Chloride (Water)	D512
h. Conductivity (Water)	D1125

ROCK TESTING

<u>TEST OR SERVICE</u>	<u>TEST METHOD</u>
1. Classification/Index Properties (Rock)	
a. Visual Description (Rock)	
b. Slake Durability	D4644
2. Density and Moisture (Rock)	
a. Moisture Content (Rock)	D2216
b. Chunk Moist Density	
3. Deformation (Rock)	
a. Elastic Moduli with Unconfined Compression (test results include plot of axial stress vs. strain)	D7012
1) Add for Poisson's Ratio (test results include plot of axial stress vs. diametric strain)	
4. Strength (Rock)	
a. Unconfined Compression (Core) (Includes Unit Weight)	D7012 (Method C)
b. Point Load Test (Core)	D5731
1) Per Point	
2) 10 Specimens	
c. Mohs Hardness of Rock	
5. Miscellaneous Rock	
a. Specimen Preservation (per specimen)	D5079
b. Potential for Expansive Sulfides	N/A
c. Percent Pyritic Sulfur	Industry Standard

CONCRETE, ASPHALT AND FIELD TESTING

<u>TEST OR SERVICE</u>	<u>TEST METHOD</u>
1. Concrete Strength	
a. Unconfined Compression (Concrete)	
1) Cylinder (each molded specimen)	C39
2) NX to 6" Diameter Structural Core with Unit Weight	C39
2a) Neoprene Caps	C39
2b) Sulfur Capping	C617/C39
b. Beams (Concrete – each molded specimen)	C78
c. 2" x 2" Cube (mortar/grout)	C109
2. Asphalt Laboratory Testing	
a. Asphalt Content & Gradation	PTM 757A
b. Bulk Specific Gravity of Asphalt Core	D2726
3. Concrete Field Testing	
a. Slump	C143
b. Air Content (pressure meter)	C231
c. Air Content (roller meter)	C173
d. Fresh Concrete Unit Weight	C138
e. Flow Cone (grout/mortar)	C939
f. Mold Cylinders (6"x 12", 4"x 8", 3"x 6")	C31
g. Temperature	C1064
4. Field Density Testing with Troxler Nuclear Gauge	
a. Soil Field Density	D6938
b. Asphalt Field Density	D2950

CONCRETE, ASPHALT AND FIELD TESTING (Cont.)

<u>TEST OR SERVICE</u>	<u>TEST METHOD</u>
5. Concrete/Asphalt Pavement Coring (2", 3", 4", 6", 8")	
6. Dynamic Cone Penetrometer	D6951
7. Foundation Inspection (Bearing and Reinforcement)	
8. Special Inspection	
a. Soils	
b. Deep Foundations	
c. Concrete Construction	
d. Masonry Construction	
e. Steel Construction (Visual Weld/Bolt Connections)	
f. Fire-Resistant Materials	
g. Others Available Upon Request	