BEYOND Engineering & Testing

AASHTO/CCRL/TxDOT Accredited
US Army Corps of Engineers Validated
Certified DBE/MBE/HUB

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Geotechnical and Construction Materials Laboratory Testing

Schedule of Services

A. Volume Change Tests

1. **1-D Consolidation (ASTM D2435), 2.5" D**
   a. 32 ksf, Loading Curve w/ Final Rebound
   b. 32 ksf, Load/Reload w/ Final Rebound
   c. Additional load increment up to 58 ksf
   d. C-alpha calculation w/ additional loading time
   e. Up to 128 ksf Loading Steps
2. **1-D Consol. w/ CRS loading (ASTM D4186), 2.5" D**
3. **1-D Swell or Collapse of Soils (ASTM D4546)**
   a. Method A, Multiple (4) Specimens
   b. Method B, Single Specimen
   c. Method C, w/ swell pressure & swell strain
4. **Expansion Index (ASTM D4829)**

B. Strength Tests: Direct Shear (Intact/Remold, ASTM D3080)

a. Consolidated-Drained, 3 pts, Sand
b. Consolidated-Drained, 3 pts, Silt/Clay (< 3 day shear)
c. Post Peak Strength Parameters, per Test

C. Soil Strength Tests: Triaxial Compression

1. **Unconfined Compression (ASTM D2166)**
   a. Intact, 2.8" D, per specimen
   b. Remolded, 2.8" D, per specimen
2. **Unconsolidated-Undrained (UU) (ASTM D2850, Tex-118-E)**
   a. Intact, 2.8" D, per specimen, <120 psi Cell Pressure
   b. Remolded, 2.8" D, per specimen, <120 psi
3. **Consolidated-Undrained (CU R-bar) (ASTM D4767, Tex-131-E)**
   a. Intact, 2.8" D, with pore pressure, 3 pts
   b. Remolded, 2.8" D, with pore pressure, 3 pts
   c. Remolded, **6.0" D**, with pore pressure, 3 pts
   d. High Cell/Back Pressure (> 120 psi, up to 450 psi)
4. **Multi-Stage CU R-bar test (ASTM D4767, modified)**
   a. Intact, 2.8" D, 3 stages, with pore pressure
   b. High Cell/Back Pressures (> 120 psi, up to 450 psi)
5. **Consolidated-Drained (CD test) (ASTM D7181)**
   a. Intact, 2.8" D, with volume change, 3 pts
   b. Remolded, 2.8" D, with volume change, 3 pts
   c. Per pt., per day, 2.8" D (> 3 days of consol & shearing)
6. **Special Triaxial Shear (Triaxial Extension, Ko Consol.)**
7. **Stress History & Normalized Soil Eng. Props (SHANSEP)**

D. Permeability Tests

1. **Granular Soils, 3"& 4.5" D, constant head (ASTM D2434)**
2. **Hydraulic Conductivity (ASTM D5084, Method C or F)**
   a. Intact, 2.8" D, flexible-wall w/ back pressure
   b. Intact, 4" D, flexible-wall w/ back pressure
   c. Remolded, 2.8" D, flexible-wall w/ back pressure
   d. Remolded, 4" D, flexible-wall w/ back pressure
   e. w/ contaminated fluids & long-term studies (D6766)

E. Analytical Chemistry Testing

1. **Sulfates Content in Soils**
   a. Colorimetric method (TxDOT Tex-145-E)
   b. Water-soluble sulfate (ASTM C1580)
   c. Sulfate ion, wet method (ASTM D516, Tex-620-J)
   d. ion chromatography, EPA 300.0 or ASTM D4327
2. **Chloride Content in Soils**
   a. pH/mV meter, method B (AASHTO T 291)
   b. Chloride ion, wet method (ASTM D512, Tex-620-J)
   c. ion chromatography, EPA 300.0 or ASTM D4327
3. **pH of Soil (ASTM D4972, G51, Tex-128-E)**

F. Rock Strength Tests

1. **Compressive Strength of Rock Core* (ASTM D7012)**
   a. Method A, triaxial test (Peak Load Only)
   b. Method B, triaxial test (Young's modulus & Poisson's ratio)
   c. Method C, unconfined, peak load Only, w/o ASTM D4543
   d. Method D, unconfined, w/ stress-strain, w/o ASTM D4543
   e. add dimensional & shape tolerances (ASTM D4543)

   * Pricing is for NX (2.16 in.) or NQ (1.87 in.) rock cores ONLY.
2. **CERCHAR Abrasivity Index (ASTM D7625)**
3. **Splitting Tensile Strength- Brazilian Test (ASTM D3967)**
4. **Slake Durability of Shales & Weak Rocks (ASTM D4644)**

G. Resilient Modulus Test** (AASHTO T307)

1. **Fine-grained material, per sample (2.8" D)**
2. **Coarse-grained material, per sample (up to 4" D)**
3. **Large-size specimens are available**

** Provide Proctor, sieve analysis, Atterberg limits, specific gravity to categorize the material as Type 1 or Type 2 and define remolding parameters.

H. Thermal Resistivity Testing (ASTM D5334)

1. **As-Rcv'd Dry-Out Curve, Intact, per Soil specimen**
2. **Dry-Out Curve, Remolded, 2.8" D, per Soil specimen**
3. **Dry-Out Curve, Flowable Fill, 4.0" D, per specimen**
4. **Field In-situ Thermal Resistivity Testing**

The above rates are subject to change for specific test requirements, extra test duration, or rapid turn-around.

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Schedule of Services

I. Soil-Cement or Lime Mixtures

1. **Moisture-Density of Soil-Cement Mixture (ASTM D558)**
2. **Wetting & Drying Compacted Soil-Cement Mix (D559)**
3. **Unconfined Compression Soil-Cement, per specimen**
   a. Method B, w/Curing (7 d) (ASTM D1633/D1632)
   b. Curing (additional 7 days)
4. **Soil-Cement/Lime Testing (Tex-120/121-E, Part I)**
5. **Soil-Cement/Lime Testing (Tex-120/121-E, Part II)**
6. **Soil-Lime Testing (Tex-121-E Part III or ASTM D6276)**
7. **Admixing Lime to Reduce Plasticity of Soil (Tex-112-E)**
   a. 4 Lime Percentage Points ($125/point)

J. Grain-Size & Aggregate Tests

1. **Sieve Analysis**
   a. 3" - 3/4" - #200 (ASTM D6913/C136)
   b. 3/4" - #200 (ASTM D6913)
   c. % Passing #200 sieve- Aggregate (ASTM C117)
   d. % Passing #200 sieve- Soil (ASTM D1140/Tex-111-E)
   e. 3/4"- #200 w/Hydrometer (ASTM D6913 & D7928)
   f. Particle Analysis of Soil (TxDOT, Tex-110-E, Part I)
   g. Particle Analysis of Soil (TxDOT, Tex-110-E, Part II)
2. **Carbonate Content (ASTM D3042 modified Method J&L)**
   a. Fine Aggregate (< 3/4" Sieve)
   b. Coarse Aggregate (> 3/4" Sieve)
3. **Soundness test (ASTM C88 or Tex-411-A)**
   a. w/ Sodium Sulfate
   b. w/ Magnesium Sulfate
4. **LA Abrasion**
   a. Small-Size Coarse Aggregate (ASTM C131 or Tex-410-A)
   b. Large-Size Coarse Aggregate (ASTM C535)
5. **Wet Ball Mill method (Tex-116-E)**
   Wet Ball Mill Value & Increase passing No. 40 Sieve
6. **Aggregate Durability Index (AASHTO T 210)**
   a. Fine Aggregate (Passing No. 4 Sieve)
   b. Coarse Aggregate (Retaining No. 4 Sieve)
7. **Soft Particles in Coarse Aggregates (OHD L-38)**
8. **Fractured Faces (OHD L-18)**
9. **Sand Equivalent Test (ASTM D2419/Tex-203-F)**
10. **Clay Lumps and Friable Particles (ASTM C142)**

K. Water Content/Density (Unit Weight) Relationship

1. **Standard Proctor- 4 points**
   a. Method A or B (ASTM D698)
   b. Method C (ASTM D698)
2. **Modified Proctor- 4 points**
   a. Method A or B (ASTM D1557)
   b. Method C (ASTM D1557)
3. **Oversize Particles Correction (ASTM D4718)**
4. **Base Material Compaction (Tex-113-E)**
5. **Subgrade & Backfill Compaction (Tex-114-E, Part I)**
6. **Subgrade & Backfill Compaction (Tex-114-E, Part II)**
7. **California Bearing Ratio (CBR) (ASTM D1883)**
   a. 10, 25, & 56 blows per layer at specified WC
   b. 90, 95, & 100% compaction at Opt. WC
8. **TxDOT Triaxial Compression (Tex-117-E, Part II) including:**
   a. Molding, Curing and Testing 9 Specimens (Tex-117-E)
   b. Sieve Analysis (Tex-110-E, Part I)
   c. Atterberg Limits (Tex-104-E, 105-E, 106-E)
   d. Bar Linear Shrinkage of Soils (Tex-107-E)
   e. Moisture Density Relationship/Compaction (Tex-113-E)
   f. Wet Ball Mill (Tex-116-E)

L. Index Properties Tests

1. **Water Content (ASTM D2216, Tex-103-E)**
2. **Water Content w/Density (ASTM D2216, 2937 & 7263)**
3. **Plastic and Liquid Limits (ASTM D4318)**
4. **Plastic & Liquid Limits (Tex-104-E, 105-E, 106-E)**
5. **Bar Linear Shrinkage of Soils (Tex-107-E)**
6. **Specific Gravity**
   a. Soils (ASTM D854)
   b. w/ Absorption of Coarse aggregates (ASTM C127)
   c. w/ Absorption of Fine aggregates (ASTM C128)
7. **Organic Content, Method C (ASTM D2974)**
8. **Rapid Carbonate Content (ASTM D4373)**
9. **Soil Resistivity Test (ASTM G57, G187, Tex-129-E)**
   a. Miller Box for mini. resistivity
   b. additional (i.e. oven dry or saturated) test
10. **Crumb Test, 2 pts per soil & 6 hrs (ASTM D6572)**
11. **Pinhole Dispersion (ASTM D4647)**
12. **Double Hydrometer/ Dispersion (ASTM D4221)**

M. Sample Preparation & Extrusion

1. **Hand-trimmed specimen (reducing diameter)**
   a. UC/UU/CU Test Specimen, 2" or 2.4" dia.
   b. Permeability Test Specimen, 2" or 2.4" dia.
2. **Pocket Penetrometer, per sample**
3. **Pocket Vane Shear, per sample**
4. **Shelby Tube Extrusion- testing performed**
5. **Damaged Shelby tube extrusion**

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