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Laboratory Testing of Soils in the U.S. per ASTM and AASHTO Standards

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TIMELY ENGINEERING SOIL TESTS, LLC.

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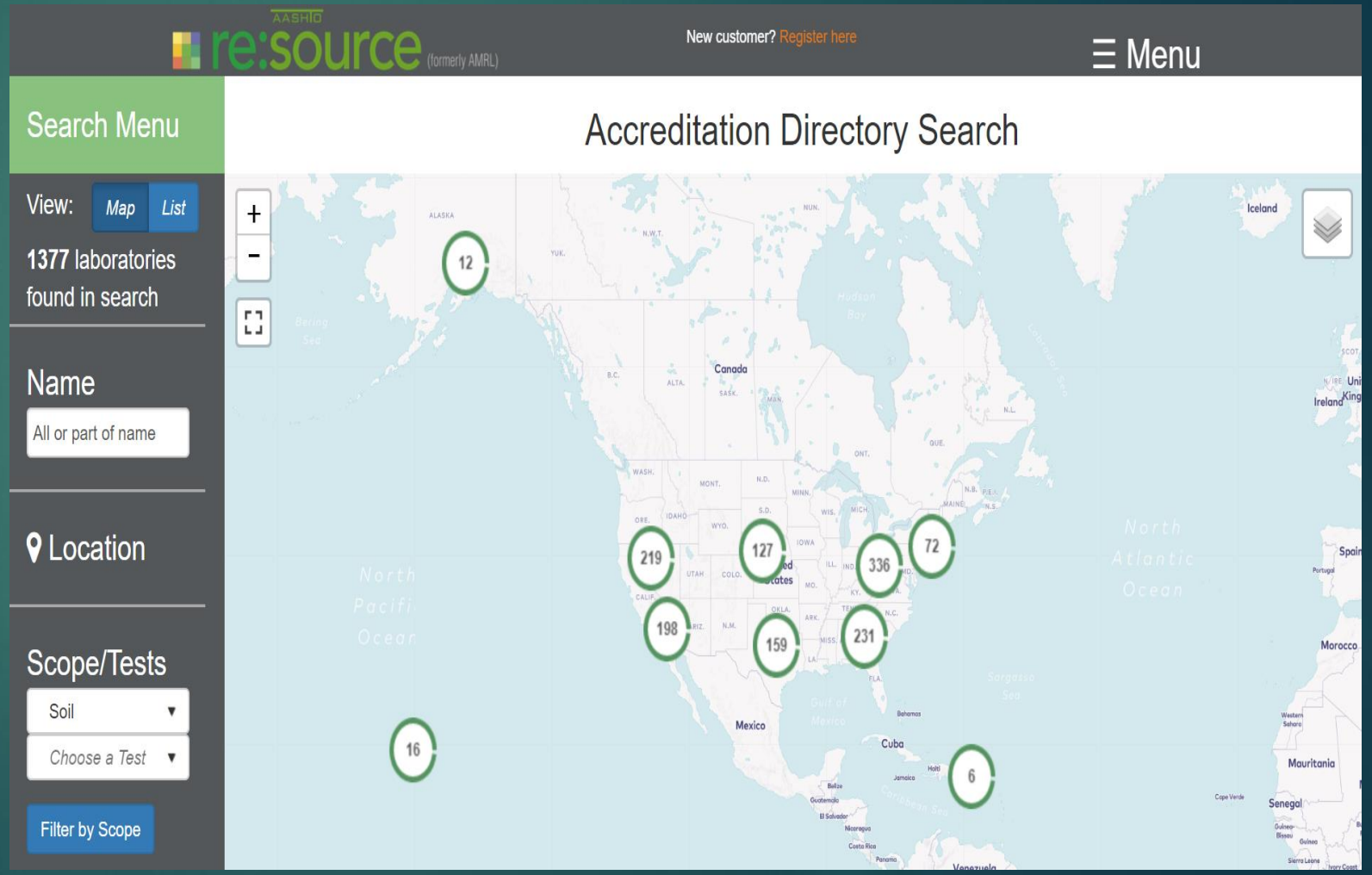
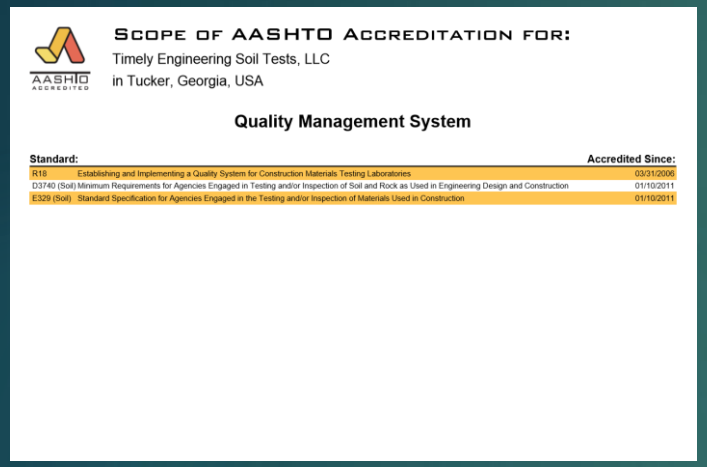


Laboratory Testing of Soils in the U.S. per ASTM and AASHTO Standards

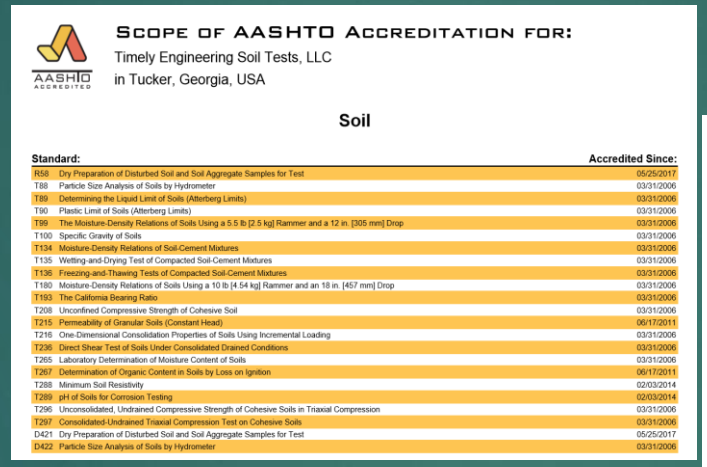
- AASHTO Accreditation Certificate



SCOPE OF AASHTO ACCREDITATION FOR:
Timely Engineering Soil Tests, LLC
in Tucker, Georgia, USA

Quality Management System

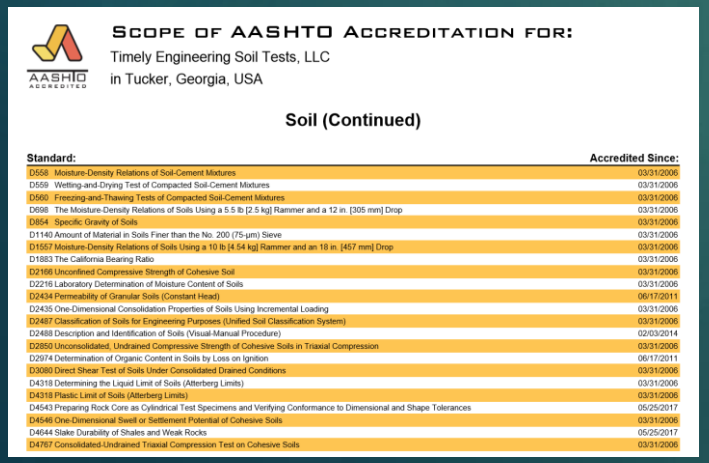
Standard:		Accredited Since:
R18	Establishing and Implementing a Quality System for Construction Materials Testing Laboratories	03/31/2006
D3740 (Soil)	Minimum Requirements for Agencies Engaged in Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction	01/10/2011
E329 (Soil)	Standard Specification for Agencies Engaged in the Testing and/or Inspection of Materials Used in Construction	01/10/2011



SCOPE OF AASHTO ACCREDITATION FOR:
Timely Engineering Soil Tests, LLC
in Tucker, Georgia, USA

Soil

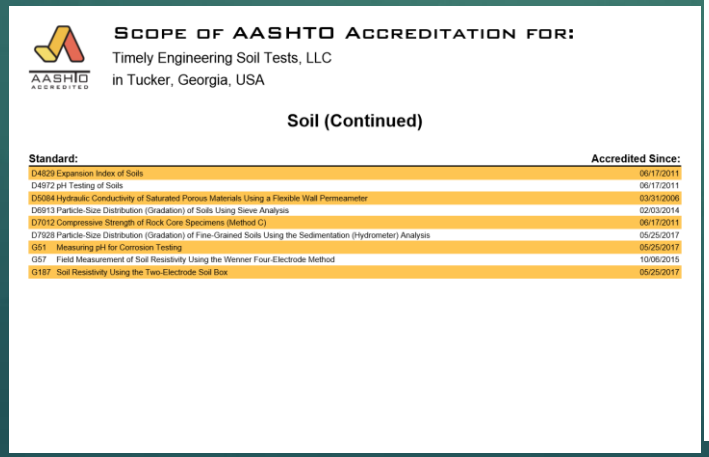
Standard:		Accredited Since:
R58	Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test	05/25/2017
T88	Particle Size Analysis of Soils by Hydrometer	03/31/2006
T89	Determining the Liquid Limit of Soils (Atterberg Limits)	03/31/2006
T90	Plastic Limit of Soils (Atterberg Limits)	03/31/2006
T99	The Moisture-Density Relations of Soils Using a 5.5 lb [2.5 kg] Rammer and a 12 in. [305 mm] Drop	03/31/2006
T100	Specific Gravity of Soils	03/31/2006
T134	Moisture-Density Relations of Soil-Cement Mixtures	03/31/2006
T135	Wetting-and-Drying Test of Compacted Soil-Cement Mixtures	03/31/2006
T136	Freezing-and-Thawing Tests of Compacted Soil-Cement Mixtures	03/31/2006
T180	Moisture-Density Relations of Soils Using a 10 lb [4.54 kg] Rammer and an 18 in. [457 mm] Drop	03/31/2006
T193	The California Bearing Ratio	03/31/2006
T208	Unconfined Compressive Strength of Cohesive Soil	03/31/2006
T215	Permeability of Granular Soils (Constant Head)	06/17/2011
T216	One-Dimensional Consolidation Properties of Soils Using Incremental Loading	03/31/2006
T236	Direct Shear Test of Soils Under Consolidated Drained Conditions	03/31/2006
T265	Laboratory Determination of Moisture Content of Soils	03/31/2006
T267	Determination of Organic Content in Soils by Loss on Ignition	06/17/2011
T288	Minimum Soil Resistivity	02/03/2014
T289	pH of Soils for Corrosion Testing	02/03/2014
T296	Unconsolidated, Undrained Compressive Strength of Cohesive Soils in Triaxial Compression	03/31/2006
T297	Consolidated-Undrained Triaxial Compression Test on Cohesive Soils	03/31/2006
D421	Dry Preparation of Disturbed Soil and Soil Aggregate Samples for Test	05/25/2017
D422	Particle Size Analysis of Soils by Hydrometer	03/31/2006



SCOPE OF AASHTO ACCREDITATION FOR:
Timely Engineering Soil Tests, LLC
in Tucker, Georgia, USA

Soil (Continued)

Standard:		Accredited Since:
D558	Moisture-Density Relations of Soil-Cement Mixtures	03/31/2006
D559	Wetting-and-Drying Test of Compacted Soil-Cement Mixtures	03/31/2006
D560	Freezing-and-Thawing Tests of Compacted Soil-Cement Mixtures	03/31/2006
D698	The Moisture-Density Relations of Soils Using a 5.5 lb [2.5 kg] Rammer and a 12 in. [305 mm] Drop	03/31/2006
D854	Specific Gravity of Soils	03/31/2006
D1140	Amount of Material in Soils Finer than the No. 200 (75-µm) Sieve	03/31/2006
D1557	Moisture-Density Relations of Soils Using a 10 lb [4.54 kg] Rammer and an 18 in. [457 mm] Drop	03/31/2006
D1883	The California Bearing Ratio	03/31/2006
D2166	Unconfined Compressive Strength of Cohesive Soil	03/31/2006
D2216	Laboratory Determination of Moisture Content of Soils	03/31/2006
D2434	Permeability of Granular Soils (Constant Head)	06/17/2011
D2435	One-Dimensional Consolidation Properties of Soils Using Incremental Loading	03/31/2006
D2487	Classification of Soils for Engineering Purposes (Unified Soil Classification System)	03/31/2006
D2488	Description and Identification of Soils (Visual-Manual Procedure)	02/03/2014
D2850	Unconsolidated, Undrained Compressive Strength of Cohesive Soils in Triaxial Compression	03/31/2006
D2974	Determination of Organic Content in Soils by Loss on Ignition	06/17/2011
D3080	Direct Shear Test of Soils Under Consolidated Drained Conditions	03/31/2006
D4318	Determining the Liquid Limit of Soils (Atterberg Limits)	03/31/2006
D4318	Plastic Limit of Soils (Atterberg Limits)	03/31/2006
D4543	Preparing Rock Core as Cylindrical Test Specimens and Verifying Conformance to Dimensional and Shape Tolerances	05/25/2017
D4546	One-Dimensional Swell or Settlement Potential of Cohesive Soils	03/31/2006
D4644	Slake Durability of Shales and Weak Rocks	05/25/2017
D4767	Consolidated-Undrained Triaxial Compression Test on Cohesive Soils	03/31/2006



SCOPE OF AASHTO ACCREDITATION FOR:
Timely Engineering Soil Tests, LLC
in Tucker, Georgia, USA

Soil (Continued)

Standard:		Accredited Since:
D4829	Expansion Index of Soils	06/17/2011
D4972	pH Testing of Soils	06/17/2011
D5084	Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter	03/31/2006
D6913	Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis	02/03/2014
D7012	Compressive Strength of Rock Core Specimens (Method C)	06/17/2011
D7928	Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis	05/25/2017
G51	Measuring pH for Corrosion Testing	05/25/2017
G57	Field Measurement of Soil Resistivity Using the Wenner Four-Electrode Method	10/06/2015
G187	Soil Resistivity Using the Two-Electrode Soil Box	05/25/2017

AASHTO ACCREDITED

CERTIFICATE OF ACCREDITATION

American Association of State Highway and Transportation Officials
AASHTO

Timely Engineering Soil Tests, LLC

in

Tucker, Georgia, USA

has demonstrated proficiency for the testing of construction materials and has conformed to the requirements established in AASHTO R 18 and the AASHTO Accreditation policies established by the AASHTO Committee on Materials and Pavements.

The scope of accreditation can be viewed on the Directory of AASHTO Accredited Laboratories (aashtoresource.org).

Bud Wright,
AASHTO Executive Director

Moe Jamshidi,
AASHTO COMP Chair

This certificate was generated on 02/25/2018 at 10:33 AM Eastern Time. Please confirm the current accreditation status of this laboratory at aashtoresource.org/aap/accreditation-directory

ASTM D698/AASHTO T99 (*ASTM D1557/AASHTO T180):

Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard (*Modified) Effort

ASTM D698/AASHTO T99 (*ASTM D1557/AASHTO T180):

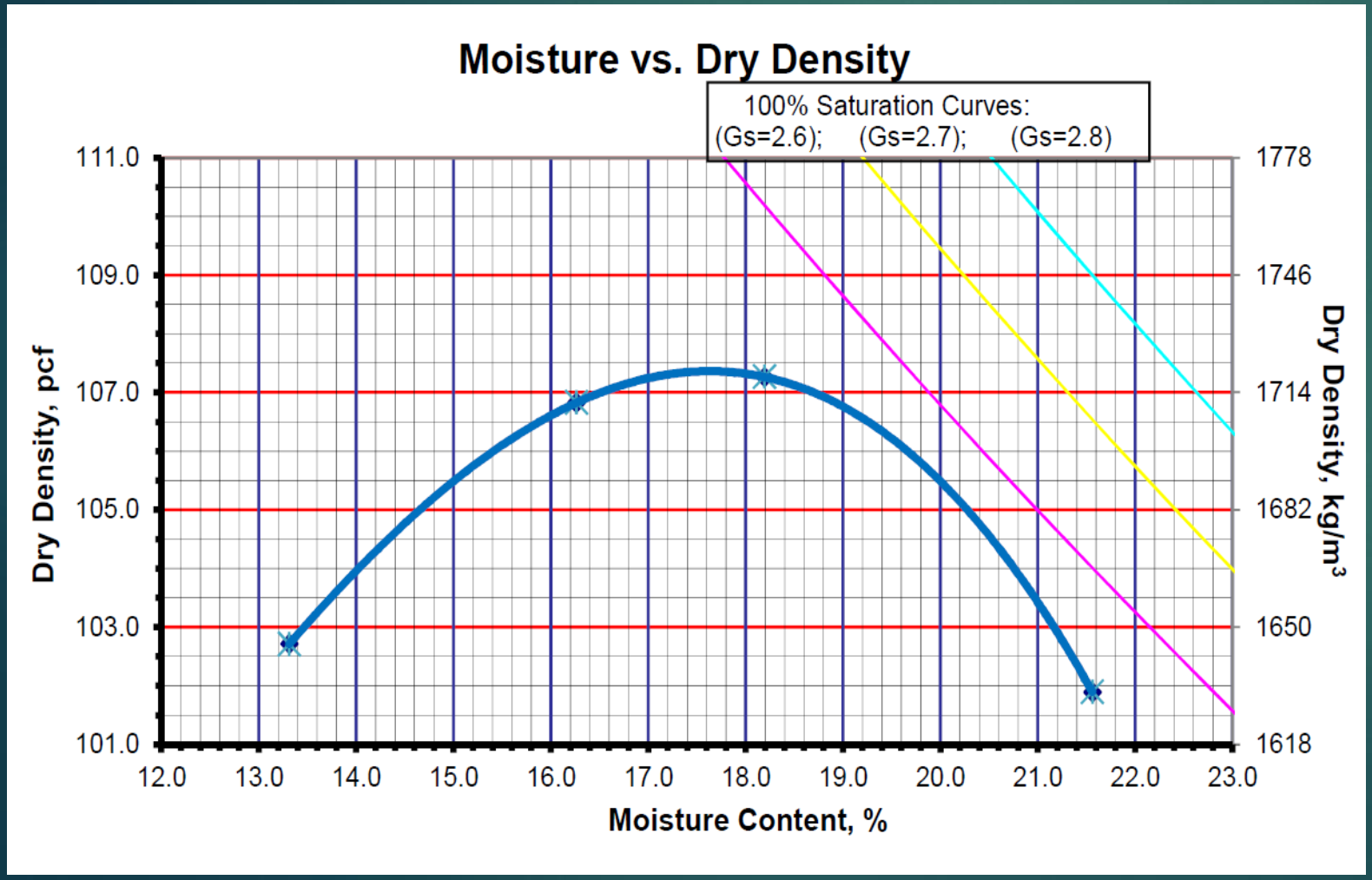
- Summary of Test Methods
  - Relationship Between Water Content and Density
- Apparatus:
  - Molds with ID 4 in./101.6mm, height 4.584 in./116.4mm
  - Molds with ID 6 in./152.4mm, height 4.584 in./116.4mm
  - Balance, Straight Edge
  - Rammer for D 698: height of fall 12 in./304.8mm, mass 5.5 lbm/2.495kg, diameter 2 in./50.80mm
  - Rammer for D 1557: height of fall 18 in./457.2mm, mass 10 lbm/4.5364kg, diameter 2 in./50.80mm
  - Miscellaneous Devices.

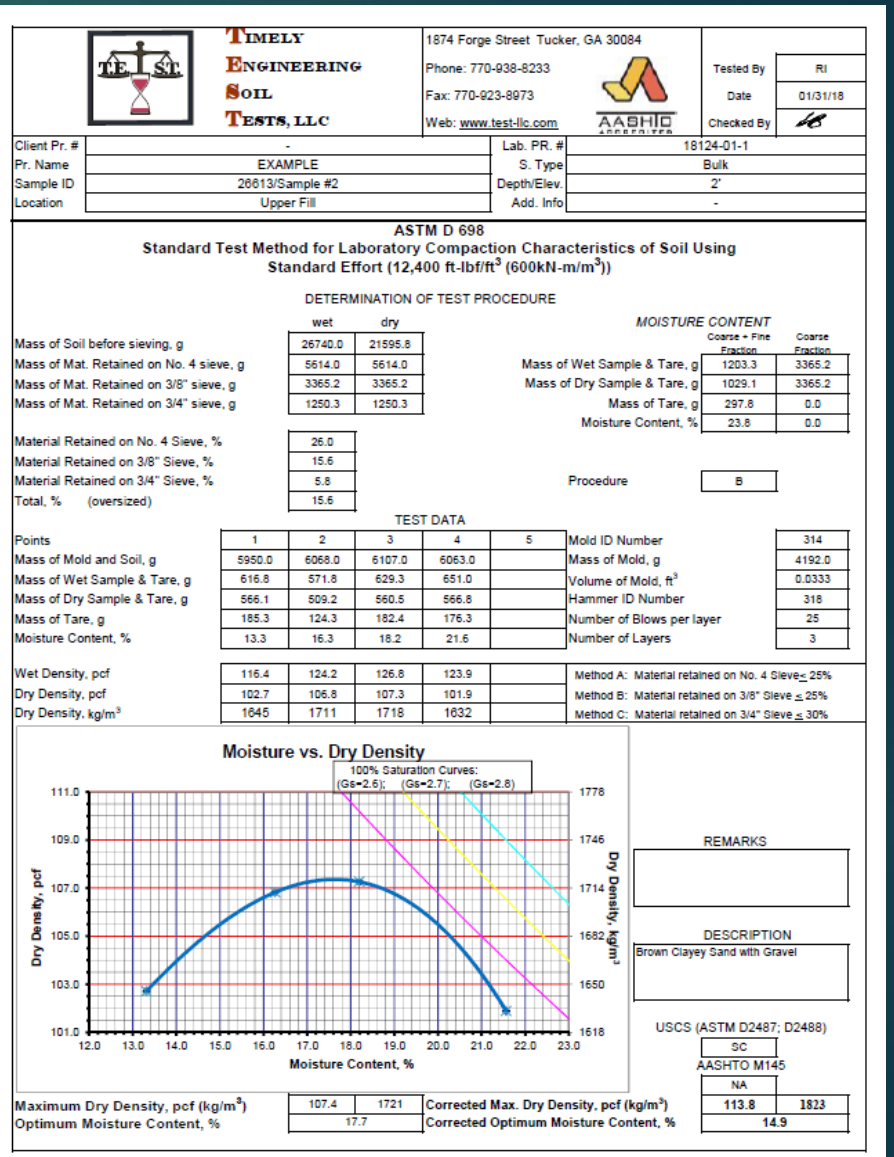
ASTM D698/AASHTO T99 (*ASTM D1557/AASHTO T180):

- Procedure for D698 (*ASTM D1557)
  - Methods A, B
    - Mold 4 in./101.6mm
    - 3 Layers (*5 Layers), 25 Blows per Layer
  - Method C
    - Mold 6 in./152.4mm
    - 3 Layers (*5 Layers), 56 Blows per Layer
- Material for Testing
  - Method A
    - Passing No. 4 (4.75mm) Sieve
  - Method B
    - Passing 3/8 in. (9.5mm) Sieve
  - Method C
    - Passing ¾ in. (19.0mm) Sieve

ASTM D698/AASHTO T99 (*ASTM D1557/AASHTO T180):

- Reports
- Application of Test





TIMELY ENGINEERING SOIL TESTS, LLC
1874 Forge Street Tucker, GA 30084
Phone: 770-938-8233
Fax: 770-923-8973
Web: www.test-llc.com
AASHTO ACCREDITED

Tested By: RI
Date: 01/31/18
Checked By:

Client Pr. #	-	Lab. PR. #	18124-01-1
Pr. Name	EXAMPLE	S. Type	Bulk
Sample ID	26613/Sample #2	Depth/Elev.	2'
Location	Upper Fill	Add. Info	-

ASTM D 698
Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600kN-m/m³))

DETERMINATION OF TEST PROCEDURE

	wet	dry
Mass of Soil before sieving, g	26740.0	21595.8
Mass of Mat. Retained on No. 4 sieve, g	5614.0	5614.0
Mass of Mat. Retained on 3/8" sieve, g	3365.2	3365.2
Mass of Mat. Retained on 3/4" sieve, g	1250.3	1250.3

Material Retained on No. 4 Sieve, %	26.0
Material Retained on 3/8" Sieve, %	15.6
Material Retained on 3/4" Sieve, %	5.8
Total, % (oversized)	15.6

MOISTURE CONTENT

	Coarse + Fine Fraction	Coarse Fraction
Mass of Wet Sample & Tare, g	1203.3	3365.2
Mass of Dry Sample & Tare, g	1029.1	3365.2
Mass of Tare, g	297.8	0.0
Moisture Content, %	23.8	0.0

Procedure: B

TEST DATA

Points	1	2	3	4	5
Mass of Mold and Soil, g	5950.0	6068.0	6107.0	6063.0	
Mass of Wet Sample & Tare, g	616.8	571.8	629.3	651.0	
Mass of Dry Sample & Tare, g	566.1	509.2	560.5	566.8	
Mass of Tare, g	185.3	124.3	182.4	176.3	
Moisture Content, %	13.3	16.3	18.2	21.6	
Wet Density, pcf	116.4	124.2	126.8	123.9	
Dry Density, pcf	102.7	106.8	107.3	101.9	
Dry Density, kg/m³	1645	1711	1718	1632	

Mold ID Number	314
Mass of Mold, g	4192.0
Volume of Mold, ft³	0.0333
Hammer ID Number	318
Number of Blows per layer	25
Number of Layers	3

Method A: Material retained on No. 4 Sieve≤ 25%
Method B: Material retained on 3/8" Sieve ≤ 25%
Method C: Material retained on 3/4" Sieve ≤ 30%

REMARKS

DESCRIPTION: Brown Clayey Sand with Gravel

USCS (ASTM D2487; D2488): SC
AASHTO M145: NA

Maximum Dry Density, pcf (kg/m³)	107.4	1721	Corrected Max. Dry Density, pcf (kg/m³)	113.8	1823
Optimum Moisture Content, %	17.7		Corrected Optimum Moisture Content, %	14.9	

ASTM D4318/AASHTO T88, T89: Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils

ASTM D4318/AASHTO T88, T89

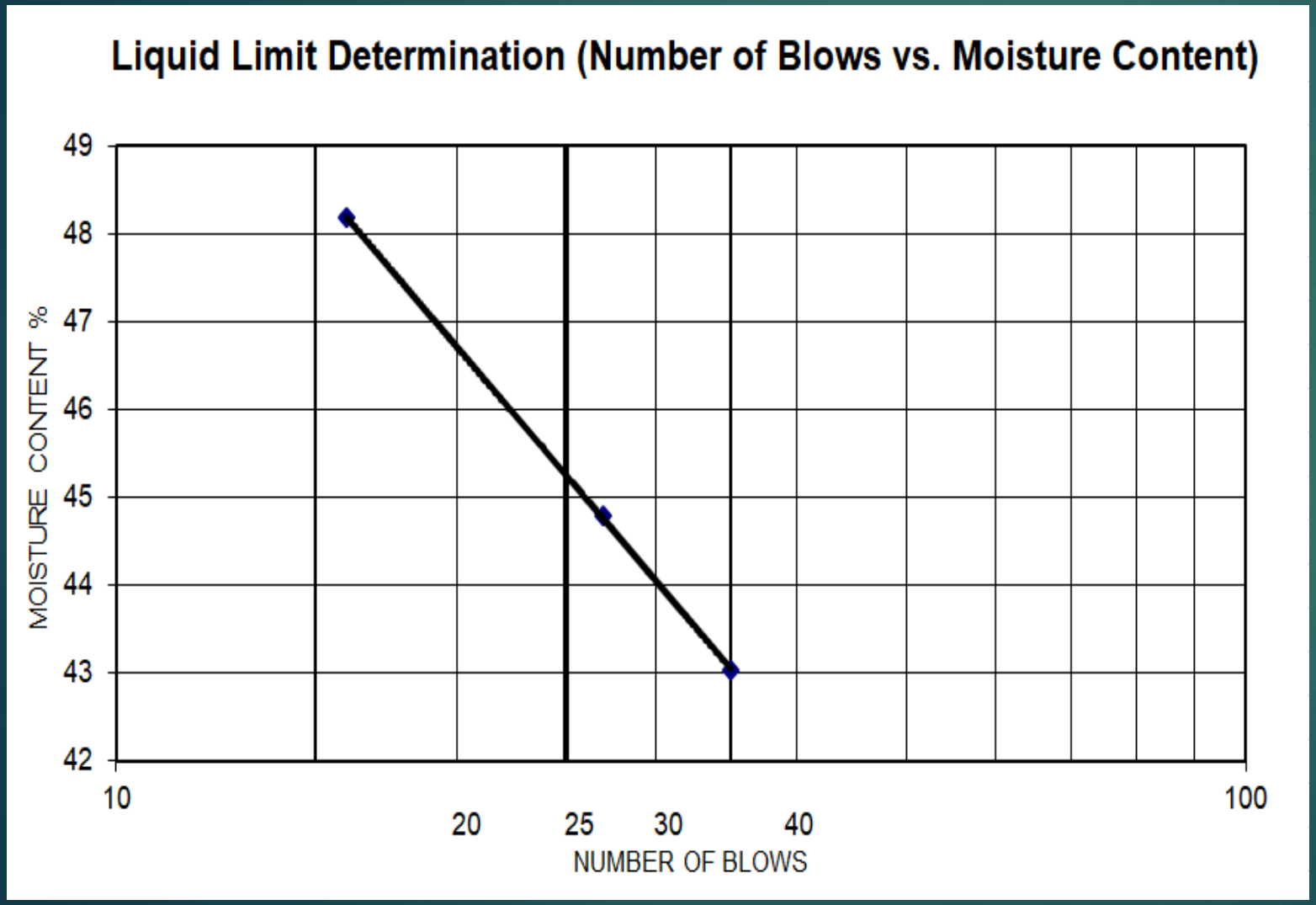
- Summary of Test Method
  - Relationship between water content and consistency/stages (plastic and liquid boundary) of soil
- Apparatus:
  - Liquid Limit Device
  - Grooving Tool, Calibration Gauges
  - Balance (readability of 0.01 g)
  - Water Content Containers
  - Ground Glass Plate
  - Spatula, Sieve No. 40 (425 micron)
  - Drying Oven (110 +/- 5°C)
  - Miscellaneous Devices

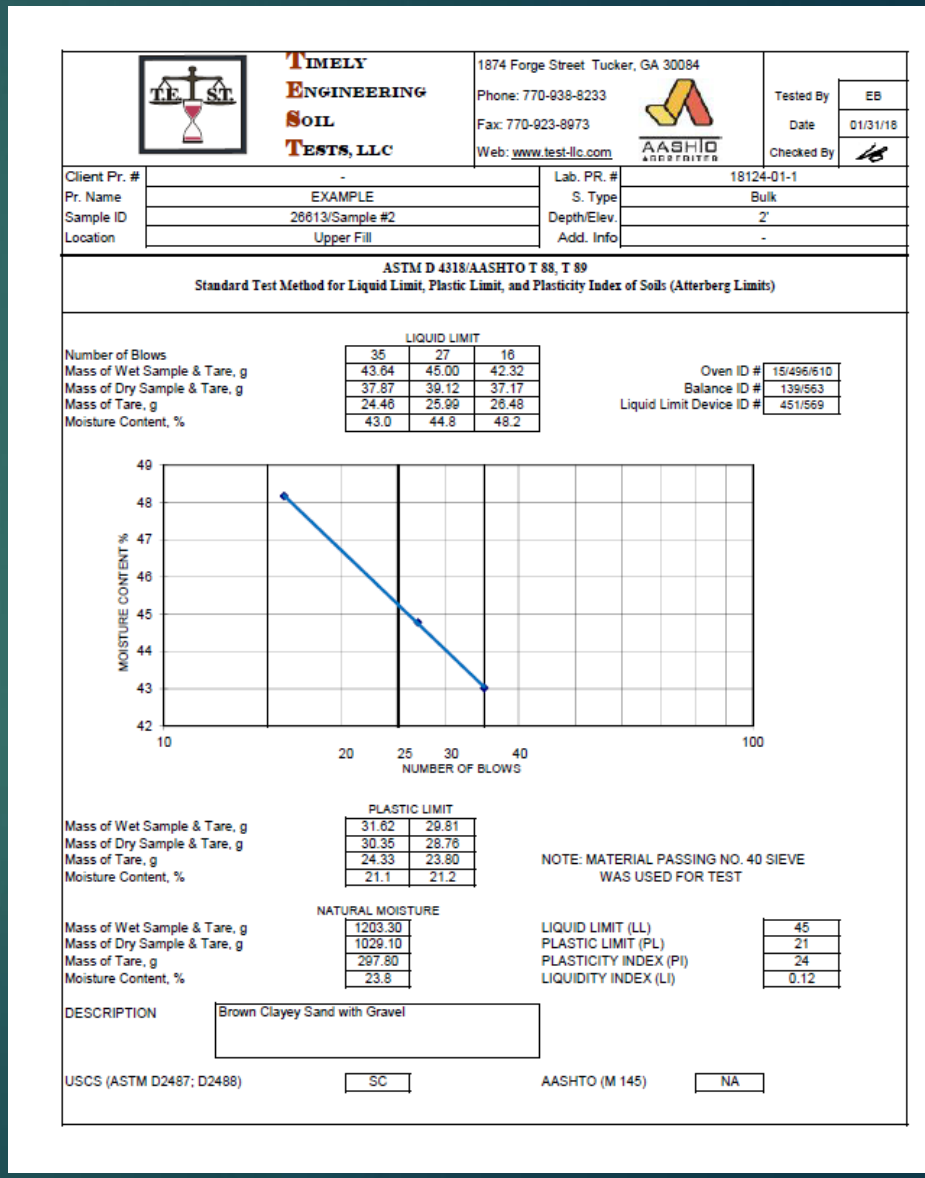
ASTM D4318/AASHTO T88, T89

- Procedure for D 4318
  - Liquid Limit (MC at Boundary Between Semi-Liquid and Plastic States, at 25 Blows)
    - Soil placed in the Brass Cup of LL Device
    - Soil divided in 2 halves by Trapezoidal Grooving Tool
    - Count the Number of Blows Until it Closes Groove on distance of ½ inch (13 mm). Height of Drop 10mm
    - Obtain Moisture Content
    - Perform Steps Above for 3 Points (25-35, 20-30, 15-25 Blows)
- Plastic Limit (MC at Boundary Between Plastic and Semi-Solid States)
  - Ellipsoidal-shaped soil (1.5-2.0 g) Rolled on Glass Plate by Palm of the Hand
  - Continue Rolling Until Thread Will Break Apart and Crumble into Threads 1/8 inch/ 3.2 mm in Diameter
  - Obtain Moisture Content
- Material for testing
  - Passing No. 40 (425µm) sieve

ASTM D4318/AASHTO T88, T89

- Reports
- Application of test





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Tested By	EB		
Date	01/31/18		
Checked By			
Client Pr. #	-	Lab. PR. #	18124-01-1
Pr. Name	EXAMPLE	S. Type	Bulk
Sample ID	26613/Sample #2	Depth/Elev.	2'
Location	Upper Fill	Add. Info	-

ASTM D 4318/AASHTO T 88, T 89
Standard Test Method for Liquid Limit, Plastic Limit, and Plasticity Index of Soils (Atterberg Limits)

LIQUID LIMIT

Number of Blows	35	27	16
Mass of Wet Sample & Tare, g	43.64	45.00	42.32
Mass of Dry Sample & Tare, g	37.87	39.12	37.17
Mass of Tare, g	24.46	25.99	26.48
Moisture Content, %	43.0	44.8	48.2

Oven ID # 15/496/610
Balance ID # 139/563
Liquid Limit Device ID # 451/569

PLASTIC LIMIT

Mass of Wet Sample & Tare, g	31.62	29.81
Mass of Dry Sample & Tare, g	30.35	28.76
Mass of Tare, g	24.33	23.80
Moisture Content, %	21.1	21.2

NOTE: MATERIAL PASSING NO. 40 SIEVE WAS USED FOR TEST

NATURAL MOISTURE

Mass of Wet Sample & Tare, g	1203.30
Mass of Dry Sample & Tare, g	1029.10
Mass of Tare, g	297.80
Moisture Content, %	23.8

LIQUID LIMIT (LL)	45
PLASTIC LIMIT (PL)	21
PLASTICITY INDEX (PI)	24
LIQUIDITY INDEX (LI)	0.12

DESCRIPTION: Brown Clayey Sand with Gravel

USCS (ASTM D2487; D2488): SC

AASHTO (M 145): NA

ASTM D6913: Standard Test Methods for Particle-Size Distribution (Gradation) of Soils Using Sieve Analysis.
ASTM D422 (Historical ‘Withdrawn 2016’)/AASHTO T88 :Standard Test Method for Particle-Size Analysis of Soils.
ASTM D1140/AASHTO T11 : Standard Test Methods for Determining the Amount of Material Finer than 75-micron (No.200) Sieve in Soils by Washing.
ASTM D7928: Standard Test Method for Particle-Size Distribution (Gradation) of Fine-Grained Soils Using the Sedimentation (Hydrometer) Analysis.

ASTM D6913, D422, D1140, D7928/AASHTO T88, T27, T11, T311

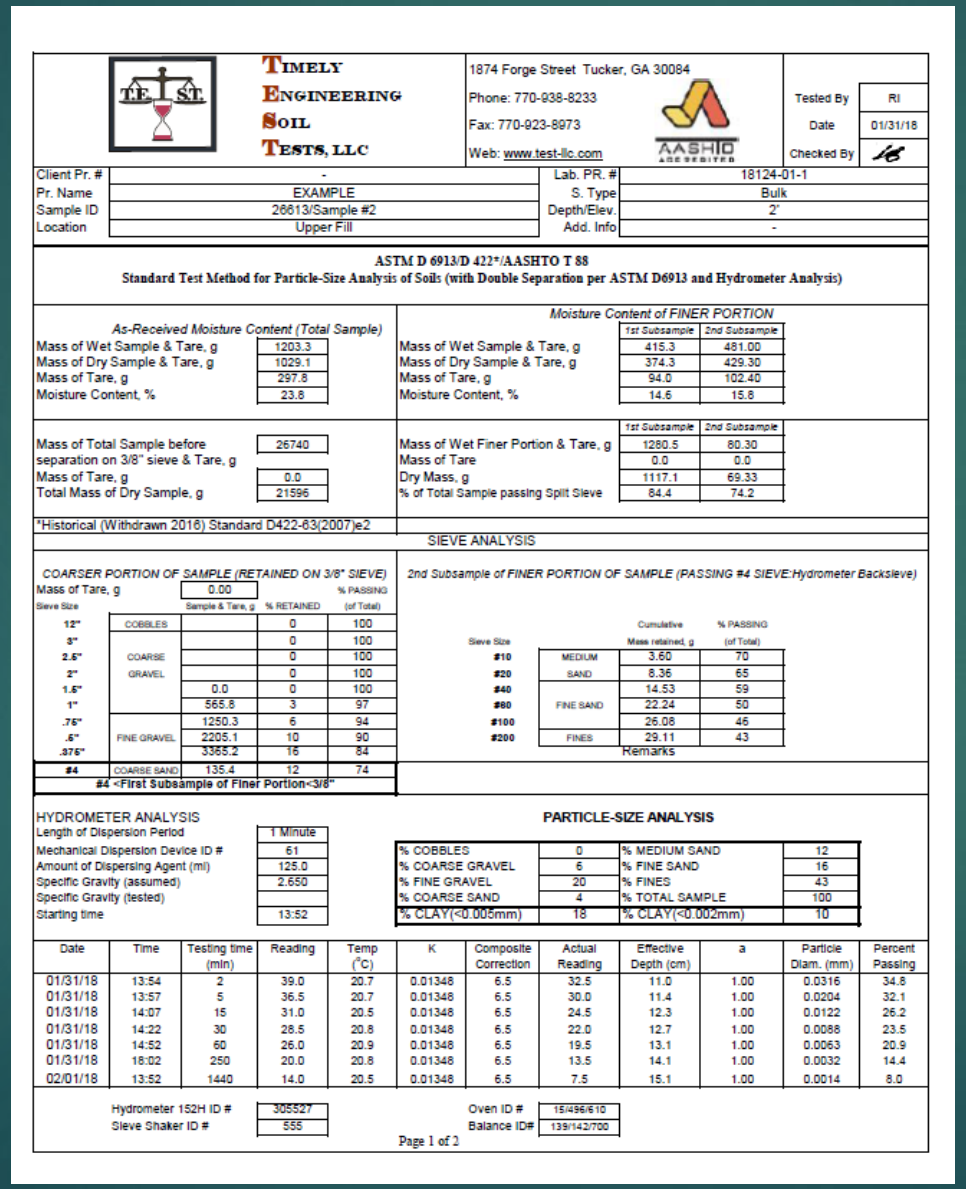
- Summary of Test Methods
  - Determination of Particle-Size, % Gravel, Sand, Fines (Silt and Clay)
- Apparatus:
  - Various Sizes of Sieves, Sieve Shaker
  - Balance, Dispersion Agent, Oven
  - Sedimentation Cylinder, Hydrometer Bulb, Dispersion Apparatus, Thermometer, Timer
  - Miscellaneous Devices

ASTM D6913, D422, D1140, D7928/AASHTO T88, T27, T11, T311

- Procedure for D6913 and D1140
  - If necessary Split Material in Fractions
  - Wash Material on No. 200 (75-micron) Sieve
  - Oven Dry Material is Sieved on Nest of Sieves
- Procedure for D422 and D7928
  - If necessary Split Material on Fractions
  - Fraction of Material Passing No.10 (2 mm) sieve is used for Sedimentation Analysis
  - Wash Material on No. 200 (75-micron) Sieve
  - Oven Dry Material is Sieved on Nest of Sieves
- Material for testing
  - Representative Sample

ASTM D6913, D422, D1140, D7928/AASHTO T88, T27, T11, T311

- Reports
- Application of test



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AASHTO ACCREDITED

Tested By: RI
Date: 01/31/18
Checked By:

Client Pr. #	-	Lab. PR. #	18124-01-1
Pr. Name	EXAMPLE	S. Type	Bulk
Sample ID	26613/Sample #2	Depth/Elev.	2'
Location	Upper Fill	Add. Info	-

ASTM D 6913/D 422*/AASHTO T 88
Standard Test Method for Particle-Size Analysis of Soils (with Double Separation per ASTM D6913 and Hydrometer Analysis)

As-Received Moisture Content (Total Sample)

Mass of Wet Sample & Tare, g	1203.3
Mass of Dry Sample & Tare, g	1029.1
Mass of Tare, g	297.8
Moisture Content, %	23.8

Moisture Content of FINER PORTION

	1st Subsample	2nd Subsample
Mass of Wet Sample & Tare, g	415.3	481.00
Mass of Dry Sample & Tare, g	374.3	429.30
Mass of Tare, g	94.0	102.40
Moisture Content, %	14.6	15.8

Mass of Total Sample before separation on 3/8" sieve & Tare, g	26740
Mass of Tare, g	0.0
Total Mass of Dry Sample, g	21596

	1st Subsample	2nd Subsample
Mass of Wet Finer Portion & Tare, g	1280.5	80.30
Mass of Tare	0.0	0.0
Dry Mass, g	1117.1	69.33
% of Total Sample passing Split Sieve	84.4	74.2

*Historical (Withdrawn 2016) Standard D422-63(2007)e2

SIEVE ANALYSIS

COARSER PORTION OF SAMPLE (RETAINED ON 3/8" SIEVE)

Mass of Tare, g: 0.00

Sieve Size		Sample & Tare, g	% RETAINED	% PASSING (of Total)
12"	COBBLES		0	100
3"			0	100
2.5"	COARSE GRAVEL		0	100
2"			0	100
1.5"		0.0	0	100
1"		565.8	3	97
.75"		1250.3	6	94
.5"	FINE GRAVEL	2205.1	10	90
.375"		3385.2	16	84
#4	COARSE SAND	135.4	12	74

#4 <First Subsample of Finer Portion<3/8"

2nd Subsample of FINER PORTION OF SAMPLE (PASSING #4 SIEVE:Hydrometer Backsieve)

Sieve Size		Cumulative Mass retained, g	% PASSING (of Total)
#10	MEDIUM SAND	3.60	70
#20		8.36	65
#40	FINE SAND	14.53	59
#80		22.24	50
#100		26.08	45
#200	FINES	29.11	43

Remarks

HYDROMETER ANALYSIS

Length of Dispersion Period	1 Minute
Mechanical Dispersion Device ID #	61
Amount of Dispersing Agent (ml)	125.0
Specific Gravity (assumed)	2.650
Specific Gravity (tested)	
Starting time	13:52

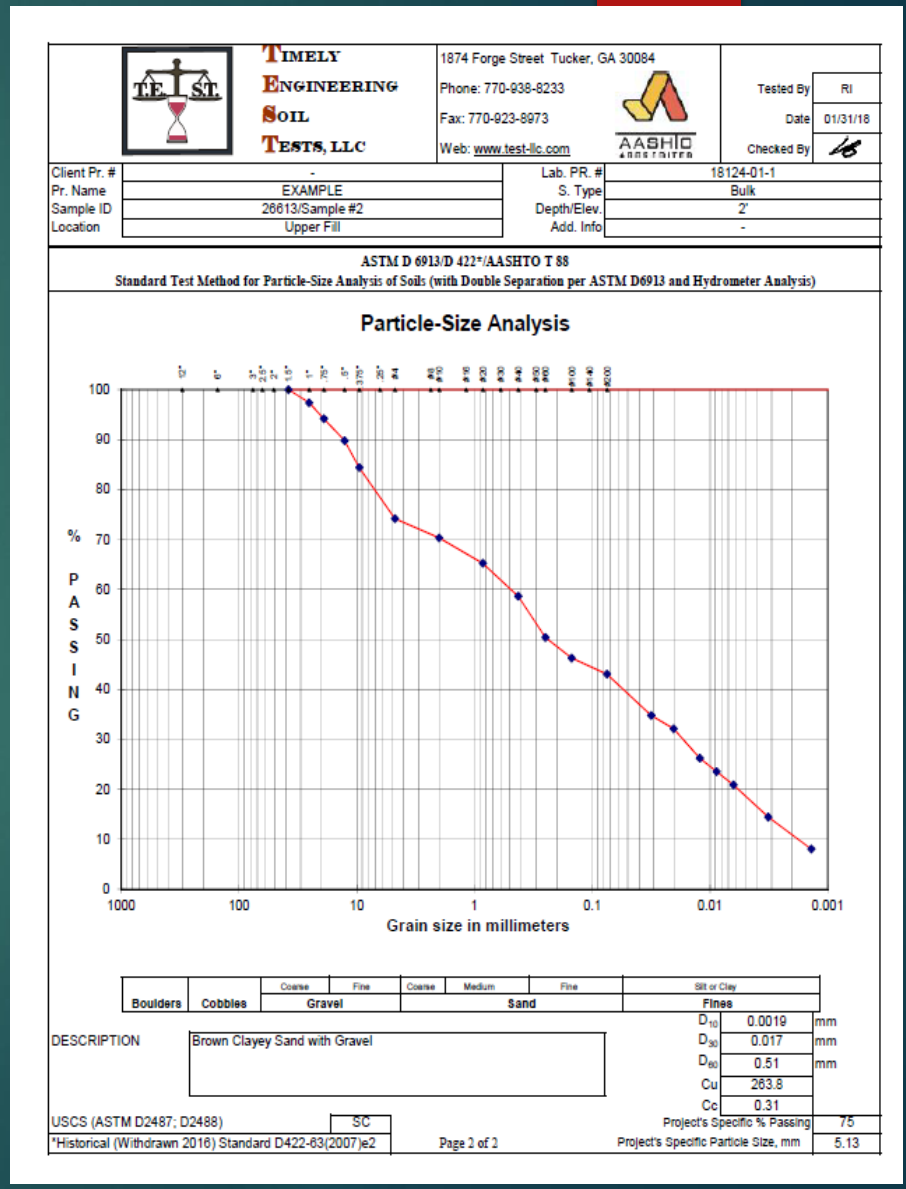
PARTICLE-SIZE ANALYSIS

% COBBLES	0	% MEDIUM SAND	12
% COARSE GRAVEL	6	% FINE SAND	16
% FINE GRAVEL	20	% FINES	43
% COARSE SAND	4	% TOTAL SAMPLE	100
% CLAY(<0.005mm)	18	% CLAY(<0.002mm)	10

Date	Time	Testing time (min)	Reading	Temp (°C)	K	Composite Correction	Actual Reading	Effective Depth (cm)	a	Particle Diam. (mm)	Percent Passing
01/31/18	13:54	2	39.0	20.7	0.01348	6.5	32.5	11.0	1.00	0.0316	34.8
01/31/18	13:57	5	36.5	20.7	0.01348	6.5	30.0	11.4	1.00	0.0204	32.1
01/31/18	14:07	15	31.0	20.5	0.01348	6.5	24.5	12.3	1.00	0.0122	26.2
01/31/18	14:22	30	28.5	20.8	0.01348	6.5	22.0	12.7	1.00	0.0088	23.5
01/31/18	14:52	60	26.0	20.9	0.01348	6.5	19.5	13.1	1.00	0.0063	20.9
01/31/18	16:02	250	20.0	20.8	0.01348	6.5	13.5	14.1	1.00	0.0032	14.4
02/01/18	13:52	1440	14.0	20.5	0.01348	6.5	7.5	15.1	1.00	0.0014	8.0

Hydrometer 152H ID #	305527	Oven ID #	15/496/610
Sieve Shaker ID #	555	Balance ID#	139/142/700

Page 1 of 2



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1874 Forge Street Tucker, GA 30084
Phone: 770-938-8233
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AASHTO ACCREDITED

Tested By: RI
Date: 01/31/18
Checked By:

Client Pr. #	-	Lab. PR. #	18124-01-1
Pr. Name	EXAMPLE	S. Type	Bulk
Sample ID	26613/Sample #2	Depth/Elev.	2'
Location	Upper Fill	Add. Info	-

ASTM D 6913/D 422*/AASHTO T 88
Standard Test Method for Particle-Size Analysis of Soils (with Double Separation per ASTM D6913 and Hydrometer Analysis)

Particle-Size Analysis

Boulders	Cobbles	Gravel (Coarse / Fine)	Sand (Coarse / Medium / Fine)	Silt or Clay: Fines

D_{10}	0.0019	mm
D_{30}	0.017	mm
D_{60}	0.51	mm
Cu	263.8	
Cc	0.31	

DESCRIPTION: Brown Clayey Sand with Gravel

USCS (ASTM D2487; D2488): SC

Project's Specific % Passing: 75

*Historical (Withdrawn 2016) Standard D422-63(2007)e2

Page 2 of 2

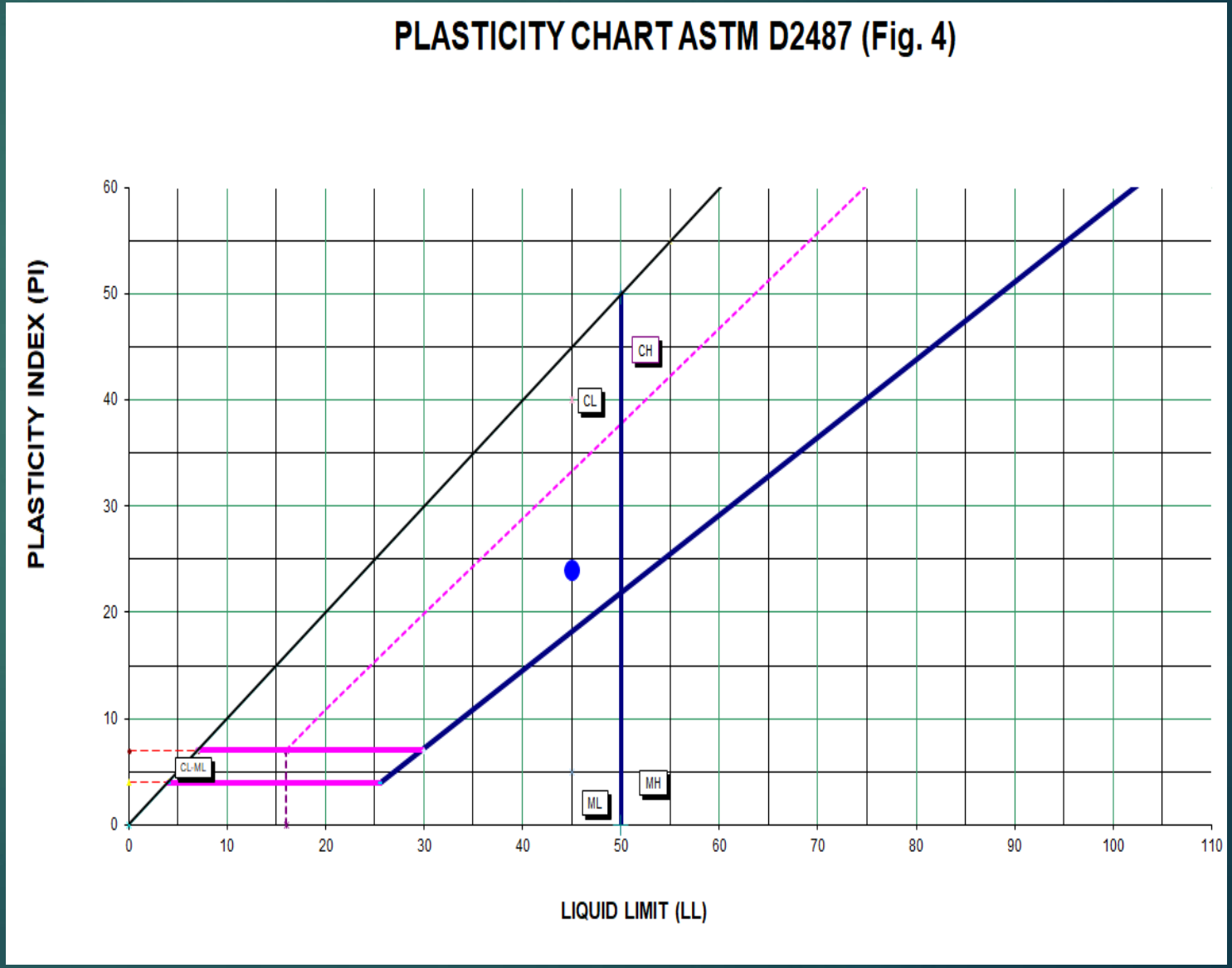
Project's Specific Particle Size, mm: 5.13

ASTM D2487/AASHTO M145:

Standard Practice for Classification of Soils for Engineering Purposes (Unified Soil Classification System)

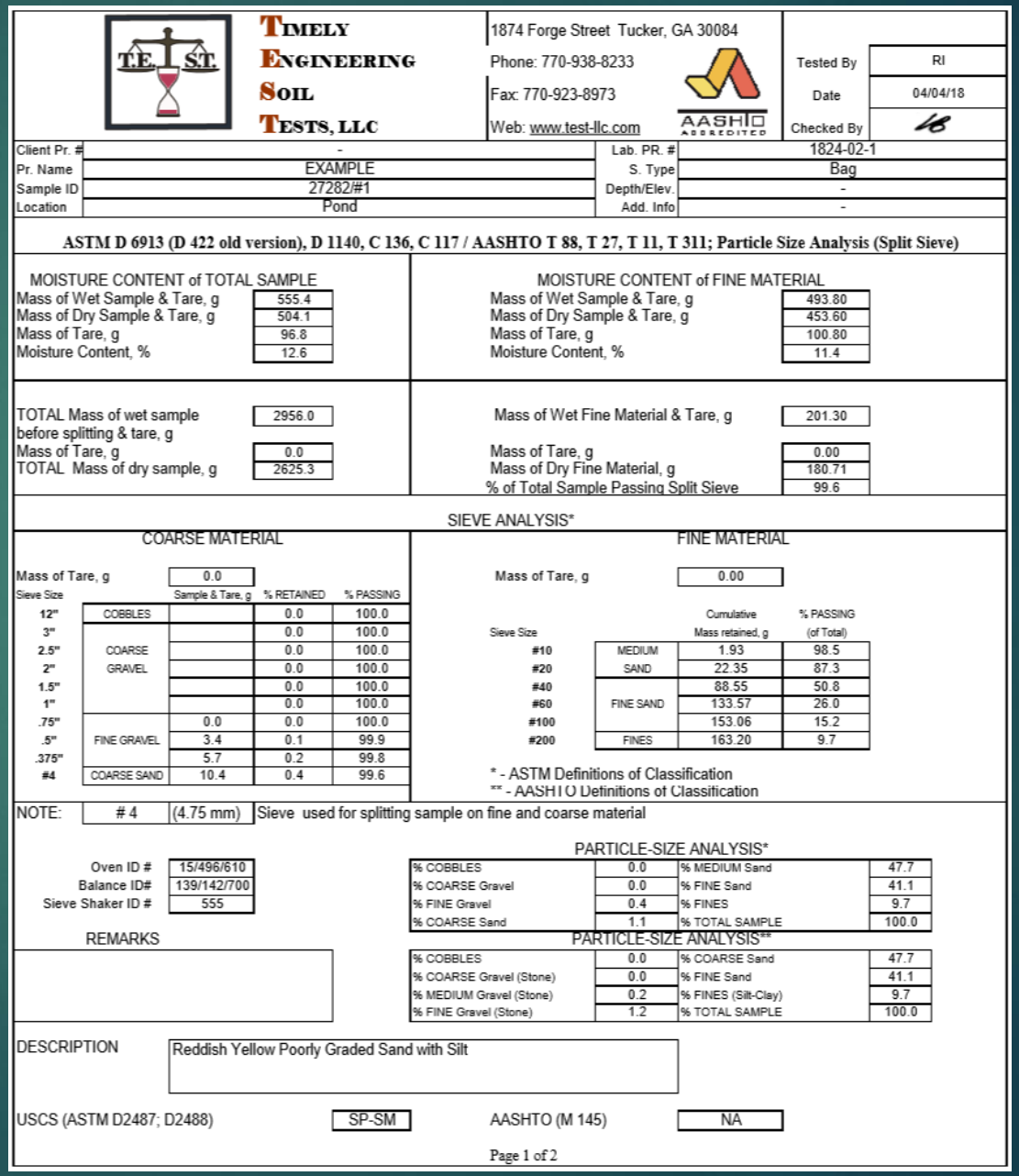
ASTM D2487/AASHTO M145

- Summary of Test Method
  - Based on Results of Sieve Analysis and LL/PL/PI Soil is Classified to Appropriate Group Symbol and Name
- Apparatus:
  - Plasticity Chart
  - Flow Charts (Table 1, FIG 1, 2, 3, 4)



ASTM D2487/AASHTO M145

- Procedure for D2487
  - Fine-Grained Soils
    - 50% or more by dry weight is passing No. 200(75-micron) Sieve.
    - 2 micron < Silt < No. 200 (75 micron)
    - Clay < 2 micron
  - Coarse-Grained Soils
    - > 50% Retain on the No. 200(75-micron) Sieve.
    - No. 4 (4.75 mm) < Gravel < 3" (75 mm)
    - No. 10 (2.00 mm) < Coarse Sand < No. 4 (4.75 mm)
    - No. 40 (425 micron) < Medium Sand < No. 10 (2.00 mm)
    - No. 200 (75 micron) < Fine Sand < No. 40 (425 micron)



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Tested By: RI
Date: 04/04/18
Checked By:

Client Pr. #	-	Lab. PR. #	1824-02-1
Pr. Name	EXAMPLE	S. Type	Bag
Sample ID	27282/#1	Depth/Elev.	-
Location	Pond	Add. Info	-

ASTM D 6913 (D 422 old version), D 1140, C 136, C 117 / AASHTO T 88, T 27, T 11, T 311; Particle Size Analysis (Split Sieve)

MOISTURE CONTENT of TOTAL SAMPLE

Mass of Wet Sample & Tare, g	555.4
Mass of Dry Sample & Tare, g	504.1
Mass of Tare, g	96.8
Moisture Content, %	12.6

MOISTURE CONTENT of FINE MATERIAL

Mass of Wet Sample & Tare, g	493.80
Mass of Dry Sample & Tare, g	453.60
Mass of Tare, g	100.80
Moisture Content, %	11.4

TOTAL Mass of wet sample before splitting & tare, g	2956.0
Mass of Tare, g	0.0
TOTAL Mass of dry sample, g	2625.3

Mass of Wet Fine Material & Tare, g	201.30
Mass of Tare, g	0.00
Mass of Dry Fine Material, g	180.71
% of Total Sample Passing Split Sieve	99.6

SIEVE ANALYSIS*

COARSE MATERIAL

Mass of Tare, g: 0.0

Sieve Size		Sample & Tare, g	% RETAINED	% PASSING
12"	COBBLES		0.0	100.0
3"			0.0	100.0
2.5"	COARSE		0.0	100.0
2"	GRAVEL		0.0	100.0
1.5"			0.0	100.0
1"			0.0	100.0
.75"		0.0	0.0	100.0
.5"	FINE GRAVEL	3.4	0.1	99.9
.375"		5.7	0.2	99.8
#4	COARSE SAND	10.4	0.4	99.6

FINE MATERIAL

Mass of Tare, g: 0.00

Sieve Size		Cumulative Mass retained, g	% PASSING (of Total)
#10	MEDIUM	1.93	98.5
#20	SAND	22.35	87.3
#40		88.55	50.8
#60	FINE SAND	133.57	26.0
#100		153.06	15.2
#200	FINES	163.20	9.7

* - ASTM Definitions of Classification
** - AASHTO Definitions of Classification

NOTE: # 4 (4.75 mm) Sieve used for splitting sample on fine and coarse material

Oven ID #	15/496/610
Balance ID#	139/142/700
Sieve Shaker ID #	555

PARTICLE-SIZE ANALYSIS*

% COBBLES	0.0	% MEDIUM Sand	47.7
% COARSE Gravel	0.0	% FINE Sand	41.1
% FINE Gravel	0.4	% FINES	9.7
% COARSE Sand	1.1	% TOTAL SAMPLE	100.0

PARTICLE-SIZE ANALYSIS**

% COBBLES	0.0	% COARSE Sand	47.7
% COARSE Gravel (Stone)	0.0	% FINE Sand	41.1
% MEDIUM Gravel (Stone)	0.2	% FINES (Silt-Clay)	9.7
% FINE Gravel (Stone)	1.2	% TOTAL SAMPLE	100.0

REMARKS

DESCRIPTION: Reddish Yellow Poorly Graded Sand with Silt

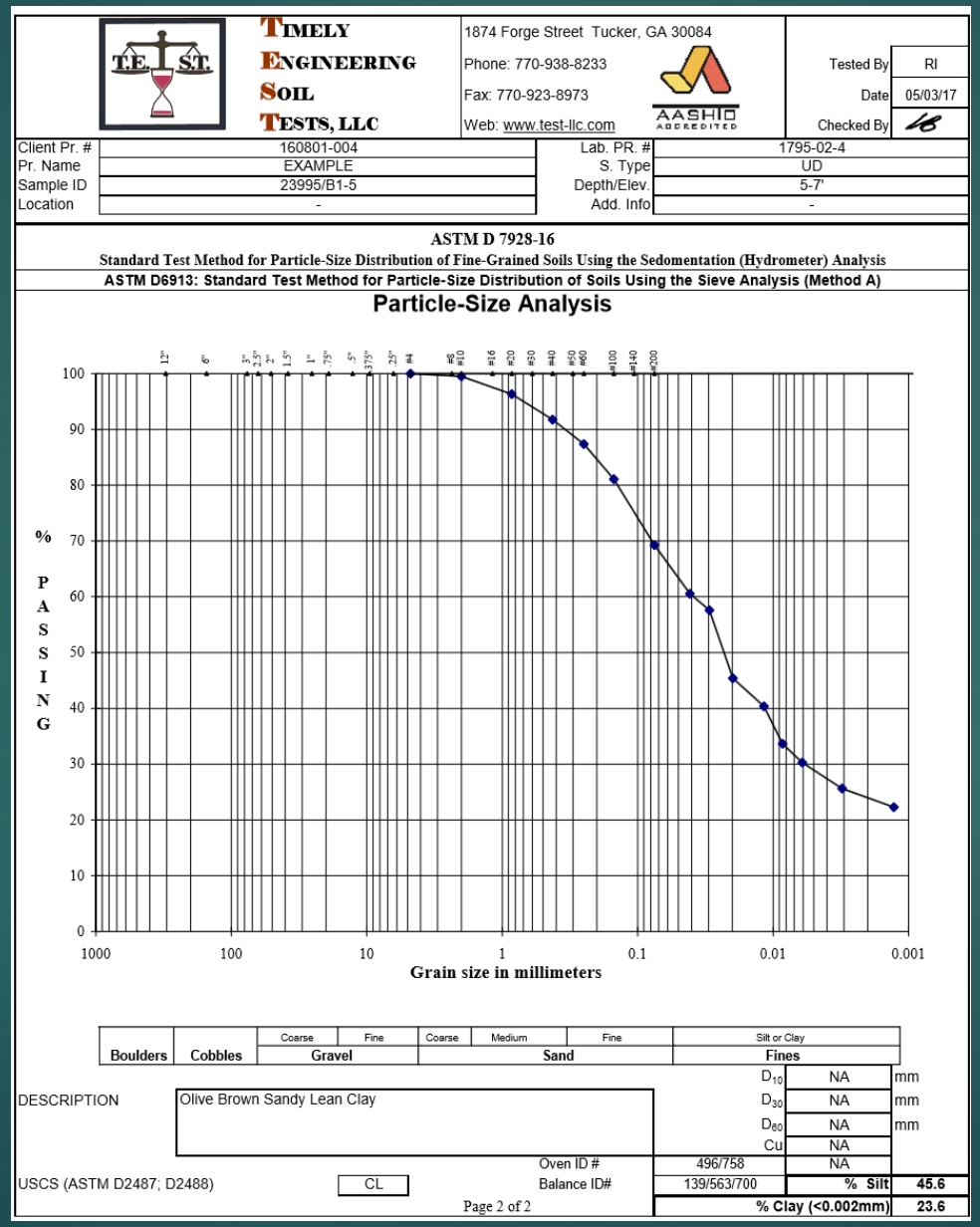
USCS (ASTM D2487; D2488): SP-SM

AASHTO (M 145): NA

Page 1 of 2

ASTM D2487/AASHTO M145

- Reports
- Application of test



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Tested By: RI
Date: 05/03/17
Checked By:

Client Pr. #	160801-004	Lab. PR. #	1795-02-4
Pr. Name	EXAMPLE	S. Type	UD
Sample ID	23995/B1-5	Depth/Elev.	5-7'
Location	-	Add. Info	-

ASTM D 7928-16
Standard Test Method for Particle-Size Distribution of Fine-Grained Soils Using the Sedomentation (Hydrometer) Analysis
ASTM D6913: Standard Test Method for Particle-Size Distribution of Soils Using the Sieve Analysis (Method A)

Particle-Size Analysis

Boulders	Cobbles	Gravel: Coarse	Gravel: Fine	Sand: Coarse	Sand: Medium	Sand: Fine	Fines: Silt or Clay

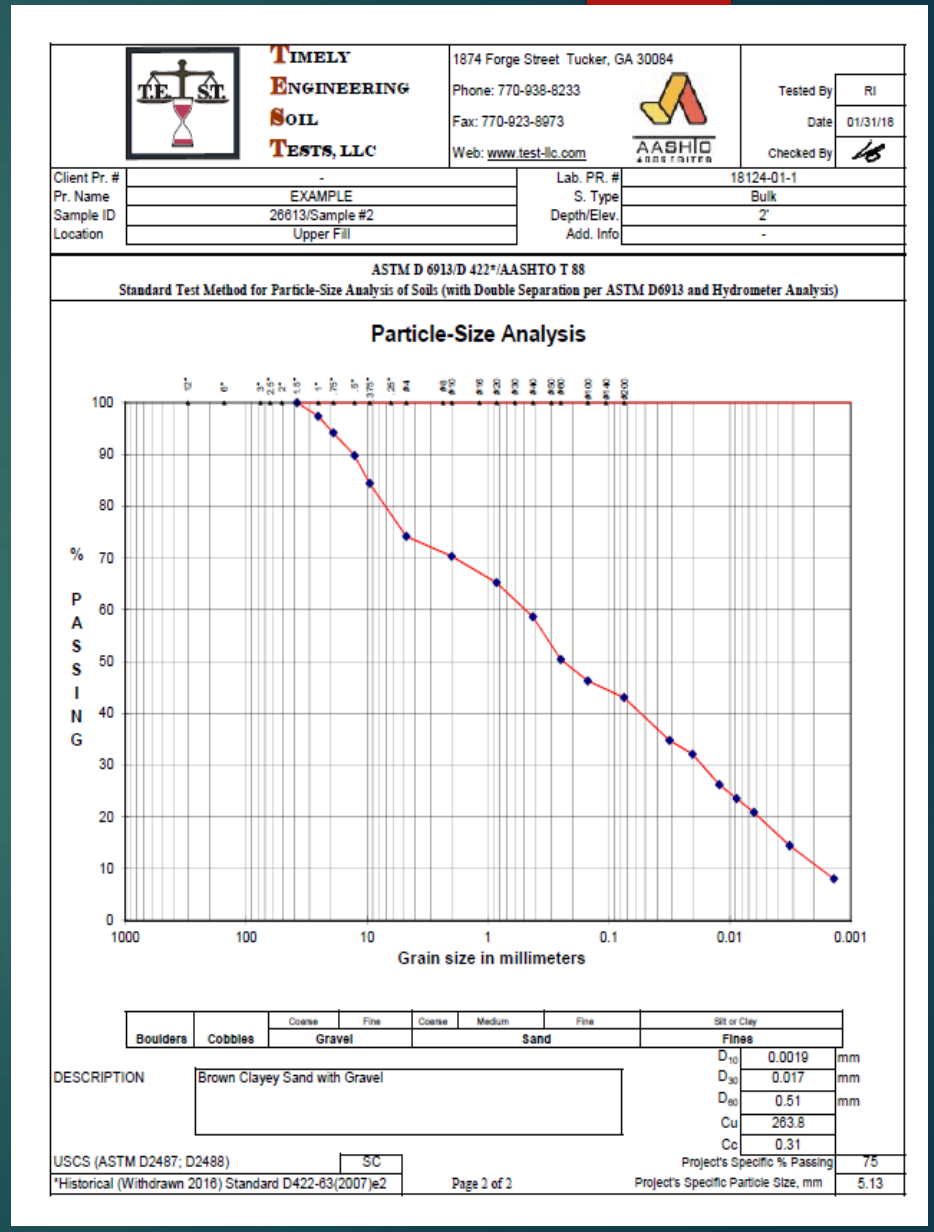
D_{10}	NA	mm
D_{30}	NA	mm
D_{60}	NA	mm
Cu	NA	

DESCRIPTION: Olive Brown Sandy Lean Clay

Oven ID #: 496/758
Balance ID#: 139/563/700

USCS (ASTM D2487; D2488)	CL	
% Silt		45.6
% Clay (<0.002mm)		23.6

Page 2 of 2



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Tested By: RI
Date: 01/31/18
Checked By:

Client Pr. #	-	Lab. PR. #	18124-01-1
Pr. Name	EXAMPLE	S. Type	Bulk
Sample ID	26613/Sample #2	Depth/Elev.	2'
Location	Upper Fill	Add. Info	-

ASTM D 6913/D 422*/AASHTO T 88
Standard Test Method for Particle-Size Analysis of Soils (with Double Separation per ASTM D6913 and Hydrometer Analysis)

Particle-Size Analysis

Boulders	Cobbles	Gravel: Coarse	Gravel: Fine	Sand: Coarse	Sand: Medium	Sand: Fine	Fines: Silt or Clay

D_{10}	0.0019	mm
D_{30}	0.017	mm
D_{60}	0.51	mm
Cu	263.8	
Cc	0.31	

DESCRIPTION: Brown Clayey Sand with Gravel

USCS (ASTM D2487; D2488)	SC	Project's Specific % Passing	75
*Historical (Withdrawn 2016) Standard D422-63(2007)e2		Project's Specific Particle Size, mm	5.13

Page 2 of 2

ASTM D1883/AASHTO T193:

Standard Test Method for California Bearing Ratio (CBR) of Laboratory-Compacted Soils

ASTM D1883/AASHTO T193

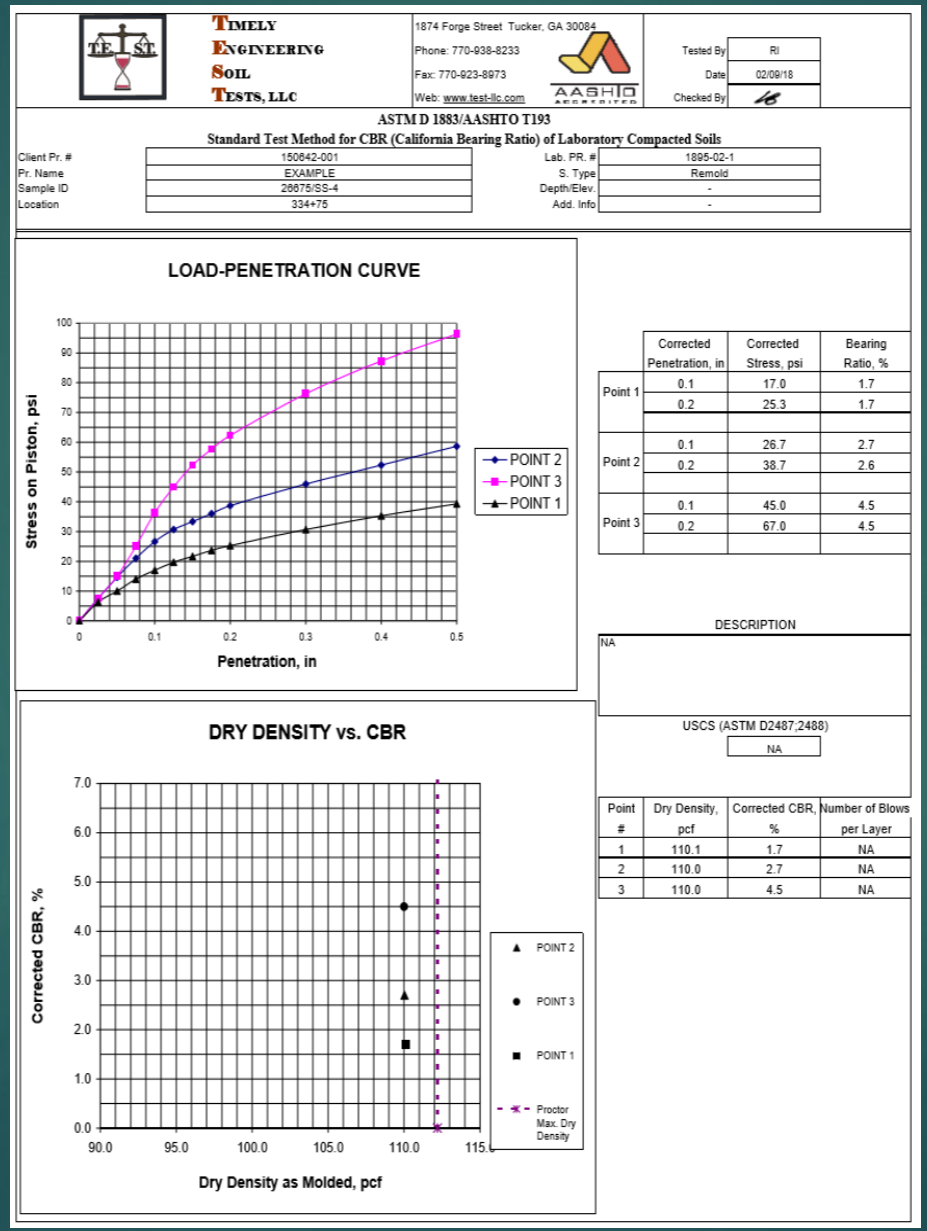
- Summary of Test Method
  - Compacted Material is Soaked and Penetrated at a constant Rate by Circular Piston
  - The CBR Is Expressed as the Ratio of the Unit Load on the Piston Required to Penetrate 0.1 Inch (2.5 Mm) and 0.2 In (5.1 Mm) of the Test Material to the Unit Load Required To Penetrate A Standard Material Of Well-graded Crushed Stone
- Apparatus:
  - Loading Machine
  - Penetration Measuring Device
  - Surcharge Weights
  - Penetration Piston (1.954 inch/49.63 mm diameter)
  - Mold, Spacer Disk, Rammer, Swell Measurement Device
  - Miscellaneous Devices

ASTM D1883/AASHTO T193

- Procedure
  - Material Compacted to a Specific water Content and Density
  - Sample is Loaded by Surcharge Weights
  - Material is Soaked for 96 Hours
  - Swell of Material is Determined
  - Material is Penetrated by Piston at rate of 0.05 inch/1.27 mm per minute
  - Load Readings at Specified Intervals are Recorded. Max Bearing Ratio at 0.1" or 0.2" is Selected for Use
- Material for testing
  - < ¾ inch (19mm) Sieve

ASTM D1883/AASHTO T193

- Reports
- Application of test
  - Pavement Subgrade
  - Subbase and Base
  - Strength evaluation of Soil for Design:
    - Airfield Pavements
    - Roads
    - Warehouse Floors



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Web: www.test-llc.com
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Tested By: RI
Date: 02/09/18
Checked By:

ASTM D 1883/AASHTO T193
Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils

Client Pr. #	150642-001	Lab. PR. #	1895-02-1
Pr. Name	EXAMPLE	S. Type	Remold
Sample ID	26675/SS-4	Depth/Elev.	-
Location	334+75	Add. Info	-

LOAD-PENETRATION CURVE

	Corrected Penetration, in	Corrected Stress, psi	Bearing Ratio, %
Point 1	0.1	17.0	1.7
	0.2	25.3	1.7
Point 2	0.1	26.7	2.7
	0.2	38.7	2.6
Point 3	0.1	45.0	4.5
	0.2	67.0	4.5

DESCRIPTION
NA

USCS (ASTM D2487,2488)
NA

DRY DENSITY vs. CBR

Point #	Dry Density, pcf	Corrected CBR, %	Number of Blows per Layer
1	110.1	1.7	NA
2	110.0	2.7	NA
3	110.0	4.5	NA

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Tested By: RI
Date: 02/09/18
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ASTM D 1883/AASHTO T193
Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils

Client Pr. #	150642-001	Lab. PR. #	1895-02-1
Pr. Name	EXAMPLE	S. Type	Remold
Sample ID	26675/SS-4	Depth/Elev.	-
Location	334+75	Add. Info	-

Proctor Method Description

Compaction Procedure	D698	T99	Other: GDT-7

Max Dry Density, pcf: 112.2
Optimum Moisture Content, %: 16.2

CBR Method Description & Test Data

Point #	1	2	3
Specified Moisture Cont., %	14.2	16.2	18.2
Specified % Compaction	98.0	98.0	98.0
Number of Layers	3	3	3
Number of Blows per layer	NA	NA	NA
Mold ID	511	512	508
Height of Sample before Soaking, in	4.583	4.582	4.582
Volume of Sample, ft^3	0.07490	0.07500	0.07500
Mass of Mold, g	6982	6970	6893
Mass of Wet Soil & Mold, g	11257.0	11320.0	11320.0
Mass of Wet Soil, g	4275	4350	4427
Wet Density, pcf	125.8	127.9	130.1
Dry Density before Soaking, pcf	110.1	110.0	110.0
Dial Gage Reading before Soaking, in	0.161	0.086	0.081
Dial Gage Reading after Soaking, in	0.345	0.197	0.149
Swell of Sample, in	0.184	0.111	0.068
Swell of Sample, %	4.0	2.4	1.5
Height of Sample after Soaking, in	4.767	4.693	4.650
Dry Density after Soaking, pcf	105.8	107.5	108.4
Mass of Sample & Mold after Soaking, g	11504.0	11472.0	11383.0
% Compaction	98.1	98.1	98.0

Mass of material before separation on 3/4" sieve, g			NA
Mass of material retained on 3/4" sieve, g			NA
Mass of +3/4" material replaced by (+#4 to -3/4") portion, g			NA
Replaced Portion,%			NA
Penetration Piston ID	123	Dial Gage ID	178
Rammer Type (Effort)	STD	Manual	
Height of Drop, in	12		
Mass of Rammer, kg	2.5		
Condition of Sample	Soaked		
Soaking Duration	96 hr		
Surcharge Load	10 lb	4.54 kg	
Surcharge Press., psi	0.35		
Penetration Rate, in/min		0.05	
Balance ID	6/564/566	Load Cell ID	11
Oven ID	496/610/758	Dial Gage ID	450
Penetration Machine ID	10	Rammer ID	315

Moisture Content

	Point 1			Point 2			Point 3		
	Before Comp.	After Comp.	After Soaking*	Before Comp.	After Comp.	After Soaking*	Before Comp.	After Comp.	After Soaking*
Mass of Wet Sample and Tare, g	654.0	556.8	863.5	635.0	582.5	818.2	727.5	586.6	986.9
Mass of Dry Sample and Tare, g	585.0	499.5	715.1	559.8	516.8	683.6	632.0	511.2	843.8
Mass of Tare, g	100.5	98.7	159.5	99.8	108.2	152.7	111.0	98.3	219.1
Moisture Content, %	14.2	14.3	26.7	16.3	16.1	25.4	18.3	18.3	22.9
Average Moisture Content, %	14.3			16.2			18.3		

* Portion of sample used for determination of moisture content after soaking and penetration: Top 1 inch; Av. Representative
YES; NO

Load - Penetration Data

Point 1		
Penetration, in	Load, lb	Stress, psi
0.000	3	0.0
0.0250	22	6.3
0.0500	33	10.0
0.0750	45	14.0
0.1000	54	17.0
0.1250	62	19.7
0.1500	68	21.7
0.1750	74	23.7
0.2000	79	25.3
0.3000	95	30.7
0.4000	109	35.3
0.5000	121	39.3

Point 2		
Penetration, in	Load, lb	Stress, psi
0.000	4	0.0
0.0250	26	7.7
0.0500	47	14.7
0.0750	66	21.0
0.1000	83	26.7
0.1250	95	30.7
0.1500	103	33.3
0.1750	111	36.0
0.2000	119	38.7
0.3000	141	46.0
0.4000	160	52.3
0.5000	179	58.7

Point 3		
Penetration, in	Load, lb	Stress, psi
0.000	4	0.0
0.0250	26	7.7
0.0500	48	15.0
0.0750	78	25.0
0.1000	112	36.3
0.1250	138	45.0
0.1500	160	52.3
0.1750	176	57.7
0.2000	190	62.3
0.3000	232	76.3
0.4000	265	87.3
0.5000	292	96.3

ASTM D5084:

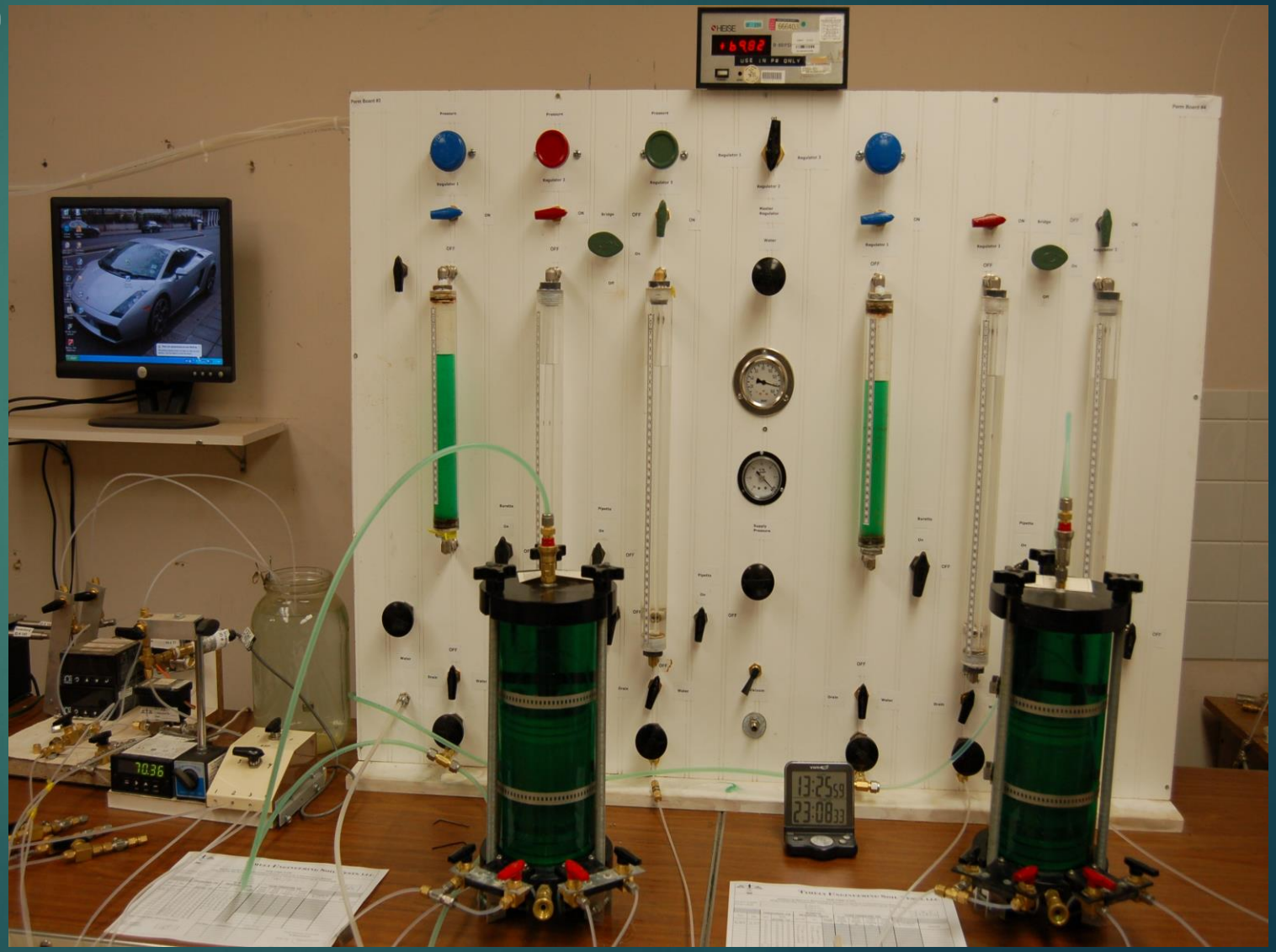
Standard Test Methods for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter

ASTM D5084

- Summary of Test Methods
  - Measurement of the Hydraulic Conductivity/Coefficient of Permeability (k) of water-saturated porous materials with a flexible wall Permeameter. Darcy's Law is Assumed to be Valid for Determination of k.
    - k – Rate of Discharge of water Under Laminar Flow Conditions Through a unit cross-sectional Area of Porous Medium Under a Unit Hydraulic Gradient and Standard Temperature Conditions (20°C).
    - Methods are Used for k Less than $1x10^{-4}$ cm/sec. with Head Loss with gradient from 2 to 30.
- Apparatus:
  - Permeability Boards/Panels, Chambers/Cells, Vacuum/Pressure/Hydraulic Systems
  - Balances, Measuring devices, Oven, Flexible Membranes
  - Miscellaneous Devices

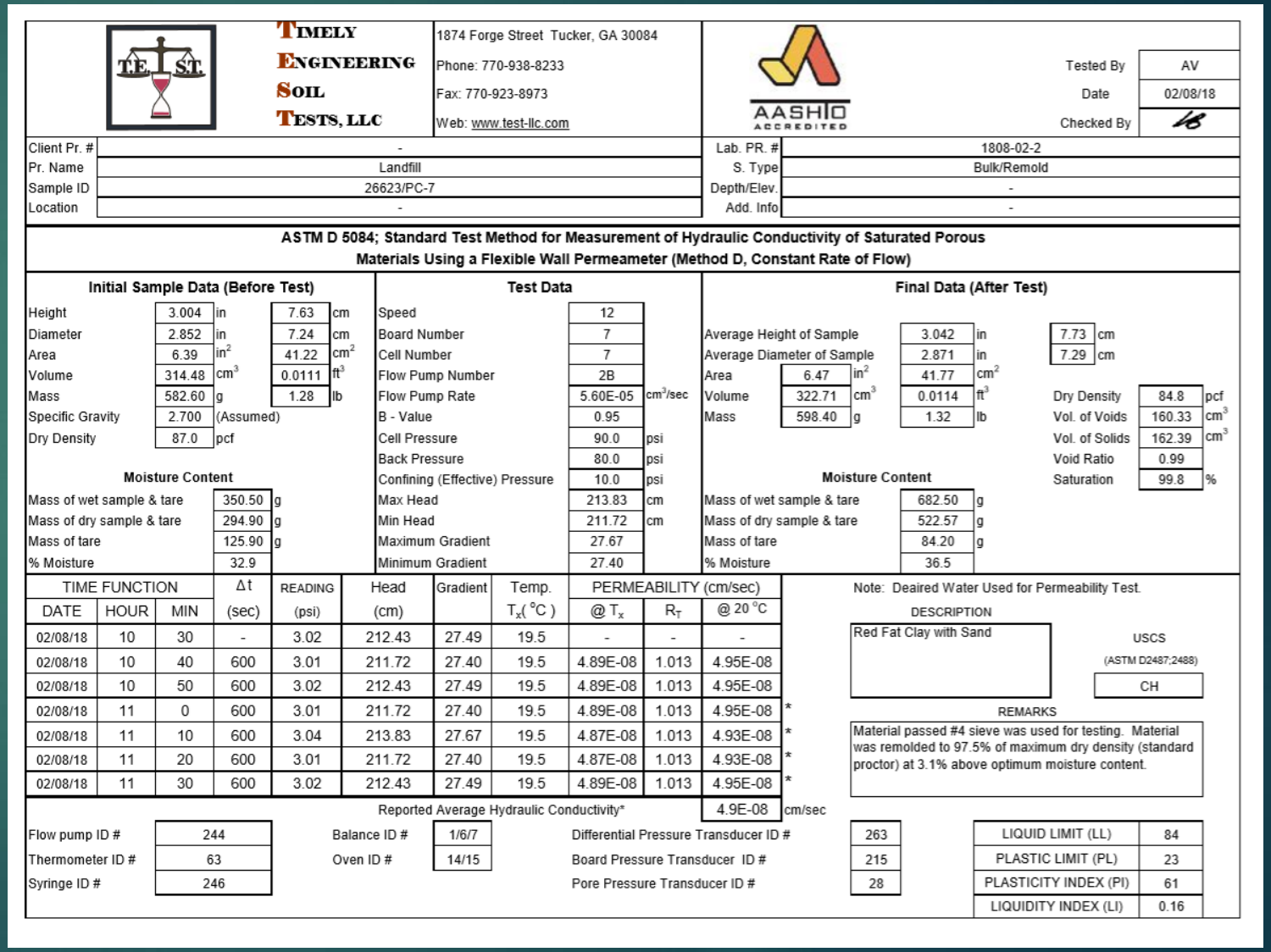
ASTM D5084

- Procedures
  - Method A (Constant Head)
  - Method B and C (Falling Head)
  - Method D (Constant Rate of Flow) $K = \Delta QL/(A \cdot \Delta h \cdot \Delta t)$
  - Method E (Constant Volume-Constant Head)
  - Method F (Constant Volume-Falling Head)
- Material for testing
  - Intact, Reconstituted, Remolded, Compacted, Undisturbed, Soil Cement



ASTM D5084

- Reports
- Application of test
  - Landfills
  - Ponds
  - Dams
  - In-situ Soil Stabilization/Treatability of Environmental Contaminated Sites
  - Waste Water Treatment Facilities
  - Septic Systems



T.E. S.T.	TIMELY ENGINEERING SOIL TESTS, LLC	1874 Forge Street Tucker, GA 30084 Phone: 770-938-8233 Fax: 770-923-8973 Web: www.test-llc.com	AASHTO ACCREDITED Tested By: AV Date: 02/08/18 Checked By:

Client Pr. #	-	Lab. PR. #	1808-02-2
Pr. Name	Landfill	S. Type	Bulk/Remold
Sample ID	26623/PC-7	Depth/Elev.	-
Location	-	Add. Info	-

ASTM D 5084; Standard Test Method for Measurement of Hydraulic Conductivity of Saturated Porous Materials Using a Flexible Wall Permeameter (Method D, Constant Rate of Flow)

Initial Sample Data (Before Test)

Height	3.004	in	7.63	cm
Diameter	2.852	in	7.24	cm
Area	6.39	in^2	41.22	cm^2
Volume	314.48	cm^3	0.0111	ft^3
Mass	582.60	g	1.28	lb
Specific Gravity	2.700	(Assumed)		
Dry Density	87.0	pcf		

Moisture Content

Mass of wet sample & tare	350.50	g
Mass of dry sample & tare	294.90	g
Mass of tare	125.90	g
% Moisture	32.9	

Test Data

Speed	12	
Board Number	7	
Cell Number	7	
Flow Pump Number	2B	
Flow Pump Rate	5.60E-05	cm^3/sec
B - Value	0.95	
Cell Pressure	90.0	psi
Back Pressure	80.0	psi
Confining (Effective) Pressure	10.0	psi
Max Head	213.83	cm
Min Head	211.72	cm
Maximum Gradient	27.67	
Minimum Gradient	27.40	

Final Data (After Test)

Average Height of Sample		3.042	in	7.73	cm
Average Diameter of Sample		2.871	in	7.29	cm
Area	6.47 in^2	41.77	cm^2		
Volume	322.71 cm^3	0.0114	ft^3		
Mass	598.40 g	1.32	lb		

Dry Density	84.8	pcf
Vol. of Voids	160.33	cm^3
Vol. of Solids	162.39	cm^3
Void Ratio	0.99	
Saturation	99.8	%

Moisture Content

Mass of wet sample & tare	682.50	g
Mass of dry sample & tare	522.57	g
Mass of tare	84.20	g
% Moisture	36.5	

TIME FUNCTION			Δt	READING	Head	Gradient	Temp.	PERMEABILITY (cm/sec)			
DATE	HOUR	MIN	(sec)	(psi)	(cm)		T_x(°C)	@ T_x	R_T	@ 20 °C	
02/08/18	10	30	-	3.02	212.43	27.49	19.5	-	-	-	
02/08/18	10	40	600	3.01	211.72	27.40	19.5	4.89E-08	1.013	4.95E-08	
02/08/18	10	50	600	3.02	212.43	27.49	19.5	4.89E-08	1.013	4.95E-08	
02/08/18	11	0	600	3.01	211.72	27.40	19.5	4.89E-08	1.013	4.95E-08	*
02/08/18	11	10	600	3.04	213.83	27.67	19.5	4.87E-08	1.013	4.93E-08	*
02/08/18	11	20	600	3.01	211.72	27.40	19.5	4.87E-08	1.013	4.93E-08	*
02/08/18	11	30	600	3.02	212.43	27.49	19.5	4.89E-08	1.013	4.95E-08	*
								Reported Average Hydraulic Conductivity*		4.9E-08	cm/sec

Note: Deaired Water Used for Permeability Test.

DESCRIPTION: Red Fat Clay with Sand

USCS (ASTM D2487;2488): CH

REMARKS: Material passed #4 sieve was used for testing. Material was remolded to 97.5% of maximum dry density (standard proctor) at 3.1% above optimum moisture content.

Flow pump ID #	244	Balance ID #	1/6/7	Differential Pressure Transducer ID #	263
Thermometer ID #	63	Oven ID #	14/15	Board Pressure Transducer ID #	215
Syringe ID #	246			Pore Pressure Transducer ID #	28

LIQUID LIMIT (LL)	84
PLASTIC LIMIT (PL)	23
PLASTICITY INDEX (PI)	61
LIQUIDITY INDEX (LI)	0.16

ASTM D3080/AASHTO T236:

Standard Test Method for Direct Shear Test of Soils Under Consolidated Drained Conditions

ASTM D3080/AASHTO T236

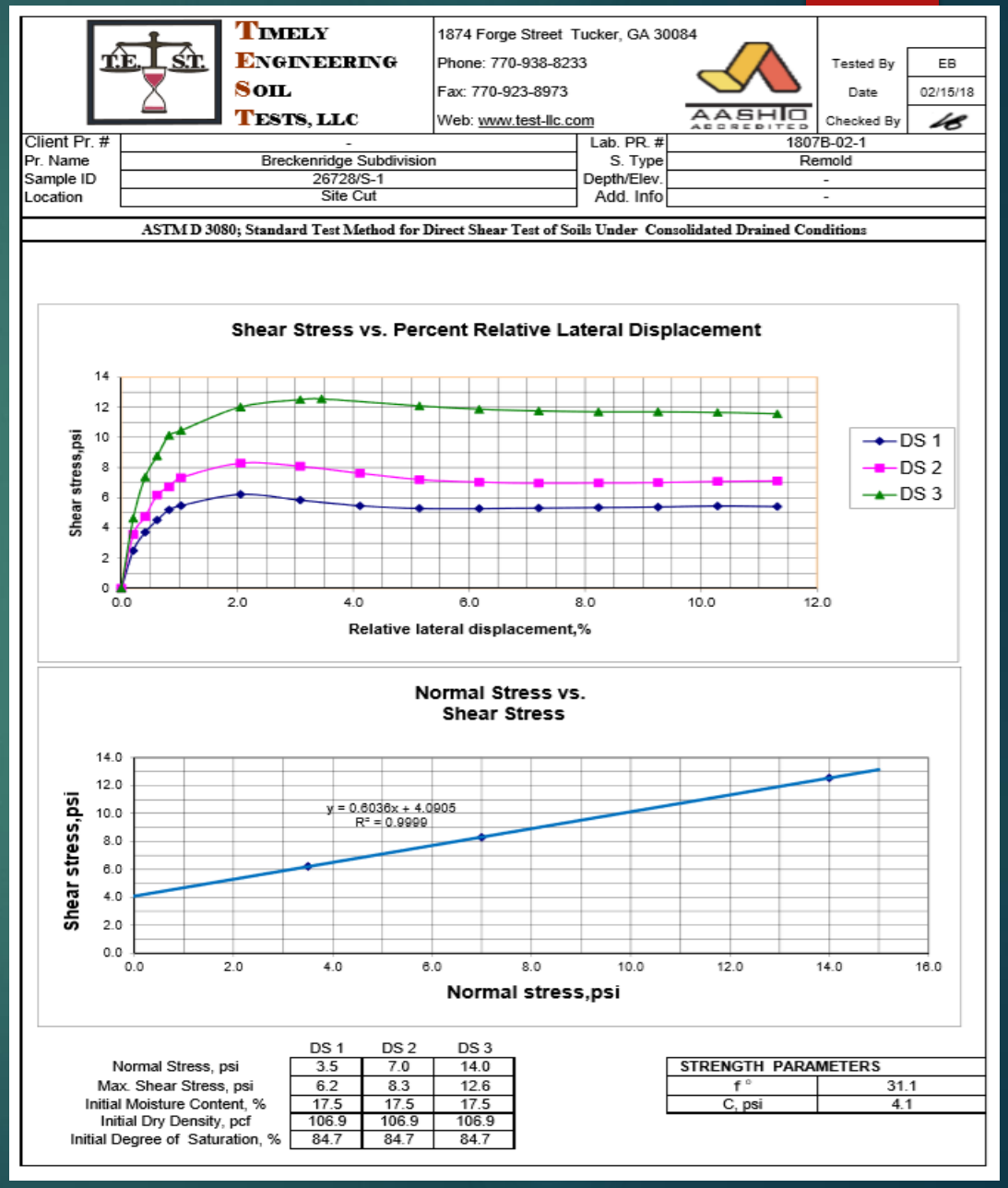
- Summary of Test Method
  - Specimen Consolidated with Normal Stress is Sheared in Direct Shear Device at Drained Condition
  - Halves of Share Box are Displaced Laterally with Respect to Each Other at a Constant rate of Shearing Deformation while Measuring the Shearing Force, Relative Lateral Displacement, and Normal Displacement
- Apparatus:
  - Shear Device, Shear Box, Porous Inserts
  - Devices for Applying Normal and Shearing Forces
  - Force and Deformation, Measurement Devices
  - Balance, Oven and Miscellaneous Equipment

ASTM D3080/AASHTO T236

- Procedure
  - Intact or Remolded Specimen (Min. H/D = 2) is Placed in Assembled Share Box
  - After Application of Seating Normal Load (Approximately 1 psi/5kPa), Initial reading of Normal Displacement is Obtained
  - Normal Load is Applied to the Specimen and Deformation vs Time is Obtained
  - Based on Consolidation Properties, Shearing Rate is Determined and Shear is Started After Removing Bolts Between Bottom and Top Halves of the Box
  - Data Readings of Normal and Lateral Displacement, Shear Force at Desired Intervals are Obtained
- Material for testing
  - Min. Specimen D= 2inch/50mm or > 10 Times of Max. Particle Size
  - Min. Specimen H= 0.5inch/13mm or > 6 Times of Max. Particle Size

ASTM D3080/AASHTO T236

- Reports
- Application of test
  - φ(phi) Angle and C is Defined Based on Results of D.S. for Min. of 3 Normal Stresses
  - Earth Retaining Structures (Retaining Walls, Bridges, Abutments)
  - Slope and Foundation Design & QC
  - Embankments, Landfills, Dams
- References
  - AASHTO LRFD Bridge Design Specification
  - Federal Highway Administration (FHWA) Publications
  - Various DOT Manuals



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Web: www.test-llc.com
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Tested By	EB		
Date	02/15/18		
Checked By			

Client Pr. #	-	Lab. PR. #	1807B-02-1
Pr. Name	Breckenridge Subdivision	S. Type	Remold
Sample ID	26728/S-1	Depth/Elev.	-
Location	Site Cut	Add. Info	-

ASTM D 3080; Standard Test Method for Direct Shear Test of Soils Under Consolidated Drained Conditions

	DS 1	DS 2	DS 3
Normal Stress, psi	3.5	7.0	14.0
Max. Shear Stress, psi	6.2	8.3	12.6
Initial Moisture Content, %	17.5	17.5	17.5
Initial Dry Density, pcf	106.9	106.9	106.9
Initial Degree of Saturation, %	84.7	84.7	84.7

STRENGTH PARAMETERS	
f °	31.1
C, psi	4.1

ASTM D4767/AASHTO T297:

Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils

ASTM D4767/AASHTO T297

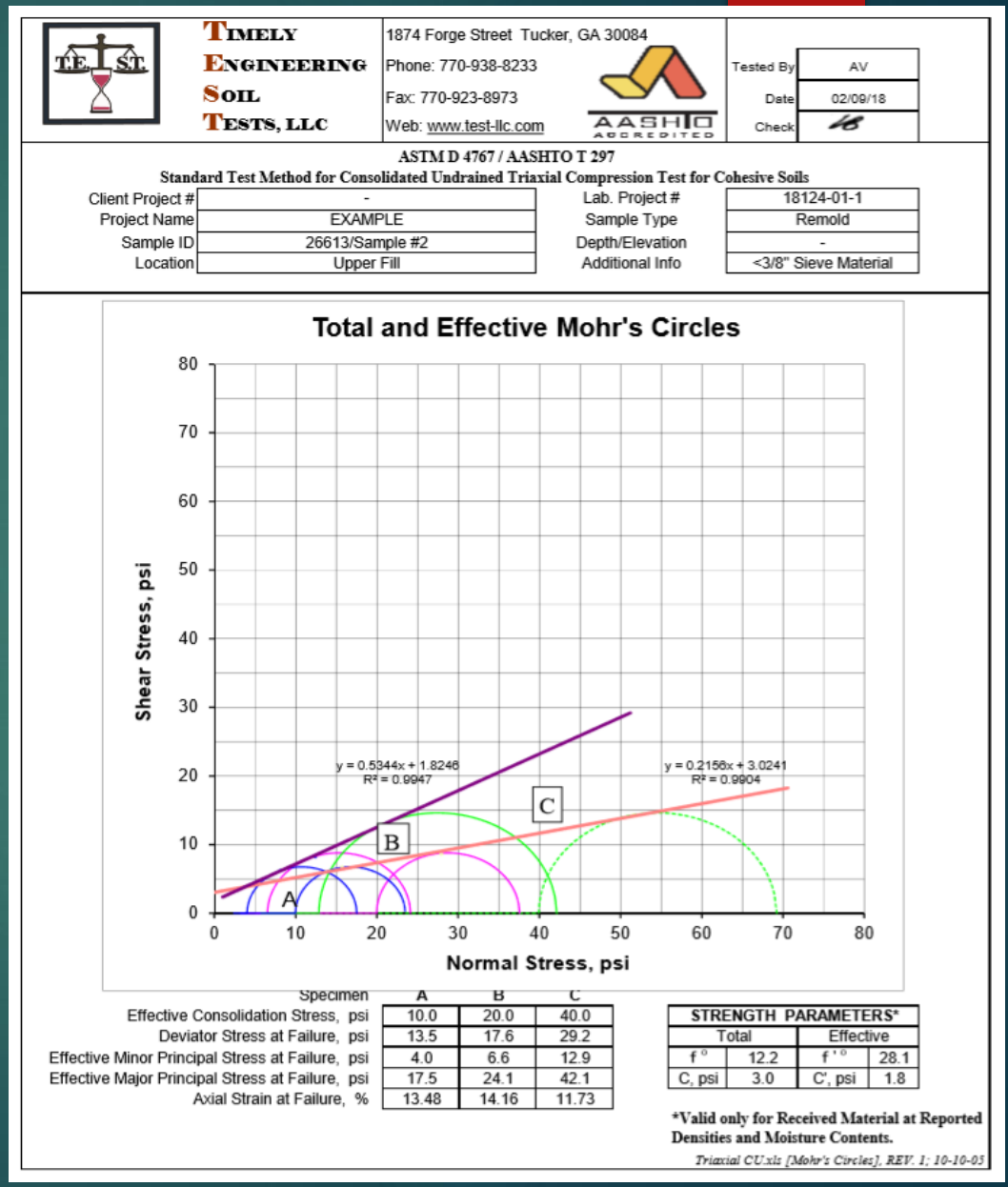
- Summary of Test Method
  - Cylindrical Specimens are Isotropically Consolidated and Sheared in Compression without Drainage at a Constant Rate of Axial Deformation (Strain Controlled) with Pore-Water Pressure Measurements
  - Based on Data for 3 Specimens at Different Effective Consolidation Stresses for Cohesive Soils Strength, Deformation Properties and Mohr Strength Envelops with C and φ(phi) are Determined
- Apparatus:
  - Triaxial Boards/Panels, Chambers/Cells, Vacuum/Pressure/Hydraulic Systems
  - Axial Loading Device
  - Force, Deformation, Vacuum, Pressure and Volume, Measurement Devices
  - Balance, Flexible Membranes, Oven and Miscellaneous Equipment

ASTM D4767/AASHTO T297

- Procedure
  - Cylindrical Specimen (2.0 < H/D < 2.5) is Saturated, Consolidated and Sheared at Constant Rate/Speed which is Defined by Consolidation Properties
  - Data Readings of Deformation, Shear Force at Desired Intervals and Pore-Water Pressure are Obtained
- Material for testing: UD or Remold
  - Min. Specimen D= 1.3inch/33mm or > 6 Times of Max. Particle Size
  - 2.0 < H/D < 2.5

ASTM D4767/AASHTO T297

- Reports
- Application of test
  - φ(phi) Angle and C is Defined Based on Results of CU Triaxial for Min. of 3 Effective Stresses
  - Earth Retaining Structures (Retaining Walls, Bridges, Abutments)
  - Slope and Foundation Design & QC
  - Embankments, Landfills, Dams
- References
  - AASHTO LRFD Bridge Design Specification
  - Federal Highway Administration (FHWA) Publications
  - Various DOT Manuals



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Tested By	AV
Date	02/09/18
Check	

ASTM D 4767 / AASHTO T 297
Standard Test Method for Consolidated Undrained Triaxial Compression Test for Cohesive Soils

Client Project #	-	Lab. Project #	18124-01-1
Project Name	EXAMPLE	Sample Type	Remold
Sample ID	26613/Sample #2	Depth/Elevation	-
Location	Upper Fill	Additional Info	<3/8" Sieve Material

Specimen	A	B	C
Effective Consolidation Stress, psi	10.0	20.0	40.0
Deviator Stress at Failure, psi	13.5	17.6	29.2
Effective Minor Principal Stress at Failure, psi	4.0	6.6	12.9
Effective Major Principal Stress at Failure, psi	17.5	24.1	42.1
Axial Strain at Failure, %	13.48	14.16	11.73

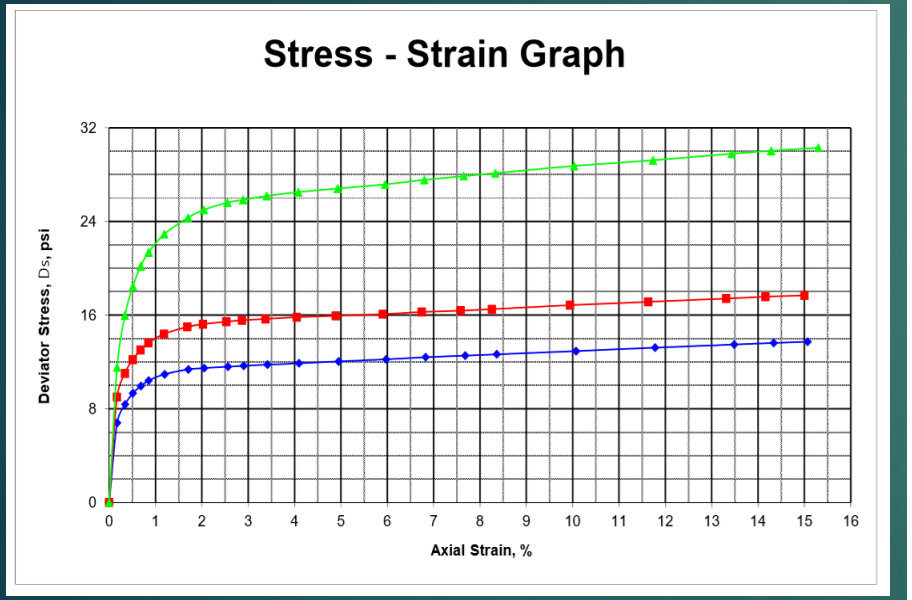
STRENGTH PARAMETERS*			
Total		Effective	
f °	12.2	f ' °	28.1
C, psi	3.0	C', psi	1.8

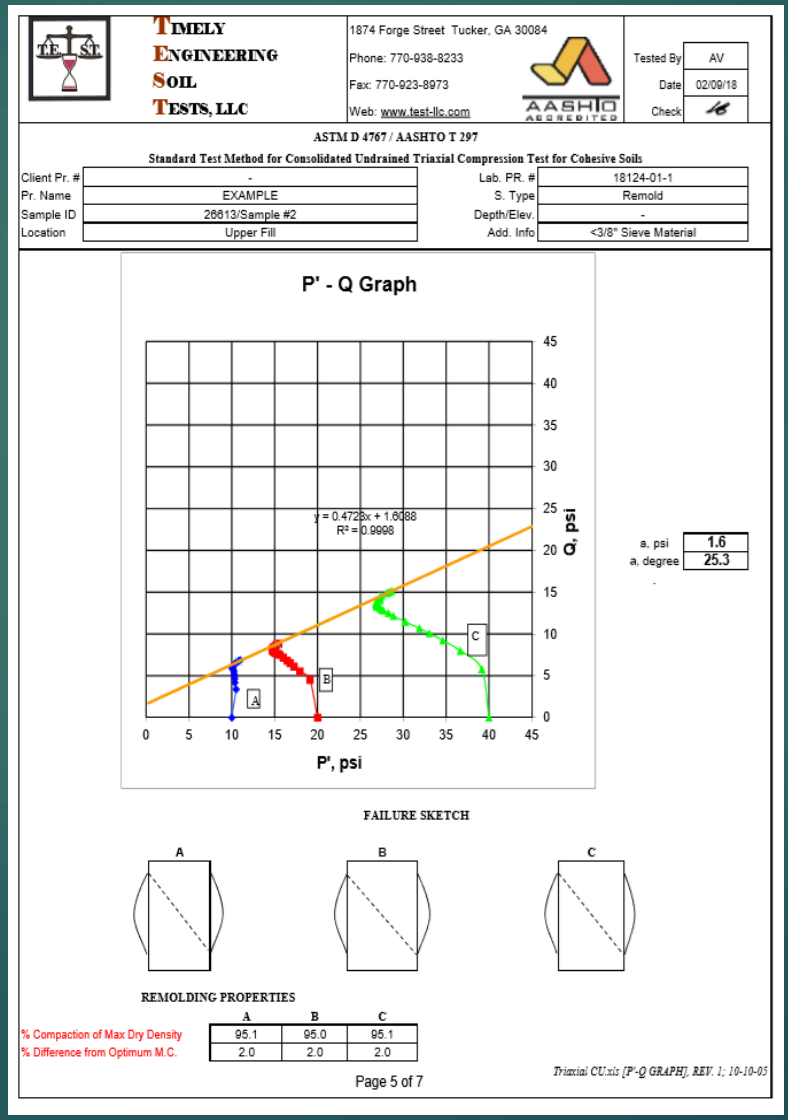
*Valid only for Received Material at Reported Densities and Moisture Contents.

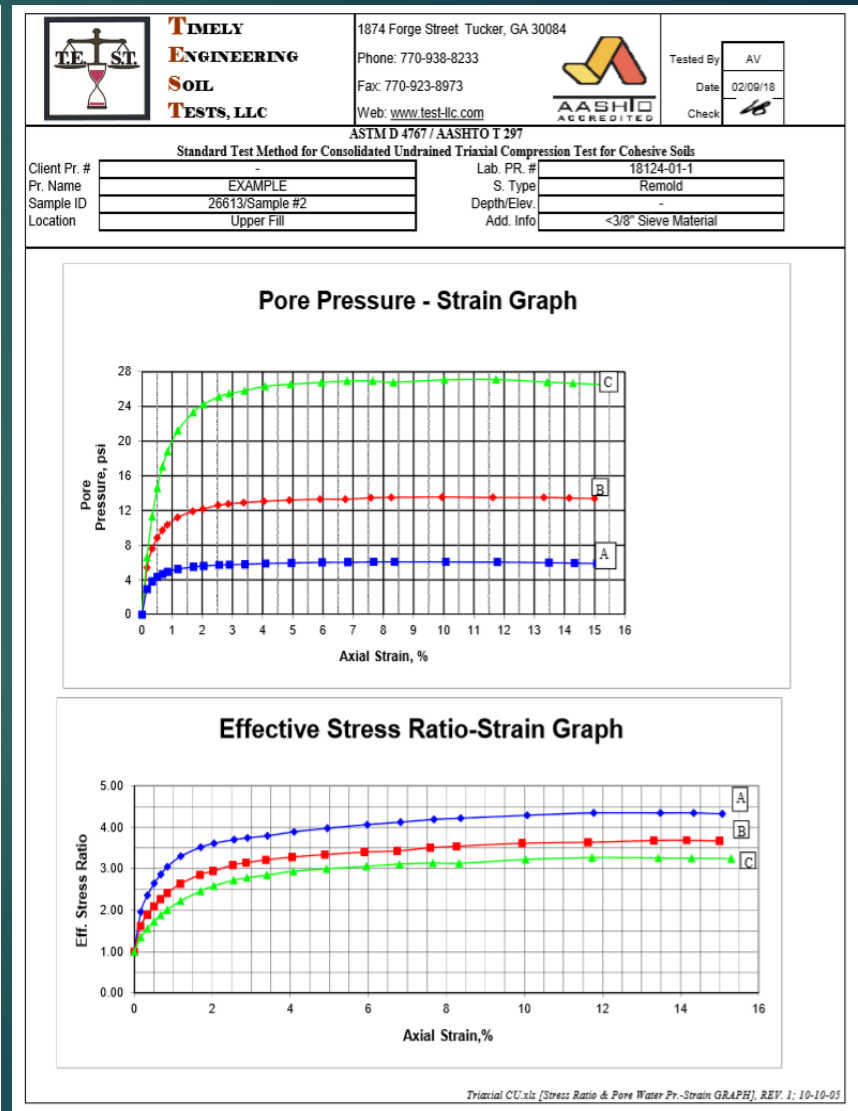
Triaxial CU.xls [Mohr's Circles], REV. 1; 10-10-05

ASTM D4767/AASHTO T297

- Reports







ASTM D2166/AASHTO T208:

Standard Test Method for Unconfined Compressive Strength of Cohesive Soil

ASTM D2166/AASHTO T208

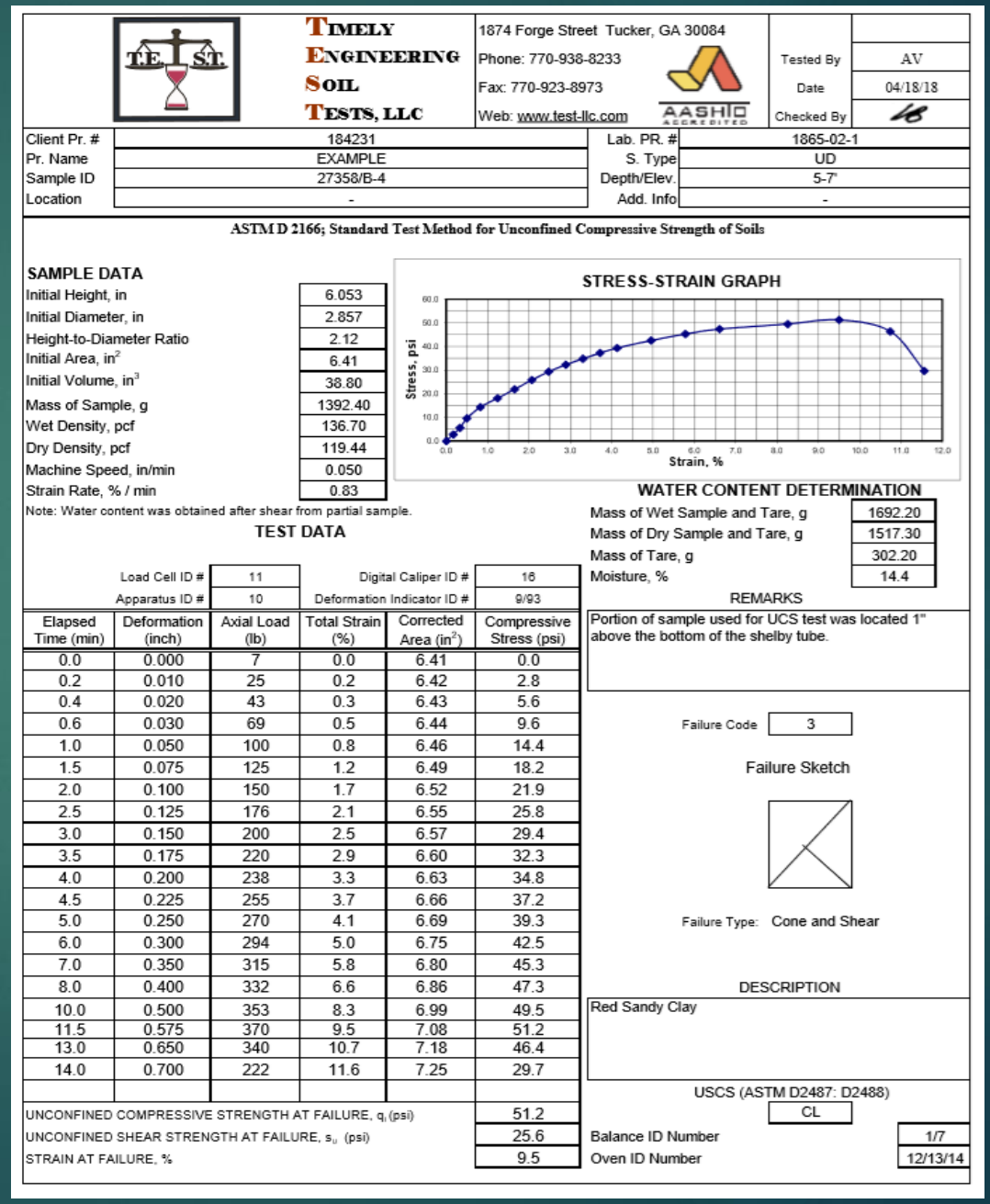
- Summary of Test Method
  - Cylindrical Specimens is Axially Loaded in Unconfined Condition at Axial Strain Rate 0.5-2.0 %/min
  - Test Method Provides an Approximate Value of the Strength of Cohesive Soils in Terms of Total Stresses
- Apparatus:
  - Compression Deice, Deformation Indicator, Timer
  - Balance, Oven and Miscellaneous Equipment

ASTM D2166/AASHTO T208

- Procedure
  - Cylindrical Specimen is Loaded at Constant Rate/Speed
  - Data Readings of Deformation vs. Shear Force at Desired Intervals are Obtained
- Material for testing: UD or Remold
  - Min. Specimen D= 1.3inch/30mm or > 10 Times of Max. Particle Size
  - If Specimen D > 2.8inch/72mm, then D > 6 Times of Max. Particle Size
  - 2.0 < H/D < 2.5

ASTM D2166/AASHTO T208

- Reports
- Application of test
  - Earth Retaining Structures (Retaining Walls, Bridges, Abutments)
  - Embankments, Landfills, Dams
  - Strength evaluation of Soil for Design:
    - Airfield Pavements
    - Roads
    - Warehouse Floors
    - Soil-Cement Stabilization
    - On-Site Testing (Mobile Laboratory)



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Tested By: AV
Date: 04/18/18
Checked By:

Client Pr. #	184231	Lab. PR. #	1865-02-1
Pr. Name	EXAMPLE	S. Type	UD
Sample ID	27358/B-4	Depth/Elev.	5-7'
Location	-	Add. Info	-

ASTM D 2166; Standard Test Method for Unconfined Compressive Strength of Soils

SAMPLE DATA

Initial Height, in	6.053
Initial Diameter, in	2.857
Height-to-Diameter Ratio	2.12
Initial Area, in^2	6.41
Initial Volume, in^3	38.80
Mass of Sample, g	1392.40
Wet Density, pcf	136.70
Dry Density, pcf	119.44
Machine Speed, in/min	0.050
Strain Rate, % / min	0.83

Note: Water content was obtained after shear from partial sample.

STRESS-STRAIN GRAPH

WATER CONTENT DETERMINATION

Mass of Wet Sample and Tare, g	1692.20
Mass of Dry Sample and Tare, g	1517.30
Mass of Tare, g	302.20
Moisture, %	14.4

TEST DATA

Load Cell ID #	11	Digital Caliper ID #	16
Apparatus ID #	10	Deformation Indicator ID #	9/93

Elapsed Time (min)	Deformation (inch)	Axial Load (lb)	Total Strain (%)	Corrected Area (in^2)	Compressive Stress (psi)
0.0	0.000	7	0.0	6.41	0.0
0.2	0.010	25	0.2	6.42	2.8
0.4	0.020	43	0.3	6.43	5.6
0.6	0.030	69	0.5	6.44	9.6
1.0	0.050	100	0.8	6.46	14.4
1.5	0.075	125	1.2	6.49	18.2
2.0	0.100	150	1.7	6.52	21.9
2.5	0.125	176	2.1	6.55	25.8
3.0	0.150	200	2.5	6.57	29.4
3.5	0.175	220	2.9	6.60	32.3
4.0	0.200	238	3.3	6.63	34.8
4.5	0.225	255	3.7	6.66	37.2
5.0	0.250	270	4.1	6.69	39.3
6.0	0.300	294	5.0	6.75	42.5
7.0	0.350	315	5.8	6.80	45.3
8.0	0.400	332	6.6	6.86	47.3
10.0	0.500	353	8.3	6.99	49.5
11.5	0.575	370	9.5	7.08	51.2
13.0	0.650	340	10.7	7.18	46.4
14.0	0.700	222	11.6	7.25	29.7

UNCONFINED COMPRESSIVE STRENGTH AT FAILURE, q_u (psi)	51.2
UNCONFINED SHEAR STRENGTH AT FAILURE, s_u (psi)	25.6
STRAIN AT FAILURE, %	9.5

REMARKS

Portion of sample used for UCS test was located 1" above the bottom of the shelby tube.

Failure Code: 3

Failure Sketch

Failure Type: Cone and Shear

DESCRIPTION

Red Sandy Clay

USCS (ASTM D2487: D2488)

CL

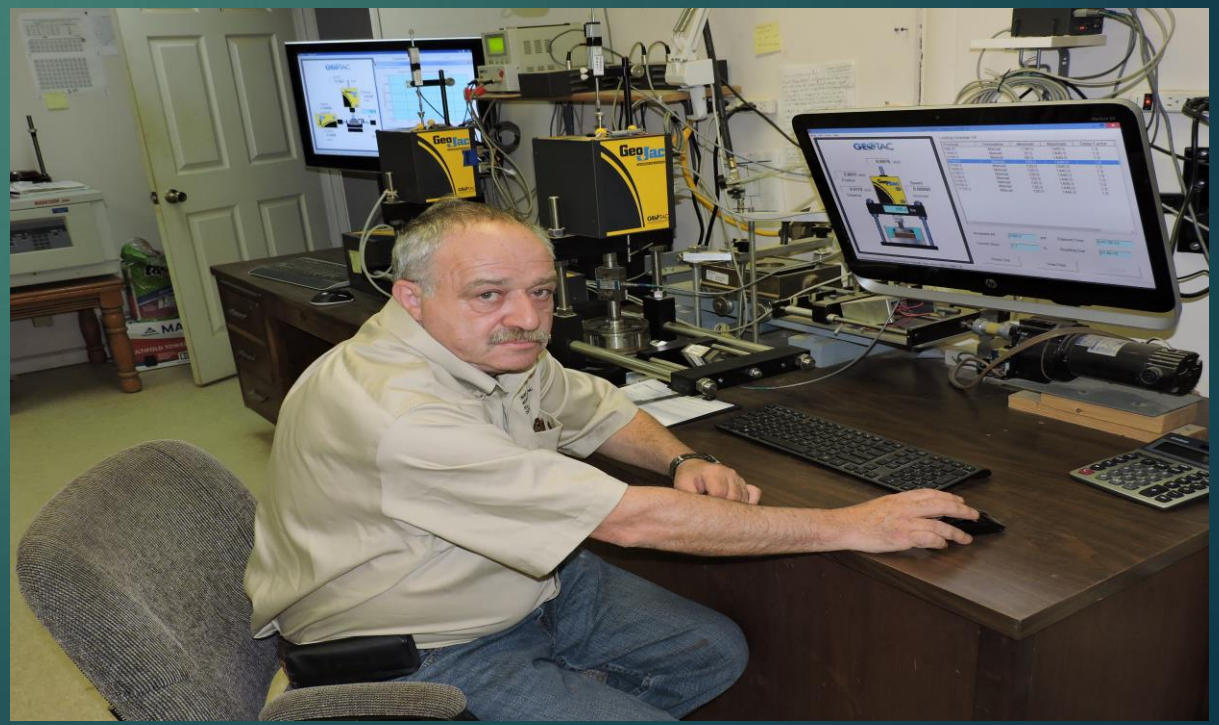
Balance ID Number	1/7
Oven ID Number	12/13/14

ASTM D2435/AASHTO T216:

Standard Test Methods for One-Dimensional Consolidation Properties of Soils Using Incremental Loading

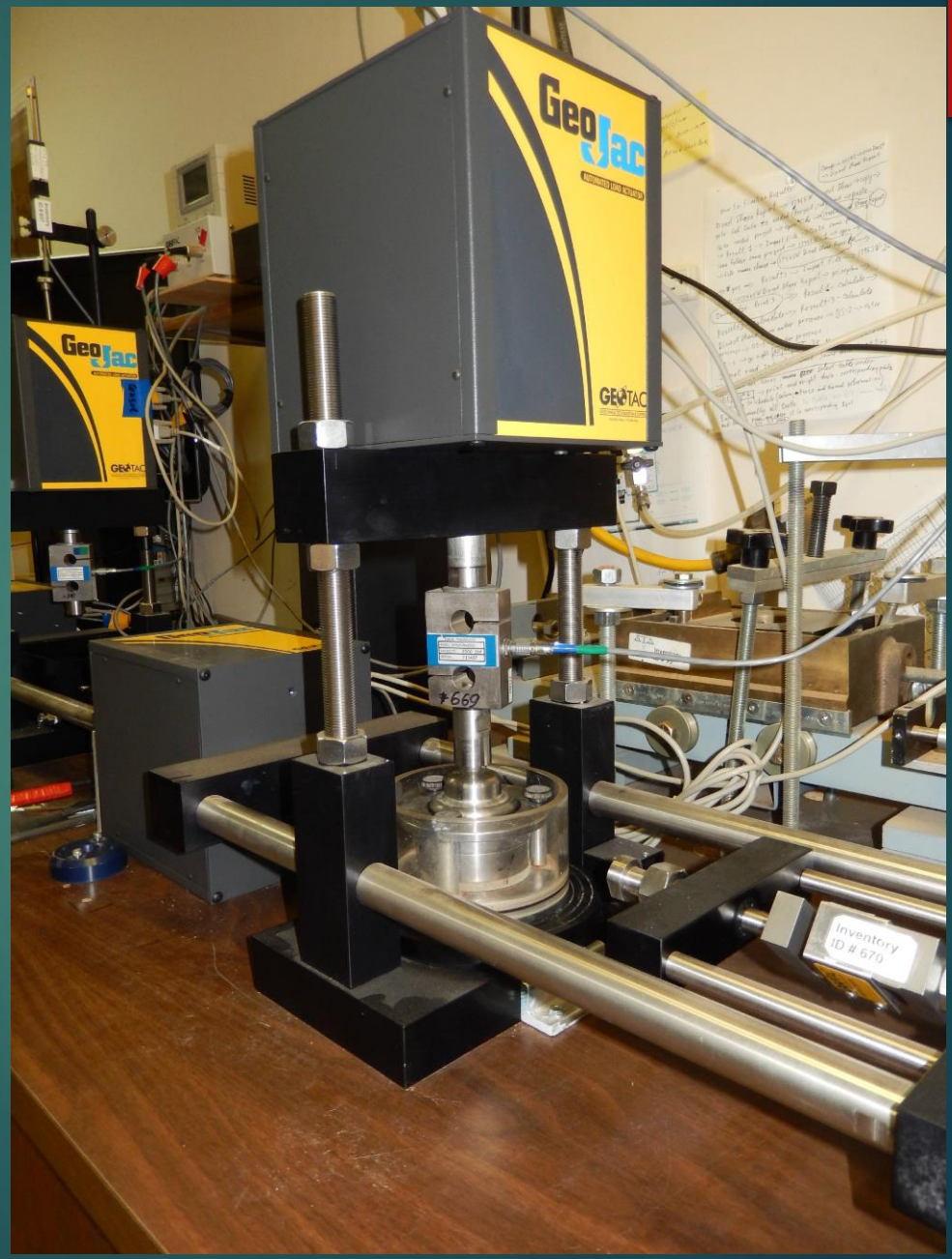
ASTM D2435/AASHTO T216

- Summary of Test Methods
  - Method A
    - Sample is Loaded with Constant Load Increment Duration of 24 Hours
  - Method B
    - Sample is Loaded with Successive Load Increments which Applied After 100% Primary Consolidation is Reached
- Apparatus:
  - Loading Device, Consolidometer
  - Oven, Balance, Deformation Indicator
  - Miscellaneous Equipment



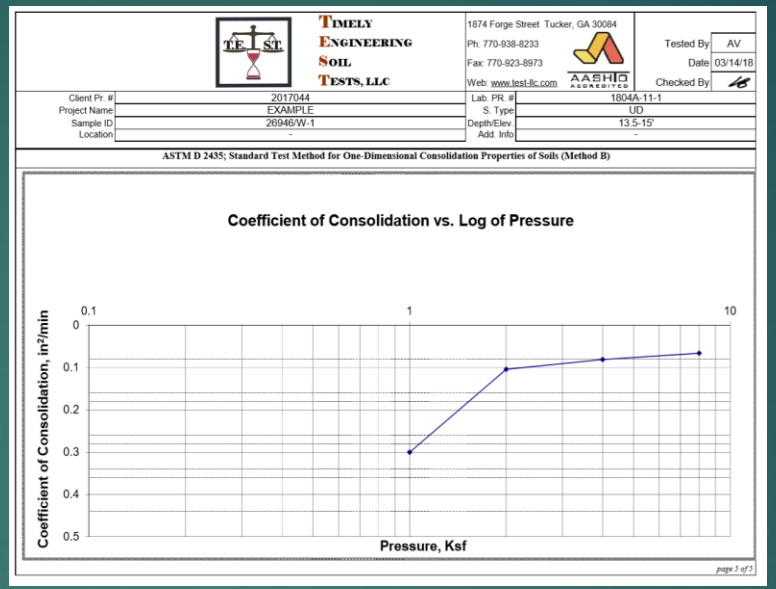
ASTM D2435/AASHTO T216

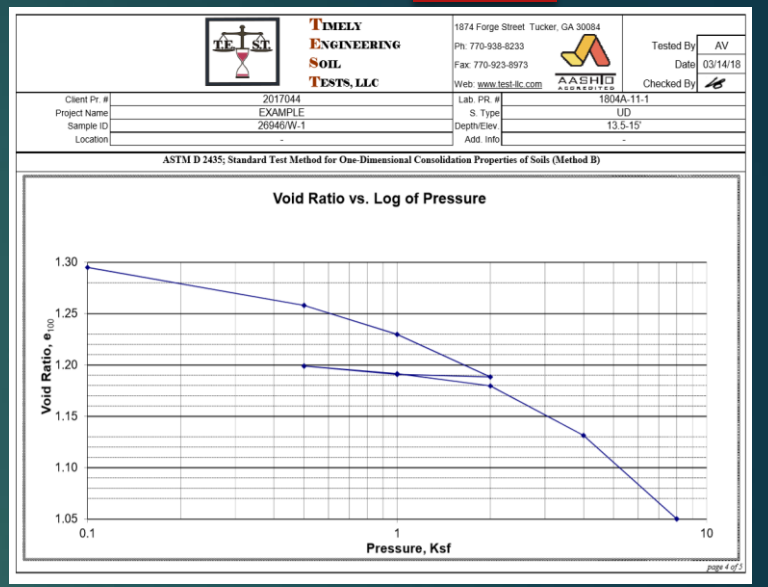
- Procedure
  - Sample is Placed in Consolidometer Ring, Seating Load of 100lb/ ft²/5kPa is Applied and Initial Deformation Reading is Recorded
  - Inundation of Sample is Performed if Needed
  - Sample is Loaded in Increments with LIR=2. Deformation Readings vs. Time are Obtained with Duration Specified in Method A or B (Time-Deformation Curve Using Log or Square Root of Time Method is Used)
- Material for testing: UD or Remold
  - Min. Specimen D= 2.0inch/50mm
  - Min. Specimen H= 0.5inch/12mm and > 10 Times of Max. Particle Size
  - D/H > 2.5

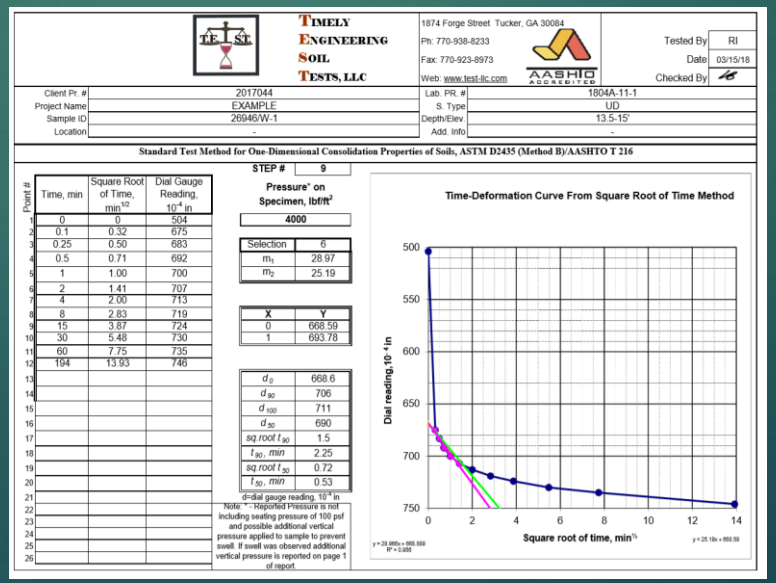


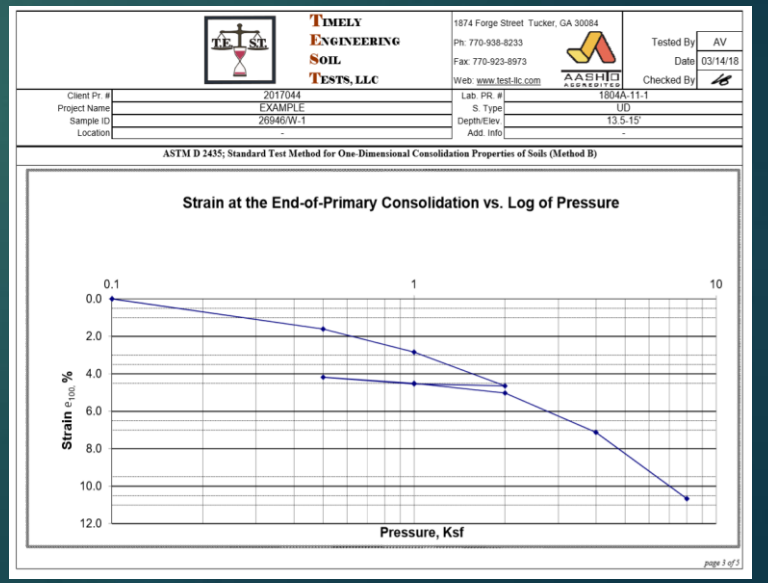
ASTM D2435/AASHTO T216

- Reports
  - Graphs of Void Ratio, Strain at 100% of Primary Consolidation, Coefficient of Consolidation vs. Axial Stress are Created and Consolidation Parameters are Estimated
- Application of test
  - Estimation of Magnitude and Rate of Differential and Total Settlement of a Structure or Earthfill
  - Earth Retaining Structures (Retaining Walls, Bridges, Abutments)
  - Slope and Foundation Design & QC
  - Embankments, Landfills, Dams









ASTM D4972/G51/G57/G187/D5334/AASHTO T290/291:

Corrosion/Electrochemical and Thermal Testing

ASTM D4972/G51/G57/G187/D5334/AASHTO T290/291

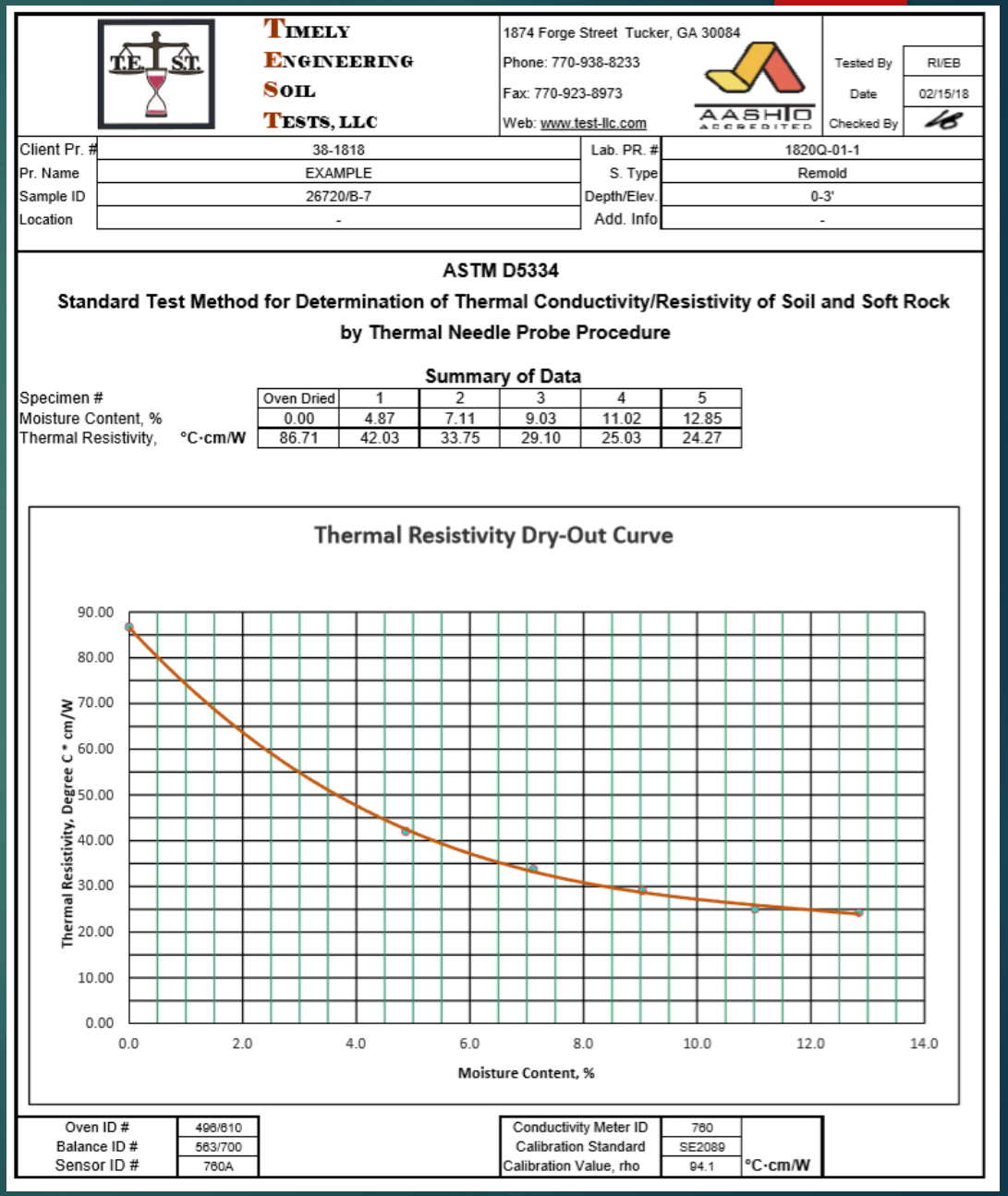
- Summary of Test Methods
  - ASTM G51 is Used for Determination of pH of Soil
  - ASTM G57 and G187 are Used for Determination of Electrical Resistivity of Soil
  - AASHTO T290 is Used for Determination of Water-Soluble Sulfate Ion Content of Soil
  - AASHTO T291 is Used for Determination of Water-Soluble Chloride Ion Content of Soil
  - ASTM D5334 is Used for Determination of Thermal Resistivity/Conductivity of Soil
  - Apparatus:
    - Various Meters and Miscellaneous Equipment

ASTM D4972/G51/G57/G187/D5334/AASHTO T290/291

- Procedure
  - Methods G57/G187 and D5334
    - Measurements at Various Moisture Content are Obtained from Corresponding Meter
  - Method D4972/G51
    - pH Electrode is Placed into Soil/Distilled Water Suspension and Measurements are Obtained
  - Methods AASHTO T290/291
    - Solution of Air Dry Sample and Distilled Water is Centrifuge and Measurements are Performed on Representative Portion
- Material for testing
  - Material Passing #10 Sieve

ASTM D4972/G57/G187/D5334/AASHTO T290/291

- Reports
- Application of test
  - Earth Retaining Structures (Retaining Walls, Bridges, Abutments)
  - Pipelines
  - Underground Structures
  - Solar Farms
  - Underground Power Lines
  - Subways



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Tested By	RI/EB
Date	02/15/18
Checked By	

Client Pr. #	38-1818	Lab. PR. #	1820Q-01-1
Pr. Name	EXAMPLE	S. Type	Remold
Sample ID	26720/B-7	Depth/Elev.	0-3'
Location	-	Add. Info	-

ASTM D5334

Standard Test Method for Determination of Thermal Conductivity/Resistivity of Soil and Soft Rock by Thermal Needle Probe Procedure

Summary of Data

Specimen #	Oven Dried	1	2	3	4	5
Moisture Content, %	0.00	4.87	7.11	9.03	11.02	12.85
Thermal Resistivity, °C·cm/W	86.71	42.03	33.75	29.10	25.03	24.27

Oven ID #	496/610	Conductivity Meter ID	760	
Balance ID #	563/700	Calibration Standard	SE2089	
Sensor ID #	760A	Calibration Value, rho	94.1	°C·cm/W

Questions?