# M E M O R A N D U M

**TO:** Dan Brown

**FROM:** Todd Barber

**DATE:** January 26, 2010

**SUBJECT:** Summary of Soil Test Borings and Rock Core Testing
Drilled Shaft Load Testing Program
Site #1- Foundation Technologies
1400 Progress Industrial Boulevard
Lawrenceville, Georgia

---

Soil test borings and laboratory testing have been completed for the above referenced site. This exploration was completed to provide subsurface data for a drilled shaft load testing program to be performed at the site. The Foundation Technologies site was the first site evaluated for the load testing program and was found to be suitable. This report presents a summary of the subsurface conditions encountered and rock core strength test data. Soil test boring records, a boring location plan, and laboratory test data sheets are attached. Representative photographs related to drilling and rock core testing are also included.

The data obtained for the site will be reviewed by Dr. Dan Brown with Dan Brown and Associates and others to develop the drilled shaft load testing program. Considerable work is still needed before drilled shafts are installed and load testing performed. However, I would like to take the opportunity to thank several people who have helped get the planned drilled shaft load testing program to this point. Sanford Thompson with Foundation Technologies has provided us with a site and has been a gracious host as we have completed the field exploration. Geoff Hebner, Scott Towe, and the drill crews with Mactec coordinated and completed drilling and rock coring for the program. This included **235 feet of soil test borings and 105 feet of rock coring**. Robert Hurt with Georgia Tech and Martin Molino with GeoTesting Express completed unconfined compression testing on rock cores, and Jon Ellingson with Golder Associates performed point load testing on rock cores with an assist from Jim Daly and Tony Sak in reviewing the test data.

## Site Information

### Description of Site

The site is located a 1400 Progress Industrial Boulevard in Lawrenceville, Georgia, north of Highway 316. The overall site area is just over 2 acres and is located west of the existing Foundation Technologies Building. The overall site is shown on the attached Boring Location Plan. The property appears to have been excavated several feet to achieve a relatively level surface, which was the condition at the time the soil test borings were performed. The ground

surface was covered mostly with high grasses and included some bare soil areas. The ground surface elevation in the area of the borings is approximately 1030 feet.

### Site Geology

The project site is located in the southern Piedmont Geologic Province of Georgia. Published geologic literature indicates that the site is underlain by the Wolf Creek Formation of the Atlanta Group. This formation consists of amphibolites and biotite-muscovite schist. A gneiss unit is located just north of the site. Soils in this area have been formed by the in-place weathering of the underlying crystalline rock, which accounts for their classification as "residual" soils. Residual soils near the ground surface, which have experienced advanced weathering, frequently consist of red brown clayey silt (ML) or silty clay (CL). The thickness of this surficial clayey zone may range up to roughly 6 feet. For various reasons, such as erosion or local variation of mineralization, the upper clayey zone is not always present.

With increased depth, the soil becomes less weathered, coarser grained, and the structural character of the underlying parent rock becomes more evident. These residual soils are typically classified as sandy micaceous silt (ML) or silty micaceous sand (SM). With a further increase in depth, the soils eventually become quite hard and take on an increasing resemblance to the underlying parent rock. When these materials have a standard penetration resistance of 100 blows per foot or greater, they are referred to as partially weathered rock. The transition from soil to partially weathered rock is usually a gradual one, and may occur at a wide range of depths. Lenses or layers of partially weathered rock are not unusual in the soil profile.

Partially weathered rock represents the zone of transition between the soil and the indurated metamorphic rocks from which the soils are derived. The subsurface profile is, in fact, a history of the weathering process which the crystalline rock has undergone. The degree of weathering is most advanced at the ground surface, where fine grained soil may be present. And, the weathering process is in its early stages immediately above the surface of relatively sound rock, where partially weathered rock may be found.

The thickness of the zone of partially weathered rock and the depth to the rock surface have both been found to vary considerably over relatively short distances. The depth to the rock surface may frequently range from the ground surface to 80 feet or more. The thickness of partially weathered rock, which overlies the rock surface, may vary from only a few inches to as much as 40 feet or more.

## Exploratory Procedures

### Field Exploration

The subsurface exploration included seven soil test borings performed at the approximate locations shown on the enclosed Boring Location Plan. The exploration included borings B-1, B-3, B-7, B-8, and B-9 advanced in the area of the planned drilled shafts. Borings B-5 and B-6 were drilled in other areas of the site to evaluate possible locations within the Foundation Technologies site. The borings were located in the field by measuring angles and distances from existing site features. Ground elevations were interpolated from the topographic site plan

provided available for the site and were rounded to the nearest foot. The locations and elevations of the borings should be considered approximate.

Standard penetration testing, as provided for in ASTM D-l586, was performed at select intervals in the soil test borings. Rock coring was performed in general accordance with ASTM 2113. Soil and rock samples obtained from the drilling operation were examined and classified in general accordance with ASTM D-2488 (Visual-Manual Procedure for Description of Soils). Soil classifications include the use of the Unified Soil Classification System described in ASTM D-2487 (Classification of Soils for Engineering Purposes). The soil classifications also include our evaluation of the geologic origin of the soils. Evaluations of geologic origin are based on our experience and interpretation and may be subject to some degree of interpretation.

## Laboratory Testing

Representative samples of the rock cores obtained were selected for laboratory strength testing. Unconfined compressive strength testing was performed on 4 samples in general accordance with ASTM D 7012 – Method D and point load strength testing was performed on 12 samples in general accordance with ASTM D 5731.

## Test Boring Summary

Starting at the ground surface, the soil test borings encountered residual soils classified as sandy silts and silty sands typical of the Piedmont region. Varying amounts of mica were present in the some of the split spoon samples. Standard penetration resistance values within the residual soil profile ranged from 6 to 69 blows per foot (bpf) with most values below 20 bpf above a depth of 15 feet and above 20 bpf below 15 feet.

Partially weathered rock was present beneath the residual soils at depths ranging from about 17 to 28 feet below the existing ground surface, corresponding to elevations between 1002 and 1012 feet. Within the planned drilled shaft installation area (original borings B-1 and B-3), partially weathered rock was at an elevation of about 1002 to 1003 feet on the west side of the area and about 1011 to 1013 feet on the east side. Where sampled, the partially weathered rock consisted of either a gray, white, and tan silty sand or a brown-tan to brown-orange silty sand. A few samples were slightly micaceous. Dense soil seams were also penetrated within the partially weathered rock zone.

Auger refusal, interpreted as rock, occurred at depths of 28 to 37 feet, corresponding to elevations of 993 to 1002 feet. Rock cores obtained from below the refusal elevations consisted of a moderately hard to hard, thinly foliated, gray and white hornblende gneiss. Core recoveries ranged from 31 to 100%, and RQD values varied from 0 to 85%. The higher quality rock was generally sampled in borings B-5 and B-6, which are not in the area selected for drilled shaft installation. RQD values improved with depth in boring B-8, but otherwise RQD values in the planned test area ranged from 0 to 30%. Rock foliation was generally at an angle of 30$^{o}$ from horizontal.

Stabilized groundwater measured at least 24 hours after drilling was measured at depths of 13½ to 18 feet, corresponding to elevations between 1012 and 1016½ feet. Borings B-7 and B-9 were

backfilled immediately after completion. Borings B-1 and B-3 were left open for several months for future groundwater checks. Groundwater levels were checked in these two borings in December 2009 and were found at depths of about 13½ feet, corresponding to an elevation of 1016½ feet. Groundwater levels will fluctuate depending on seasonal variations of precipitation and other factors, and may occur at higher elevations in the future.

## Laboratory Test Results

### Unconfined Compressive Strength Testing

To provide data concerning the strength of the rock cored at the boring locations, 6 samples were taken from borings B-1, B-3, B-7 and B-8 within the planned drilled shaft test area. These samples were cut to length and then 4 of the 6 samples chosen for strength testing. The following samples were tested:

1. Sample #1 from Boring B-1, 39½ to 40 feet
2. Sample #3 from Boring B-7, 40 to 40½ feet
3. Sample #5 from Boring B-3, 30 to 30½ feet
4. Sample #8 from Boring B-8, 43½ to 44 feet

The depth of the rock core samples should be considered approximate as recoveries were not 100% and so the location of the core samples taken for testing was estimated. Unconfined compression tests were performed in general accordance with the ASTM D 7012 – Method D. Unconfined compressive strength test results ranged from 7,000 to 11,291 psi. Laboratory test data sheets are attached.

### Point Load Testing

To provide additional information concerning rock strength, point load testing was performed on 12 samples chosen form the rock cores obtained. These samples were generally not long enough to allow unconfined compression testing. For correlation purposes, several samples were selected from the cores near samples for unconfined compression testing. As with the unconfined compression test samples, the depth for each sample should be considered approximate. Point load testing was performed in general accordance with ASTM D 5731. The samples were initially tested in the diametral direction (perpendicular to the direction cored). The test results appeared to be affected by weathering and weakness along rock foliation that could not be seen with the naked eye. Therefore, additional samples unaffected by initial testing were then tested again in the axial direction. The test results in the diametral direction ranged from 1,437 to 9,113 psi and in the axial direction from 3,089 to 15,959 psi. The axial strength test result was greater than the diametral strength test result in all but one case. The ratio of axial to diametral strength ranged from 0.56 to 4.1 with most values between 1.8 and 2.6. A summary of the point load test results is attached.

If you have any questions concerning this letter or the soil test boring or test results, please call me.

# APPENDIX


0 30 60 120 180

Approximate Scale: 1"= 60'

LEGEND: Soil Test Boring

Boring Location Plan

Drilled Shaft Load Testing Program
Foundation Technologies Site
1400 Progress Industrial Boulevard
Lawrenceville, Georgia 30043

# B-1 Test Boring Record

| | | |
|---|---|---|
| Project: **Foundation Technologies Site** | | Project No: |
| Location: **1400 Progress Industrial Blvd., Lawrenceville, Georgia 30043** | | Date: **6/23/09** |
| Method: **HSA- ASTM D1586** | GWT at Drilling: **16 feet** | G.S. Elev: **1030** |
| Drill: **CME 550 AUTO HAMMER** | GWT at 24 hrs: **13.5 feet** | Logged By: **TB** |

| Elev. (Ft) | Depth (Ft) | Description | N-Value | Blows/6" |
|---|---|---|---|---|
| | | Firm brown-tan fine sandy silt (ML) (RESIDUUM) | 8 | 3-4-4 |
| | | Loose gray, white and tan silty fine sand (SM) | 9 | 3-4-5 |
| 1025 | 5 | | | |
| | | | 10 | 4-5-5 |
| 1020 | 10 | | | |
| | | Firm gray, white and tan slightly micaceous silty fine sand (SM) | 20 | 6-9-11 |
| 1015 | 15 | | | |
| | | Dense to very dense gray, white and tan slightly micaceous silty fine sand (SM) | 66 | 16-26-40 |
| 1010 | 20 | | | |
| | | | 36 | 11-14-22 |
| 1005 | 25 | | | |
| | | Partially weathered rock sampled as gray, white and tan slightly micaceous silty fine sand (SM) | 50/5" | 23-50/5" |
| 1000 | 30 | | | |
| | | | 50/1" | 50/1" |
| 995 | 35 | | | |

Standard Penetration Test (Blows/Foot)

0 10 20 30 40 50 60 70 80 90 100

**Remarks:**

# B-1 Test Boring Record

| | | |
|---|---|---|
| Project: **Foundation Technologies Site** | | Project No: |
| Location: **1400 Progress Industrial Blvd., Lawrenceville, Georgia 30043** | | Date: **6/23/09** |
| Method: **HSA- ASTM D1586** | GWT at Drilling: **16 feet** | G.S. Elev: **1030** |
| Drill: **CME 550 AUTO HAMMER** | GWT at 24 hrs: **13.5 feet** | Logged By: **TB** |

| Elev. (Ft) | Depth (Ft) | GWT | Symbol | Description | N-Value | Blows/6" | Standard Penetration Test (Blows/Foot) 0 10 20 30 40 50 60 70 80 90 100 |
|---|---|---|---|---|---|---|---|
| | | | | Auger Refusal at 36 1/2 feet | | | |
| 990 | 40 | | | Moderately hard to hard gray and white hornblende gneiss, thinly laminated (Recovery - 60% RQD - 13%) | | | |
| | | | | Hard gray and white hornblende gneiss, thinly laminated (Recovery - 98% RQD - 23%) | | | |
| 985 | 45 | | | Hard gray and white hornblende gneiss, thinly laminated (Recovery - 100% RQD - 7%) | | | |
| 980 | 50 | | | Hard gray and white hornblende gneiss, thinly laminated (Recovery - 100% RQD - 0%) | | | |
| | | | | Coring terminated at 51 1/2 feet | | | |
| 975 | 55 | | | | | | |
| 970 | 60 | | | | | | |
| 965 | 65 | | | | | | |
| 960 | 70 | | | | | | |

**Remarks:**

# B-3 Test Boring Record

| | | |
|---|---|---|
| Project: **Foundation Technologies Site** | | Project No: |
| Location: **1400 Progress Industrial Blvd., Lawrenceville, Georgia 30043** | | Date: **6/24/09** |
| Method: **HSA- ASTM D1586** | GWT at Drilling: **22 feet** | G.S. Elev: |
| Drill: **CME 550 AUTO HAMMER** | GWT at 24 hrs: **13.5 feet** | Logged By: **TB** |

| Elev. (Ft) | Depth (Ft) | GWT | Symbol | Description | N-Value | Blows/6" |
|---|---|---|---|---|---|---|
| | | | | Loose tan-brown silty fine sand (SM) (RESIDUUM) | 8 | 2-4-4 |
| | | | | Loose gray, white and tan silty fine sand (SM) | 6 | 2-3-3 |
| | 5 | | | | | |
| | | | | Very firm gray, white and tan silty fine sand (SM) | 23 | 7-11-12 |
| | 10 | | | | | |
| | | ▼ | | Loose brown-orange silty fine sand (SM) | 9 | 3-4-5 |
| | 15 | | | | | |
| | | | | Partially weathered rock sampled as very dense brown-orange silty fine sand (SM) with dense soil seams | 50/5" | 21-30 -50/5" |
| | 20 | ▽ | | | | |
| | | | | Partially weathered rock sampled as very dense dark gray, white and tan slightly micaceous silty fine sand (SM) | 50/1" | 45-50/1" |
| | 25 | | | | | |

Standard Penetration Test (Blows/Foot)

0 10 20 30 40 50 60 70 80 90 100

**Remarks:**

# B-3

## Test Boring Record

| | | |
|---|---|---|
| Project: **Foundation Technologies Site** | | Project No: |
| Location: **1400 Progress Industrial Blvd., Lawrenceville, Georgia 30043** | | Date: **6/24/09** |
| Method: **HSA- ASTM D1586** | GWT at Drilling: **22 feet** | G.S. Elev: |
| Drill: **CME 550 AUTO HAMMER** | GWT at 24 hrs: **13.5 feet** | Logged By: **TB** |

| Elev. (Ft) | Depth (Ft) | GWT | Symbol | Description | N-Value | Blows/6" | Standard Penetration Test (Blows/Foot) 0 10 20 30 40 50 60 70 80 90 100 |
|---|---|---|---|---|---|---|---|
| | 30 | | | Auger Refusal at 30 feet<br><br>Hard gray and white hornblende gneiss, thinly laminated<br>(Recovery - 31% RQD - 12%) | | | |
| | 35 | | | Moderately hard gray and white hornblende gneiss, thinly laminated<br>(Recovery - 70% RQD - 0%) | | | |
| | 40 | | | Moderately hard gray and white hornblende gneiss, thinly laminated<br>(Recovery - 71% RQD - 19%) | | | |
| | | | | Coring terminated at 43 feet | | | |
| | 45 | | | | | | |
| | 50 | | | | | | |
| | 55 | | | | | | |

**Remarks:**

# B-5

## Test Boring Record

| | | |
|---|---|---|
| Project: **Foundation Technologies Site** | | Project No: |
| Location: **1400 Progress Industrial Blvd., Lawrenceville, Georgia 30043** | | Date: **6/26/09** |
| Method: **HSA- ASTM D1586** | GWT at Drilling: **Not Encountered** | G.S. Elev: |
| Drill: **CME 550 AUTO HAMMER** | GWT at 24 hrs: **15 feet** | Logged By: **TB** |

| Elev. (Ft) | Depth (Ft) | GWT | Symbol | Description | N-Value | Blows/6" |
|---|---|---|---|---|---|---|
| | | | | Stiff orange-brown fine sandy silt (ML) (RESIDUUM) | 9 | 3-4-5 |
| | 5 | | | Loose orange-brown and gray-brown silty fine sand (SM) | 8 | 4-4-4 |
| | | | | Firm orange, white and tan silty fine sand (SM) | 12 | 5-6-6 |
| | 10 | | | | | |
| | | ▼ | | Dense gray, white and tan silty fine sand (SM) | 47 | 23-27-20 |
| | 15 | | | | | |
| | | | | Partially weathered rock sampled as very dense gray, white and tan silty fine sand (SM) | 50/5" | 50/5" |
| | 20 | | | | | |
| | | | | | 50/2" | 50/2" |
| | 25 | | | | | |
| | | | | Auger Refusal at 28 feet<br><br>Moderately hard to hard gray and white hornblende gneiss, thinly laminated (Recovery - 92% RQD - 62%) | | |
| | 30 | | | | | |
| | | | | Hard gray and white hornblende gneiss, thinly laminated (Recovery - 91% RQD - 70%) | | |
| | 35 | | | | | |
| | | | | Coring terminated at 38 feet | | |
| | 40 | | | | | |

Standard Penetration Test (Blows/Foot)

0 10 20 30 40 50 60 70 80 90 100

**Remarks:**

# B-6 Test Boring Record

| | | |
|---|---|---|
| Project: **Foundation Technologies Site** | | Project No: |
| Location: **1400 Progress Industrial Blvd., Lawrenceville, Georgia 30043** | | Date: **6/25/09** |
| Method: **HSA- ASTM D1586** | GWT at Drilling: **Not Encountered** | G.S. Elev: |
| Drill: **CME 550 AUTO HAMMER** | GWT at 24 hrs: **14 feet** | Logged By: **TB** |

| Elev. (Ft) | Depth (Ft) | GWT | Symbol | Description | N-Value | Blows/6" |
|---|---|---|---|---|---|---|
| | 0 | | | Loose brown-tan silty fine sand (SM) (RESIDUUM) | 10 | 2-4-6 |
| | 5 | | | Loose gray-brown, white and tan silty fine sand (SM) | 7 | 2-4-3 |
| | 10 | ▼ | | Firm to very firm gray, white and tan slightly micaceous silty fine sand (SM) | 16 | 3-7-9 |
| | 15 | | | | 22 | 6-10-12 |
| | 20 | | | | 22 | 9-12-10 |
| | 25 | | | Dense gray-brown and white slightly micaceous silty fine sand (SM) | 48 | 10-24-24 |
| | 30 | | | Partially weathered rock sampled as very dense gray-brown and white slightly micaceous silty fine sand (SM) | 50/2" | 50/2" |
| | 35 | | | | 50/4" | 50/4" |

Standard Penetration Test (Blows/Foot)

0 10 20 30 40 50 60 70 80 90 100

**Remarks:**

# B-6 Test Boring Record

| | | |
|---|---|---|
| Project: **Foundation Technologies Site** | | Project No: |
| Location: **1400 Progress Industrial Blvd., Lawrenceville, Georgia 30043** | | Date: **6/25/09** |
| Method: **HSA- ASTM D1586** | GWT at Drilling: **Not Encountered** | G.S. Elev: |
| Drill: **CME 550 AUTO HAMMER** | GWT at 24 hrs: **14 feet** | Logged By: **TB** |

| Elev. (Ft) | Depth (Ft) | GWT | Symbol | Description | N-Value | Blows/6" | Standard Penetration Test (Blows/Foot) 0 10 20 30 40 50 60 70 80 90 100 |
|---|---|---|---|---|---|---|---|
| | | | | Auger Refusal at 37 feet | | | |
| | 40 | | | Moderately hard gray and white hornblende gneiss, thinly laminated (Recovery - 100% RQD - 85%) | | | |
| | | | | Moderately hard to hard gray and white hornblende gneiss, thinly laminated (Recovery - 80% RQD - 62%) | | | |
| | 45 | | | Hard gray and white hornblende gneiss, thinly laminated (Recovery - 80% RQD - 60%) | | | |
| | | | | Coring terminated at 48 feet | | | |
| | 50 | | | | | | |
| | 55 | | | | | | |
| | 60 | | | | | | |
| | 65 | | | | | | |
| | 70 | | | | | | |

**Remarks:**

# B-7

## Test Boring Record

| | | |
|---|---|---|
| Project: **Foundation Technologies Site** | | Project No: |
| Location: **1400 Progress Industrial Blvd., Lawrenceville, Georgia 30043** | | Date: **8/4/09** |
| Method: **HSA- ASTM D1586** | GWT at Drilling: **Not Encountered** | G.S. Elev: |
| Drill: **CME 550 AUTO HAMMER** | GWT at 24 hrs: | Logged By: **DJD** |

| Elev. (Ft) | Depth (Ft) | GWT | Symbol | Description | N-Value | Blows/6" |
|---|---|---|---|---|---|---|
| | | | | Stiff to firm brown-tan fine sandy silt (ML) (RESIDUUM) | 10 | 3-5-5 |
| | | | | | 8 | 3-4-4 |
| | 5 | | | | | |
| | | | | | 10 | 6-5-5 |
| | 10 | | | | | |
| | | | | Firm to very dense gray, white, and tan micaceous silty fine sand (SM) | 20 | 9-11-11 |
| | 15 | | | | | |
| | | | | | 50 | 6-20-30 |
| | 20 | | | | | |
| | | | | | 56 | 17-25-31 |
| | 25 | | | | | |
| | | | | Partially Weathered Rock sampled as tan and brown silty fine sand (SM) | 50/1" | 50/1" |
| | 30 | | | | | |
| | | | | | 50/3" | 50/3" |
| | 35 | | | | | |

Standard Penetration Test (Blows/Foot)

0 10 20 30 40 50 60 70 80 90 100

**Remarks:** Groundwater at 12 1/2 feet on October 29, 2009

# B-7

## Test Boring Record

| | | |
|---|---|---|
| Project: **Foundation Technologies Site** | | Project No: |
| Location: **1400 Progress Industrial Blvd., Lawrenceville, Georgia 30043** | | Date: **8/4/09** |
| Method: **HSA- ASTM D1586** | GWT at Drilling: **Not Encountered** | G.S. Elev: |
| Drill: **CME 550 AUTO HAMMER** | GWT at 24 hrs: | Logged By: **DJD** |

| Elev. (Ft) | Depth (Ft) | GWT | Symbol | Description | N-Value | Blows/6" | Standard Penetration Test (Blows/Foot) 0 10 20 30 40 50 60 70 80 90 100 |
|---|---|---|---|---|---|---|---|
| | | | | Auger Refusal at 36 feet | | | |
| | | | | Hard, gray and white, slightly weathered, horneblende gneiss, thinly laminated (Recovery - 90% RQD - 30%) | | | |
| | 40 | | | Hard, gray, slightly weathered, horneblende gneiss, thinly laminated (Recovery - 93% RQD - 46%) | | | |
| | 45 | | | | | | |
| | | | | Hard, gray, slightly weathered, horneblende gneiss, thinly laminted (Recovery - 80% RQD -19%) | | | |
| | 50 | | | Moderately weathered from 48.5 to 49 feet | | | |
| | | | | No recovery from 54.5 to 56 feet | | | |
| | 55 | | | Coring terminated at 56 feet | | | |
| | 60 | | | | | | |
| | 65 | | | | | | |
| | 70 | | | | | | |

**Remarks:** Groundwater at 12 1/2 feet on October 29, 2009

# B-8

## Test Boring Record

| | | |
|---|---|---|
| Project: **Foundation Technologies Site** | | Project No: |
| Location: **1400 Progress Industrial Blvd., Lawrenceville, Georgia 30043** | | Date: **8/5/09** |
| Method: **HSA- ASTM D1586** | GWT at Drilling: **Not Encountered** | G.S. Elev: |
| Drill: **CME 550 AUTO HAMMER** | GWT at 24 hrs: **18 feet** | Logged By: **DJD** |

| Elev. (Ft) | Depth (Ft) | GWT | Symbol | Description | N-Value | Blows/6" |
|---|---|---|---|---|---|---|
| | | | | Stiff to firm brown fine sandy silt (ML) (RESIDUUM) | 9 | 3-4-5 |
| | | | | | 8 | 3-4-4 |
| | 5 | | | | | |
| | | | | | 9 | 4-4-5 |
| | 10 | | | | | |
| | | | | Firm to dense brown and tan micaceous silty fine sand (SM) | | |
| | | | | | 19 | 7-8-11 |
| | 15 | | | | | |
| | | ▼ | | | | |
| | | | | | 42 | 16-20-22 |
| | 20 | | | | | |
| | | | | | 69 | 12-24-45 |
| | 25 | | | | | |
| | | | | Partially Weathered Rock sampled as brown and tan silty fine sand (SM) | | |
| | | | | | 50/4" | 50/4" |
| | 30 | | | | | |
| | | | | Auger Refusal at 33 feet | | |
| | 35 | | | | | |

Standard Penetration Test (Blows/Foot)

0 10 20 30 40 50 60 70 80 90 100

**Remarks:** Groundwater at 12 1/2 feet on October 29, 2009

# B-8 Test Boring Record

| | | |
|---|---|---|
| Project: **Foundation Technologies Site** | | Project No: |
| Location: **1400 Progress Industrial Blvd., Lawrenceville, Georgia 30043** | | Date: **8/5/09** |
| Method: **HSA- ASTM D1586** | GWT at Drilling: **Not Encountered** | G.S. Elev: |
| Drill: **CME 550 AUTO HAMMER** | GWT at 24 hrs: **18 feet** | Logged By: **DJD** |

| Elev. (Ft) | Depth (Ft) | GWT | Symbol | Description | N-Value | Blows/6" | Standard Penetration Test (Blows/Foot) 0 10 20 30 40 50 60 70 80 90 100 |
|---|---|---|---|---|---|---|---|
| | | | | Hard, gray, slightly weathered, horneblende gneiss, thinly laminated (Recovery - 95% RQD - 30%) | | | |
| | | | | Continuitous from 36 to 37 feet | | | |
| | 40 | | | Hard, gray, slightly weathered, horneblende gneiss, thinly laminated (Recovery - 100% RQD - 33%) | | | |
| | | | | Continutous from 40 to 41 feet | | | |
| | 45 | | | Hard, gray, slightly weathered, horneblende gneiss, thinly laminated (Recovery - 100% RQD - 50%) | | | |
| | | | | Hard, gray, slightly weathered, horneblende gneiss, thinly laminated (Recovery - 100% RQD - 60%) | | | |
| | 50 | | | Soft to moderately weathered from 52 to 53 feet | | | |
| | | | | Coring terminated at 53 feet | | | |
| | 55 | | | | | | |
| | 60 | | | | | | |
| | 65 | | | | | | |
| | 70 | | | | | | |

**Remarks:** Groundwater at 12 1/2 feet on October 29, 2009

# B-9

## Test Boring Record

| | | |
|---|---|---|
| Project: **Foundation Technologies Site** | | Project No: |
| Location: **1400 Progress Industrial Blvd., Lawrenceville, Georgia 30043** | | Date: |
| Method: **HSA- ASTM D1586** | GWT at Drilling: **Not Encountered** | G.S. Elev: |
| Drill: **CME 550 AUTO HAMMER** | GWT at 24 hrs: | Logged By: **TB** |

| Elev. (Ft) | Depth (Ft) | GWT | Symbol | Description | N-Value | Blows/6" |
|---|---|---|---|---|---|---|
| | 0 | | | Loose to firm orange-brown silty fine sand (SM) (RESIDUUM) | | |
| | 5 | | | | 8 | 2-4-4 |
| | 10 | | | | 14 | 3-7-7 |
| | 15 | | | Very firm tan and brown silty fine sand (SM) | 26 | 8-12-14 |
| | 20 | | | Partially weathered rock sampled as gray and tan silty fine sand (SM) | 50/5" | 50/5" |
| | 25 | | | | 50/3" | 50/3" |
| | 30 | | | | 50/2" | 50/2" |
| | 35 | | | Auger Refusal at 34 feet | | |

Standard Penetration Test (Blows/Foot)

0 10 20 30 40 50 60 70 80 90 100

**Remarks:**

# B-9

# Test Boring Record

| | | |
|---|---|---|
| Project: **Foundation Technologies Site** | | Project No: |
| Location: **1400 Progress Industrial Blvd., Lawrenceville, Georgia 30043** | | Date: |
| Method: **HSA- ASTM D1586** | GWT at Drilling: **Not Encountered** | G.S. Elev: |
| Drill: **CME 550 AUTO HAMMER** | GWT at 24 hrs: | Logged By: **TB** |

| Elev. (Ft) | Depth (Ft) | GWT | Symbol | Description | N-Value | Blows/6" | Standard Penetration Test (Blows/Foot) 0 10 20 30 40 50 60 70 80 90 100 |
|---|---|---|---|---|---|---|---|
| | 40 | | | Moderately hard to hard, gray and white, honeblende gneiss, thinly laminated (Recovery - 80% RQD - 42%) | | | |
| | 45 | | | Hard, gray and white, honeblende gneiss, thinly laminated (Recovery - 56% RQD - 33%) | | | |
| | 50 | | | Coring Terminated at 50 feet | | | |
| | 55 | | | | | | |
| | 60 | | | | | | |
| | 65 | | | | | | |
| | 70 | | | | | | |

**Remarks:**

Overall Site Looking Northwest

Planned Drilled Shaft Locations (B-1, B-3, B-7, B-8, and B-9)

Planned Drilled Shaft Locations Looking East Towards Foundation Technologies

Drilling of Soil Test Boring B-1

Coring Soil Test Boring B-1

Coring Soil Test Boring B-1


B-1 Core Sample, 36½ feet to 44 feet


B-1 Core Sample, 44 feet to 51½ feet

B-3 Core Sample, 30 feet to 43 feet


B-7 Core Sample, 36 feet to 47½ feet


B-7 Core Sample, 47½ feet to 56 feet

B-8 Core Sample, 33 feet to 43 feet

B-8 Core Sample, 43 feet to 53 feet


B-9 Core Sample, 34 feet to 44 feet


B-9 Core Sample, 44 feet to 50 feet

DECEMBER 2009

## ASTM D-5731 - Point Load Test Data & Calculations

| SAMPLE ID | BORING NUMBER AND DEPTH (ft) | TEST TYPE | GAUGE READING AT FAILURE (bar) | D PLATEN SEPARA-TION (mm) | W Diameter (in) | GAUGE READING AT FAILURE (psi) | $De^2$ ($mm^2$) | $De^2$ ($in^2$) | De EQUIV. CORE DIA. (mm) | De EQUIV. CORE DIA. (in) | P FORCE AT FAILURE[1] (lb) | P FORCE AT FAILURE (kN) | $I_S$ POINT LOAD INDEX (Mpa) | F SIZE CORRECTION (De/50) | $I_{s(50)}$ (Mpa) | $I_{s(50)}$ (psi) | UCS Based on Correlation with Point Load Index[2] (psi) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 7 | B-7, 40 to 50' | D | 25.0 | 47.0 | - | 362.6 | 2209 | 3.4 | 47.0 | 1.85 | 534.5 | 2.38 | 1.08 | 0.97 | 1.04 | 151.3 | 3,390 |
| 7 | | A | 80.6 | 31.5 | 1.87 | 1169.0 | 1905 | 3.0 | 43.6 | 1.72 | 1723.1 | 7.66 | 4.02 | 0.93 | 3.76 | 545.2 | 12,213 |
| 8 | B-7, 36 to 37' | D | 25.0 | 47.0 | - | 362.6 | 2209 | 3.4 | 47.0 | 1.85 | 534.5 | 2.38 | 1.08 | 0.97 | 1.04 | 151.3 | 3,390 |
| 8 | | A | 59.4 | 32.5 | 1.87 | 861.5 | 1965 | 3.0 | 44.3 | 1.75 | 1269.9 | 5.65 | 2.87 | 0.94 | 2.71 | 392.5 | 8,792 |
| 9 | B-7, 55 to 56' | D | 21.2 | 47.0 | - | 307.5 | 2209 | 3.4 | 47.0 | 1.85 | 453.2 | 2.02 | 0.91 | 0.97 | 0.88 | 128.3 | 2,875 |
| 9 | | A | 46.0 | 33.0 | 1.87 | 667.2 | 1991 | 3.1 | 44.6 | 1.76 | 983.4 | 4.37 | 2.20 | 0.94 | 2.08 | 301.0 | 6,742 |
| 10 | B-1, 39 to 40' | D | 63.0 | 47.0 | - | 913.8 | 2209 | 3.4 | 47.0 | 1.85 | 1346.9 | 5.99 | 2.71 | 0.97 | 2.63 | 381.4 | 8,543 |
| 10 | | A | 105.6 | 33.0 | 1.87 | 1531.6 | 1996 | 3.1 | 44.7 | 1.76 | 2257.6 | 10.04 | 5.03 | 0.95 | 4.76 | 689.9 | 15,453 |
| 11 | B-1, 43 to 44' | D | 67.2 | 47.0 | - | 974.7 | 2209 | 3.4 | 47.0 | 1.85 | 1436.7 | 6.39 | 2.89 | 0.97 | 2.80 | 406.8 | 9,113 |
| 11 | | A | 95.2 | 27.5 | 1.87 | 1380.8 | 1665 | 2.6 | 40.8 | 1.61 | 2035.3 | 9.05 | 5.44 | 0.90 | 4.91 | 712.5 | 15,959 |
| 12 | B-1, 49 to 50' | D | 40.8 | 47.0 | - | 591.8 | 2209 | 3.4 | 47.0 | 1.85 | 872.3 | 3.88 | 1.76 | 0.97 | 1.70 | 247.0 | 5,533 |
| 12 | | A | 82.2 | 35.0 | 1.87 | 1192.2 | 2117 | 3.3 | 46.0 | 1.81 | 1757.3 | 7.82 | 3.69 | 0.96 | 3.54 | 513.8 | 11,509 |
| 13 | B-3, 30 to 31' | D | 40.8 | 47.0 | - | 591.8 | 2209 | 3.4 | 47.0 | 1.85 | 872.3 | 3.88 | 1.76 | 0.97 | 1.70 | 247.0 | 5,533 |
| 13 | | A | 15.8 | 22.5 | 1.86 | 229.2 | 1356 | 2.1 | 36.8 | 1.45 | 337.8 | 1.50 | 1.11 | 0.86 | 0.95 | 137.9 | 3,089 |
| 14 | B-3, 37 to 38' | D | 10.8 | 47.0 | - | 156.6 | 2209 | 3.4 | 47.0 | 1.85 | 230.9 | 1.03 | 0.46 | 0.97 | 0.45 | 65.4 | 1,465 |
| 14 | | A | 20.6 | 27.0 | 1.84 | 298.8 | 1606 | 2.5 | 40.1 | 1.58 | 440.4 | 1.96 | 1.22 | 0.90 | 1.09 | 158.4 | 3,548 |
| 15 | B-3, 41 to 42' | D | 11.2 | 47.0 | - | 162.4 | 2209 | 3.4 | 47.0 | 1.85 | 239.4 | 1.07 | 0.48 | 0.97 | 0.47 | 67.8 | 1,519 |
| 15 | | A | 26.0 | 36.0 | 1.85 | 377.1 | 2153 | 3.3 | 46.4 | 1.83 | 555.9 | 2.47 | 1.15 | 0.96 | 1.11 | 160.5 | 3,595 |
| 16 | B-8, 33 to 34' | D | 17.4 | 47.0 | - | 252.4 | 2209 | 3.4 | 47.0 | 1.85 | 372.0 | 1.65 | 0.75 | 0.97 | 0.73 | 105.3 | 2,359 |
| 16 | | A | 36.6 | 28.5 | 1.88 | 530.8 | 1731 | 2.7 | 41.6 | 1.64 | 782.5 | 3.48 | 2.01 | 0.91 | 1.83 | 266.0 | 5,959 |
| 17 | B-8, 40 to 41' | D | 10.6 | 47.0 | - | 153.7 | 2209 | 3.4 | 47.0 | 1.85 | 226.6 | 1.01 | 0.46 | 0.97 | 0.44 | 64.2 | 1,437 |
| 17 | | A | 34.0 | 26.0 | 1.87 | 493.1 | 1572 | 2.4 | 39.7 | 1.56 | 726.9 | 3.23 | 2.06 | 0.89 | 1.83 | 265.6 | 5,949 |
| 18 | B-8, 51 to 52' | D | 44.6 | 47.0 | - | 646.9 | 2209 | 3.4 | 47.0 | 1.85 | 953.5 | 4.24 | 1.92 | 0.97 | 1.86 | 270.0 | 6,048 |
| 18 | | A | 93.0 | 35.0 | 1.87 | 1348.9 | 2114 | 3.3 | 46.0 | 1.81 | 1988.2 | 8.84 | 4.18 | 0.96 | 4.01 | 581.8 | 13,032 |

Note:

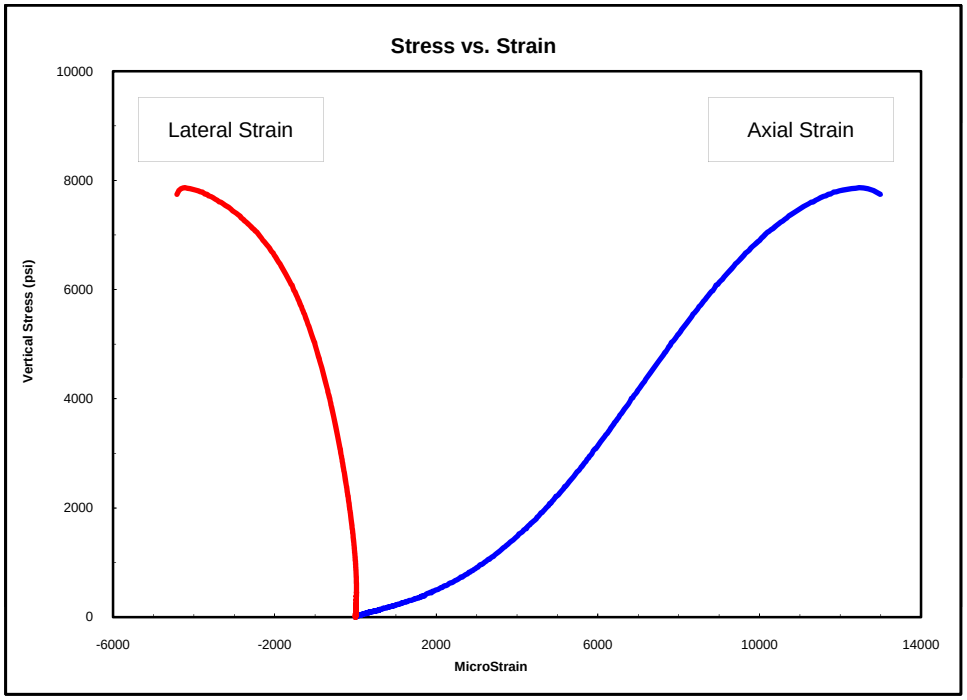
1. Force at Failure (P) calculated from Gauge reading at failure x Ram Area of Jack(1.474 $in^2$)
2. UCS values calculated from Is(50)*22.4 based on correlation in "Rock Slope Engineering" Hoek and Bray, 1981
3. Test Type designation "D" = diametral, Test Type designation "A" = axial

| | |
|---|---|
| TECH | DA/RF |
| DATE | |
| CHECK | |
| REVIEW | |

GeoTesting express
a subsidiary of Geocomp Corporation

| | |
|---|---|
| Client: | Geo-Hydro Engineers, Inc. |
| Project Name: | Foundation Technologies |
| Project Location: | |
| GTX #: | 9562 |
| Test Date: | 01/05/10 |
| Tested By: | daa |
| Checked By: | mpd |
| Boring ID: | --- |
| Sample ID: | 3 |
| Depth, ft: | --- |
| Sample Type: | rock core |
| Sample Description: | See photographs |

# Compressive Strength and Elastic Moduli of Rock by ASTM D 7012 - Method D




Peak Compressive Stress: 7,866 psi

The graph above may not include all data up to the peak shear stress value. Therefore, the highest value on the graph may not represent the peak shear stress value listed above.

| Stress Range, psi | Young's Modulus, psi | Poisson's Ratio |
|---|---|---|
| 1000-3000 | 750,000 | 0.14 |
| 3000-5000 | 1,030,000 | 0.33 |
| 5000-7000 | 867,000 | --- |

Notes: Young's Modulus and Poisson's Ratio calculated using the tangent to the line in the stress range listed.
Calculations assume samples are isotropic, which is not necessarily the case.

GeoTesting express
a subsidiary of Geocomp Corporation

| | |
|---|---|
| Client: | Geo-Hydro Engineers, Inc. |
| Project Name: | Foundation Technologies |
| Project Location: | |
| GTX #: | 9562 |
| Test Date: | 01/05/10 |
| Tested By: | daa |
| Checked By: | mpd |
| Boring ID: | --- |
| Sample ID: | 3 |
| Depth, ft: | --- |

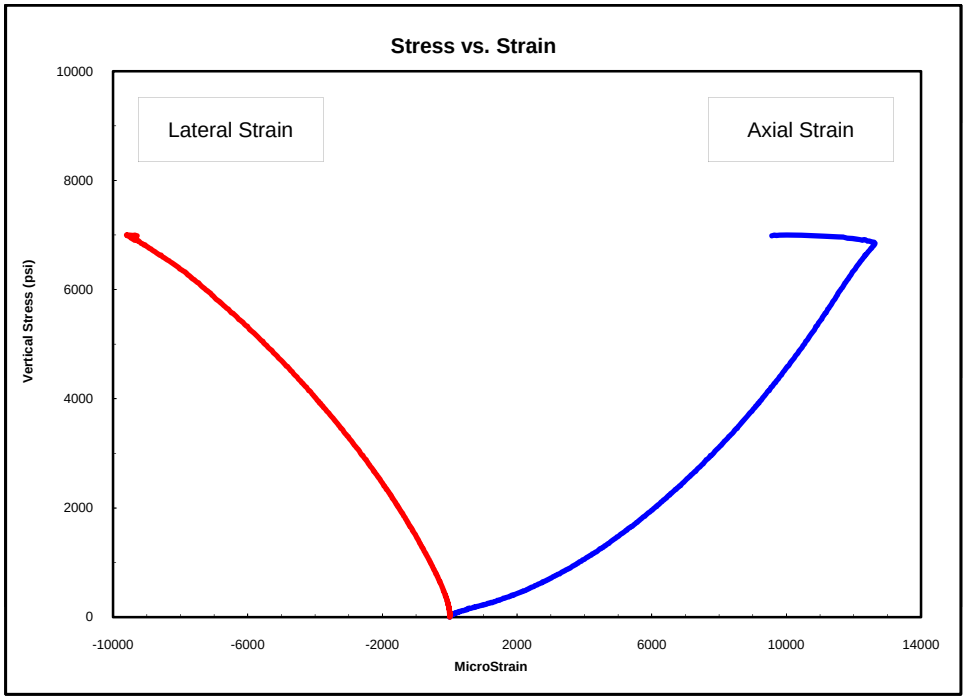

After cutting and grinding


After break

GeoTesting express
a subsidiary of Geocomp Corporation

| | |
|---|---|
| Client: | Geo-Hydro Engineers, Inc. |
| Project Name: | Foundation Technologies |
| Project Location: | |
| GTX #: | 9562 |
| Test Date: | 01/05/10 |
| Tested By: | daa |
| Checked By: | mpd |
| Boring ID: | --- |
| Sample ID: | 5 |
| Depth, ft: | --- |
| Sample Type: | rock core |
| Sample Description: | See photographs |

# Compressive Strength and Elastic Moduli of Rock by ASTM D 7012 - Method D




Peak Compressive Stress: 7,001 psi

The graph above may not include all data up to the peak shear stress value. Therefore, the highest value on the graph may not represent the peak shear stress value listed above.

| Stress Range, psi | Young's Modulus, psi | Poisson's Ratio |
|---|---|---|
| 1000-3000 | 501,000 | --- |
| 3000-5000 | 740,000 | --- |
| 5000-7000 | 780,000 | --- |

Notes: Young's Modulus and Poisson's Ratio calculated using the tangent to the line in the stress range listed.
Calculations assume samples are isotropic, which is not necessarily the case.

GeoTesting express
a subsidiary of Geocomp Corporation

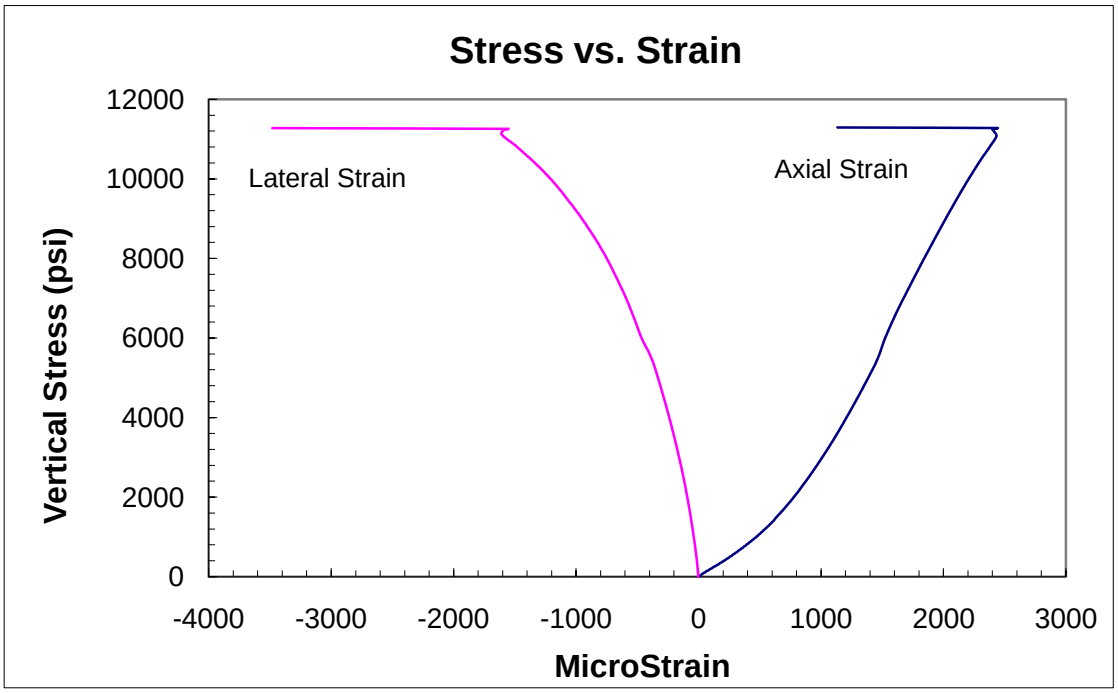
| | |
|---|---|
| Client: | Geo-Hydro Engineers, Inc. |
| Project Name: | Foundation Technologies |
| Project Location: | |
| GTX #: | 9562 |
| Test Date: | 01/05/10 |
| Tested By: | daa |
| Checked By: | mpd |
| Boring ID: | --- |
| Sample ID: | 5 |
| Depth, ft: | --- |


After cutting and grinding


After break

| | |
|---|---|
| Drilled Shaft Load Testing Program | |
| Foundation Technologies Site | |
| 1400 Progress Industrial Boulevard | |
| Sample 1 | Boring B-1, 39.5 to 40 feet |
| Sample Type | NQ Rock Core |

## Unconfined Compressive Strength and Elastic Modulus of Rock
## ASTM D 7012 - Method D



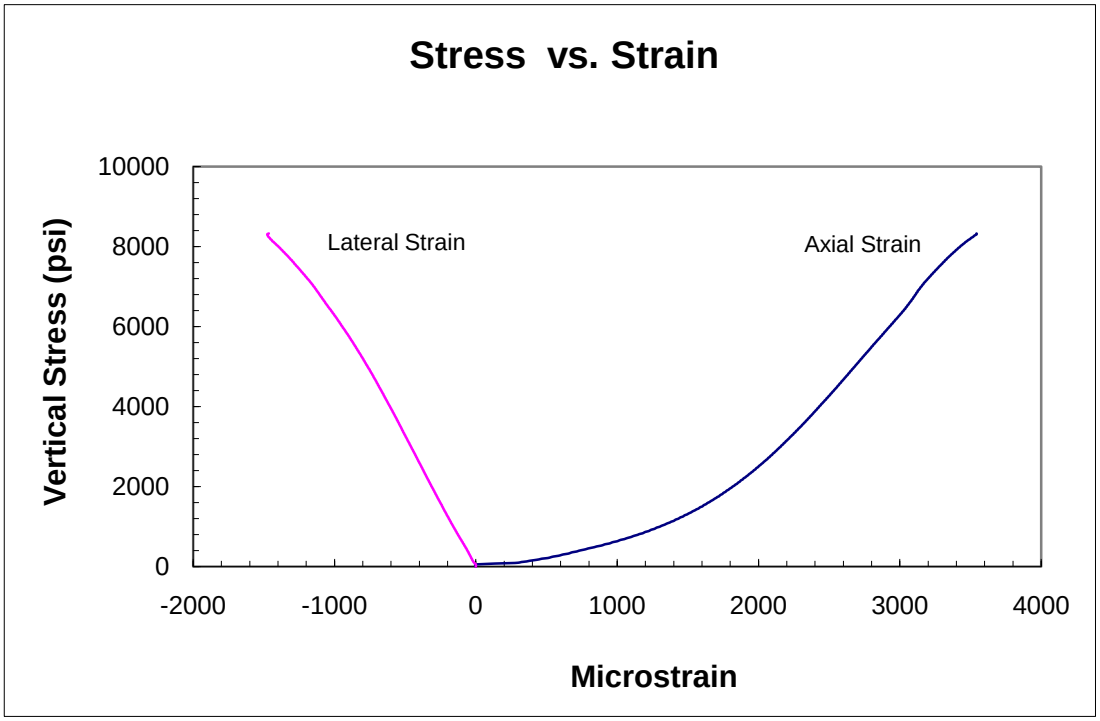

Peak Compressive Strength 11,291 psi

| Stress Range (psi) | Young's Modulus (psi) | Poisson's Ratio |
|---|---|---|
| 1,000-3,000 | 3,740,000 | 0.22 |
| 3,000-5,000 | 5,480,000 | 0.45 |
| 5,000-7,000 | 6,670,000 | 0.86 |

Notes: Young's modulus and Poisson's ratio calculated using the tangent method in stress range indicated.
Calculations assume rock sample is isotropic.

| | |
|---|---|
| Drilled Shaft Load Testing Program | |
| Foundation Technologies Site | |
| 1400 Progress Industrial Boulevard | |
| Sample 6 | Boring B-8, 43.5 to 44 feet |
| Sample Type | NQ Rock Core |

## Unconfined Compressive Strength and Elastic Modulus of Rock
## ASTM D 7012 - Method D

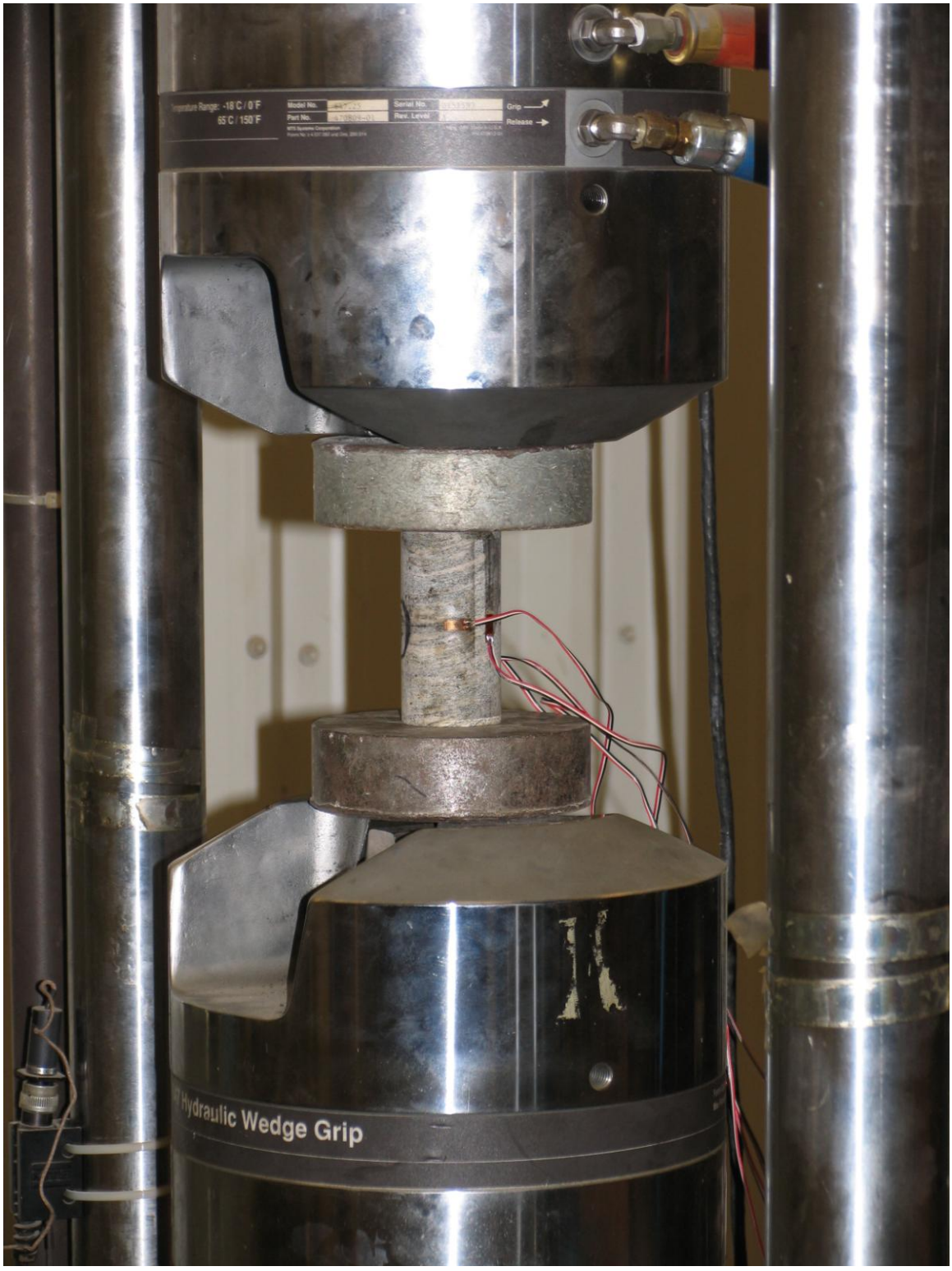



Peak Compressive Strength 8,332 psi

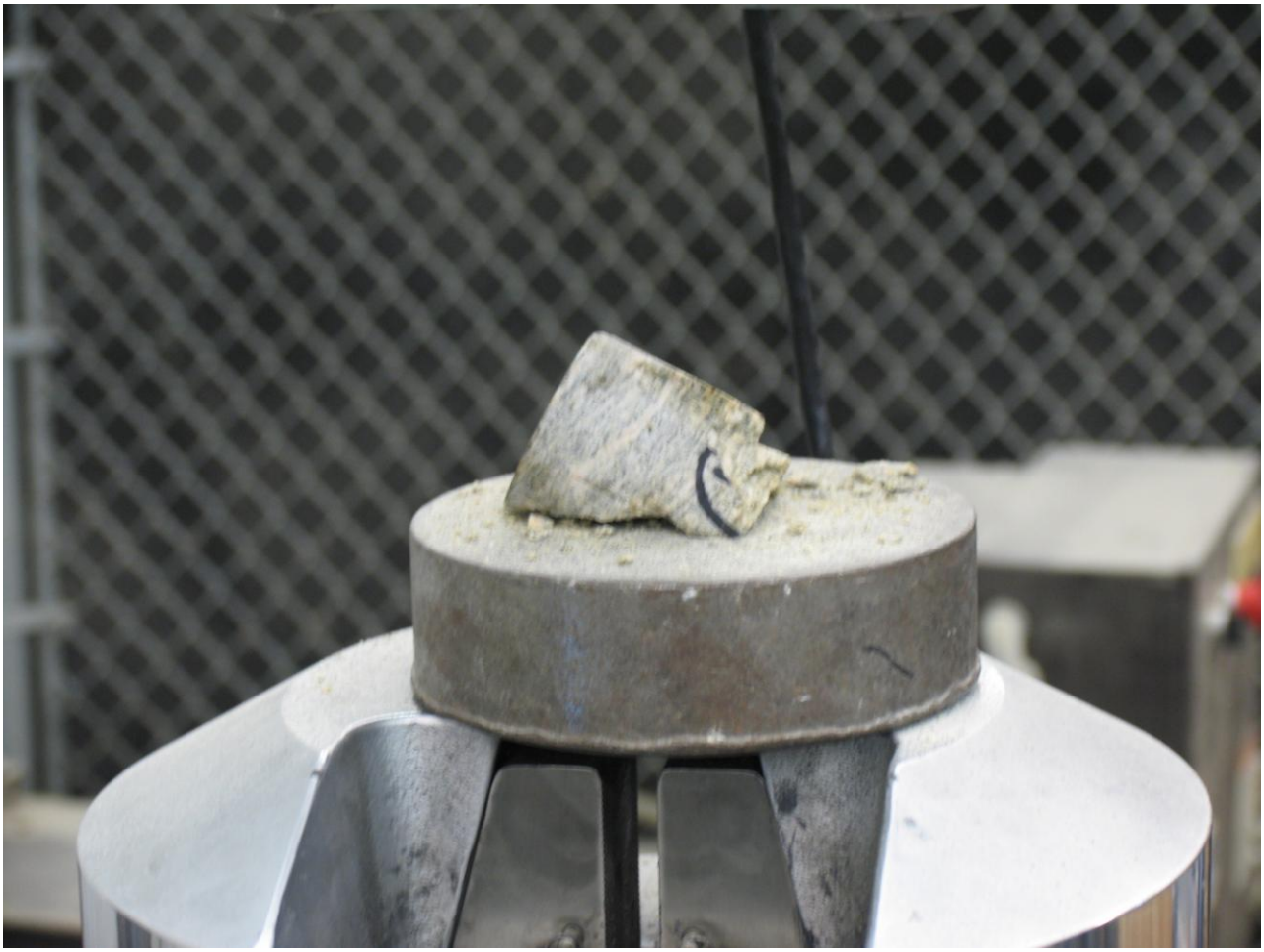
| Stress Range (psi) | Young's Modulus (psi) | Poisson's Ratio |
|---|---|---|
| 1,000-3,000 | 2,505,000 | 0.34 |
| 3,000-5,000 | 3,905,000 | 0.58 |
| 5,000-7,000 | 4,210,000 | 0.81 |

Notes: Young's modulus and Poisson's ratio calculated using the tangent method in stress range indicated.
Calculations assume rock sample is isotropic.

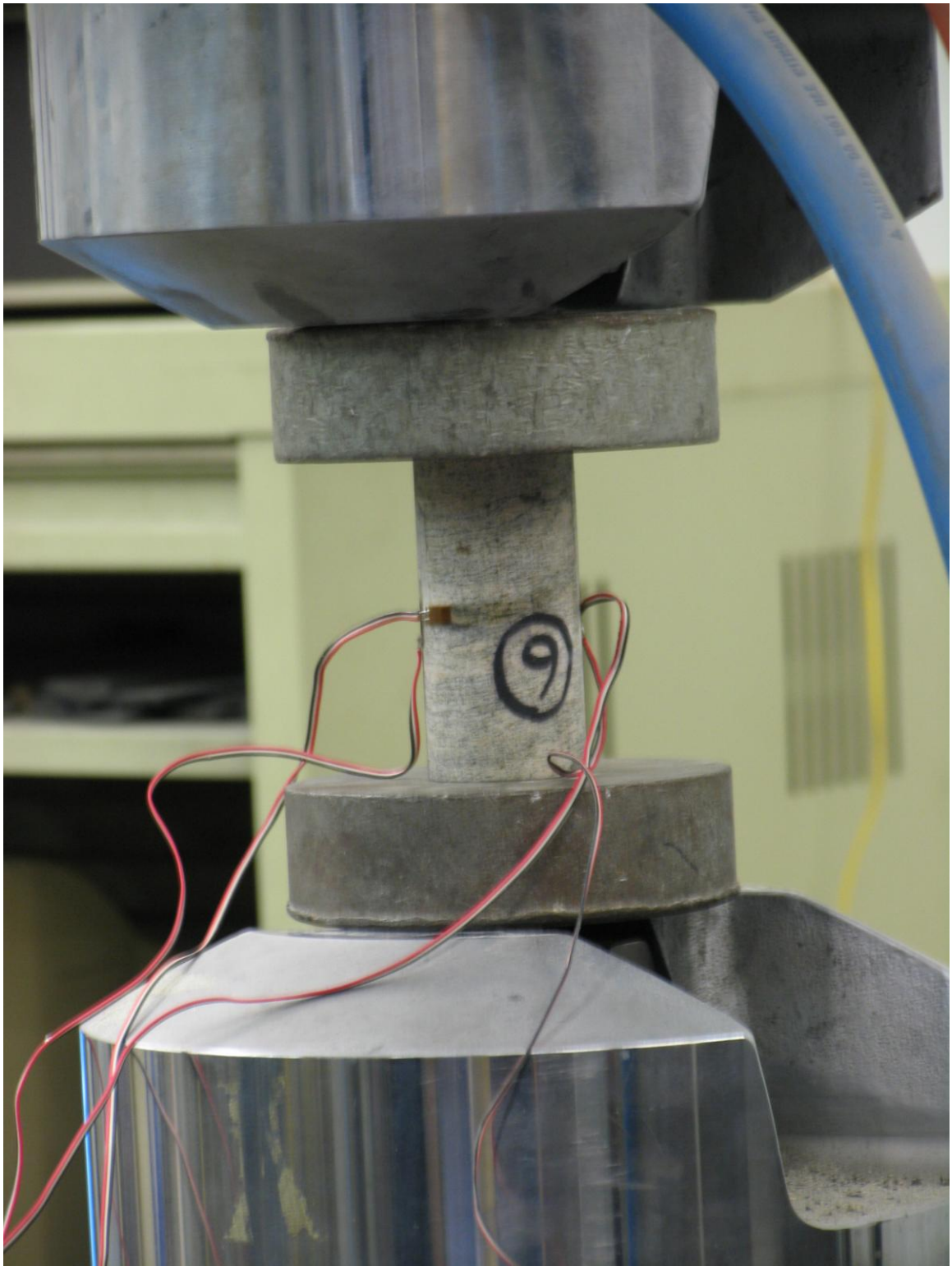

Rock Core Sample #1, Testing at Georgia Tech




Rock Core Sample #1, Testing at Georgia Tech



Rock Core Sample #1, Failure




Rock Core Sample #6, Georgia Tech

Rock Core Sample #6, Failure