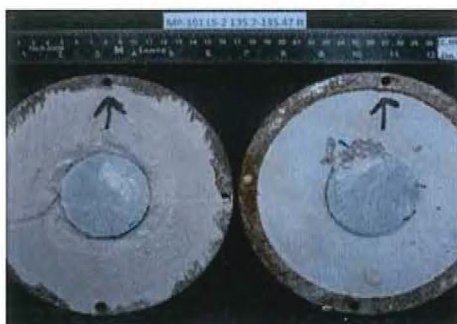




| | |
|---------------------|----------------------|
| Client: | AMEC E&I, Inc. |
| Project Name: | Clinch River Project |
| Project Location: | Oak Ridge, TN |
| GTX #: | 301001 |
| Start Date: | 3/6/2014 |
| End Date: | 3/14/2014 |
| Tested By: | cnk <i>cnk</i> |
| Checked By: | mpd <i>mpd</i> |
| Boring ID: | MP-101 |
| Sample ID: | L5-2 |
| Depth, ft: | 135.20-135.47 |
| Sample Description: | NA After test |

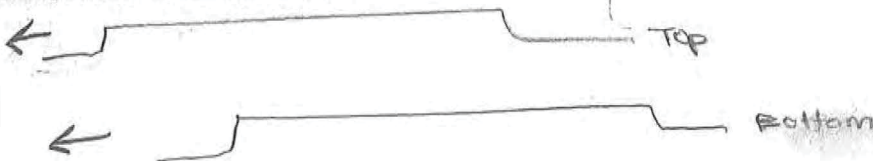




| | |
|-------------------|--|
| Client: | AMEC E&I, Inc. |
| Project Name: | Clinch River Project |
| Project Location: | Oak Ridge, TN |
| GTX #: | 301001 |
| Test Date: | 3/14/2014 |
| Tested By: | JSC |
| Checked By: | mpd |
| Boring ID: | MP-101 |
| Sample ID: | L-5 L5-2 mpd 3/26/14 Saw cut shear plane |
| Depth, ft: | 135.2-135.6 ft. |

Joint Roughness Profiles by ASTM D5607

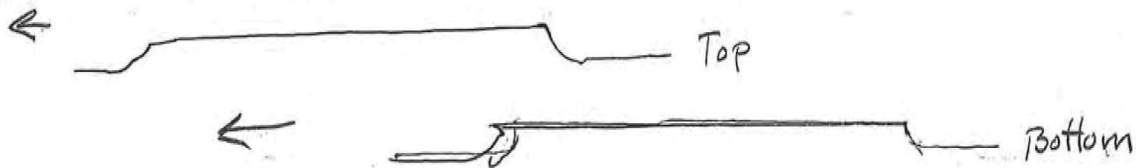
Sliding Friction Initial Shear Surface



Joint Roughness Coefficient: 0-2

Sliding Friction Failure Shear Surface

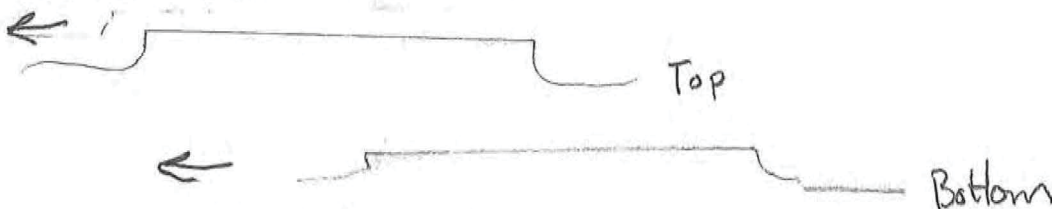
Normal Load: 110 psi



Joint Roughness Coefficient: 0-2

Sliding Friction Failure Shear Surface

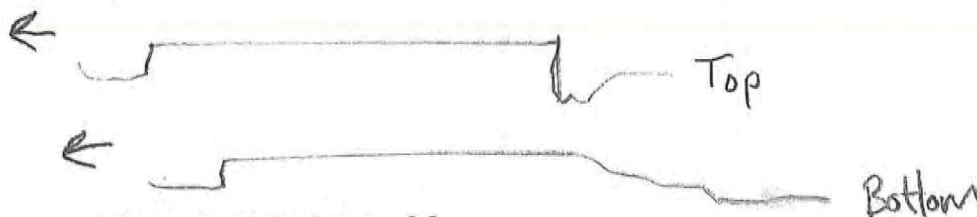
Normal Load: 150 psi



Joint Roughness Coefficient: 0-2

Sliding Friction Failure Shear Surface

Normal Load: 200 psi



Joint Roughness Coefficient: 0-2

Note: Surface Roughness measured in the direction of shear displacement. Joint Roughness Coefficient based on ASTM D5607 Figure 4.



| | |
|---------------------|----------------------|
| Client: | AMEC E&I, Inc. |
| Project Name: | Clinch River Project |
| Project Location: | Oak Ridge, TN |
| GTX #: | 301001 |
| Start Date: | 2/25/2014 |
| End Date: | 3/7/2014 |
| Tested By: | jsc SSC |
| Checked By: | mpd mpd |
| Boring ID: | MP-201 |
| Sample ID: | L5-11 |
| Depth, ft: | 28.40-28.65 |
| Sample Description: | NA |

Sliding Friction Test of Rock by ASTM D5607-08 ⁽¹⁾

| | |
|-------------------------------------|--|
| Test Profile / Setup Top to bottom: | steel plate / Rock Core Sample / steel plate |
| Sample Preparation: | Sample core cut to length using diamond tipped saw blade. Specimen coated with polyurethane spray. 'Hydro-Stone Super X' encapsulating compound was used to mount the specimen into the specimen holding ring. |
| Test Equipment: | Load cells and LVDTs connected to data acquisition system for shear force, normal load and horizontal displacement readings. |
| Test Condition: | Tested at as-received moisture and density. |
| Horizontal Displacement, in/min: | 0.005 |

| Parameter | Point 1 | Point 2 | Point 3 | Point 4 | Point 5 |
|-----------------------------------|---------|---------|---------|---------|---------|
| Specimen Diameter, inches | 2.40 | 2.40 | 2.40 | --- | --- |
| Specimen Length, inches | 3.07 | 3.07 | 3.07 | --- | --- |
| Specimen Area, in ² | 4.50 | 4.50 | 4.50 | --- | --- |
| Specimen Weight, grams | 584 | 584 | 584 | --- | --- |
| Bulk Density of Specimen, pcf | 161 | 161 | 161 | --- | --- |
| Shear Plane Area, in ² | 5.57 | 5.57 | 5.57 | --- | --- |
| Normal Compressive Stress, psi | 100 | 150 | 200 | --- | --- |
| Peak Shear Stress, psi | 90 | 100 | 125 | --- | --- |
| Post-Peak Shear Stress, psi | 61 | 92 | 121 | --- | --- |

| | | |
|----------------------------------|-------------|----------------|
| Peak Friction Angle: | 19.3 | degrees |
| Peak Cohesion: | 52.4 | psi |
| Post Peak Friction Angle: | 31.0 | degrees |
| Post Peak Cohesion: | 1.3 | psi |

| | | |
|---------------------------|-----------|------------|
| Equipment: | Serial #: | Date Next: |
| Balance: | 15606518 | 11/13/2014 |
| Caliper: | 09047598 | 11/6/2014 |
| 10k Horizontal Load Cell: | 473831A | 1/7/2015 |
| 50k Horizontal Load Cell: | 236439 | 11/13/2014 |
| 50k Vertical Load Cell: | 253300 | 11/13/2014 |
| 10k Vertical Load Cell: | 99440A | 1/9/2015 |
| Horizontal LVDT: | 103998 | 12/12/2014 |
| Vertical LVDT: | DSRLVDT-1 | 12/12/2014 |
| Vertical LVDT: | DSRLVDT-2 | 12/12/2014 |
| Vertical LVDT: | DSRLVDT-3 | 12/12/2014 |
| Vertical LVDT: | DSRLVDT-4 | 12/12/2014 |

Notes:

(1) Deviation approved by Bechtel: Test specimens coated with polyurethane spray

Initial JRC: 8-10

After Point 1 JRC: 8-10

After Point 2 JRC: 6-8

Final JRC: 6-8

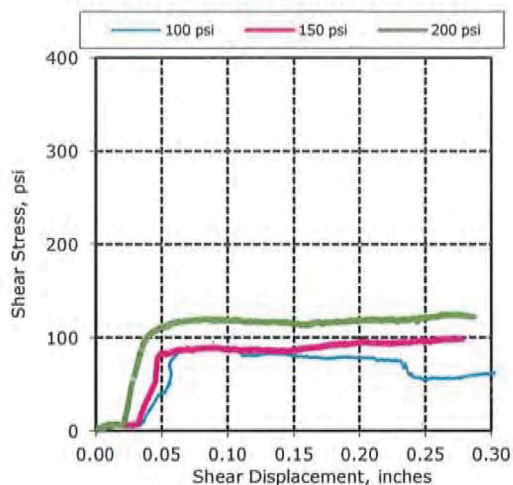
Actual strength parameters may vary and should be determined by an engineer for site-specific conditions.



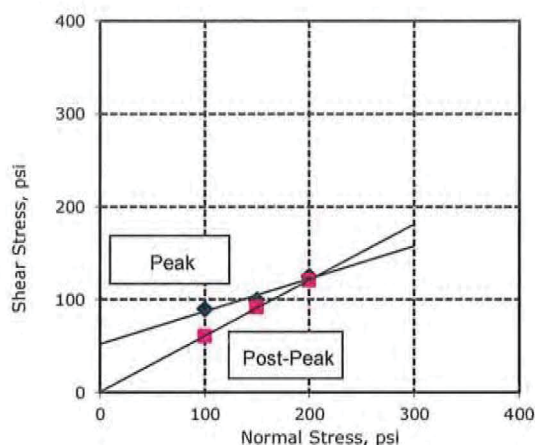
| | |
|---------------------|----------------------|
| Client: | AMEC E&I, Inc. |
| Project Name: | Clinch River Project |
| Project Location: | Oak Ridge, TN |
| GTX #: | 301001 |
| Start Date: | 2/25/2014 |
| End Date: | 3/7/2014 |
| Tested By: | jsc JSC |
| Checked By: | mpd mpd |
| Boring ID: | MP-201 |
| Sample ID: | L5-11 |
| Depth, ft: | 28.40-28.65 |
| Sample Description: | NA |

Sliding Friction Test of Rock by ASTM D5607-08

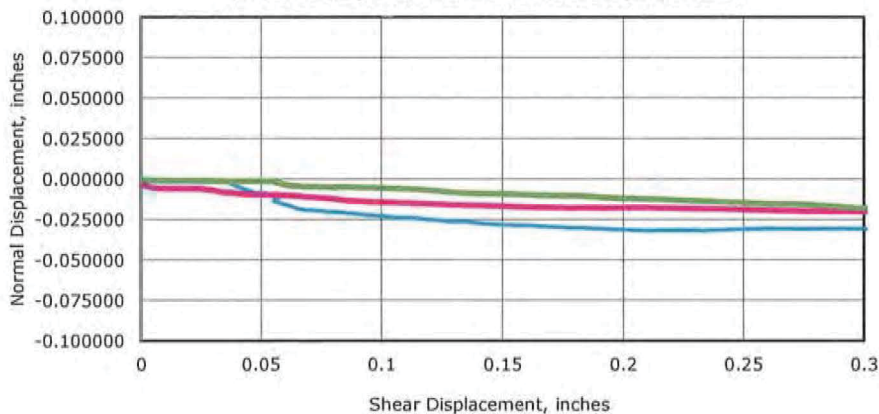
Shear Stress vs. Shear Displacement



Shear Stress vs. Normal Stress

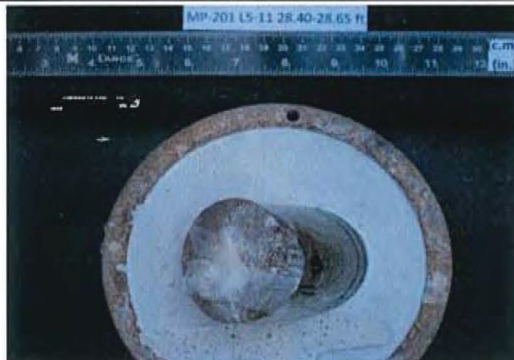
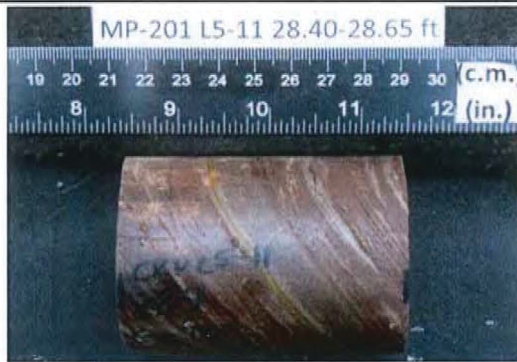


Normal Displacement vs. Shear Displacement



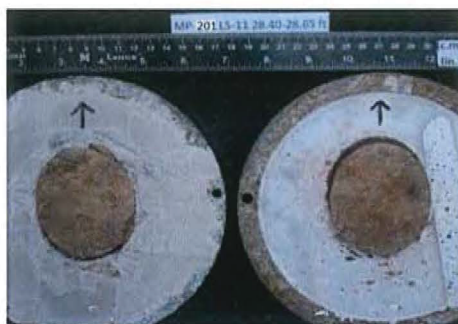
| | | |
|---------------------------|-----------|------------|
| Equipment: | Serial #: | Date Next: |
| Balance: | 15606518 | 11/13/2014 |
| Caliper: | 09047598 | 11/6/2014 |
| 10k Horizontal Load Cell: | 473831A | 1/7/2015 |
| 50k Horizontal Load Cell: | 236439 | 11/13/2014 |
| 50k Vertical Load Cell: | 253300 | 11/13/2014 |
| 10k Vertical Load Cell: | 99440A | 1/9/2015 |
| Horizontal LVDT: | 103998 | 12/12/2014 |
| Vertical LVDT: | DSRLVDT-1 | 12/12/2014 |
| Vertical LVDT: | DSRLVDT-2 | 12/12/2014 |
| Vertical LVDT: | DSRLVDT-3 | 12/12/2014 |
| Vertical LVDT: | DSRLVDT-4 | 12/12/2014 |

| | |
|---------------------|----------------------|
| Client: | AMEC E&I, Inc. |
| Project Name: | Clinch River Project |
| Project Location: | Oak Ridge, TN |
| GTX #: | 301001 |
| Start Date: | 2/25/2014 |
| End Date: | 3/7/2014 |
| Tested By: | jsc <i>jsc</i> |
| Checked By: | mpd <i>mpd</i> |
| Boring ID: | MP-201 |
| Sample ID: | L5-11 |
| Depth, ft: | 28.40-28.65 |
| Sample Description: | NA Before test |





| | |
|---------------------|----------------------|
| Client: | AMEC E&I, Inc. |
| Project Name: | Clinch River Project |
| Project Location: | Oak Ridge, TN |
| GTX #: | 301001 |
| Start Date: | 2/25/2014 |
| End Date: | 3/7/2014 |
| Tested By: | jsc <i>ISC</i> |
| Checked By: | mpd <i>mpd</i> |
| Boring ID: | MP-201 |
| Sample ID: | L5-11 |
| Depth, ft: | 28.40-28.65 |
| Sample Description: | NA After test |

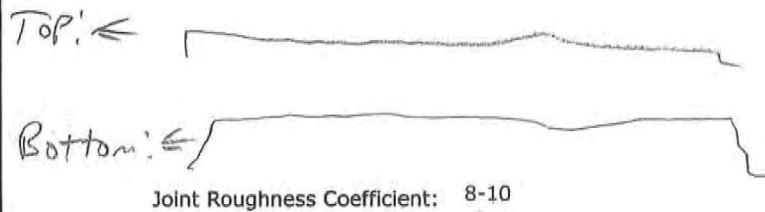




| | |
|-------------------|------------------------|
| Client: | AMEC E&I, Inc. |
| Project Name: | Clinch River Project |
| Project Location: | Oak Ridge, TN |
| GTX #: | 301001 |
| Test Date: | 3/7/2014 |
| Tested By: | JSC |
| Checked By: | mpd |
| Boring ID: | MP-10+ 201 mpa 3/26/14 |
| Sample ID: | L5-11 |
| Depth, ft: | 28.40-28.65 |

Joint Roughness Profiles by ASTM D5607

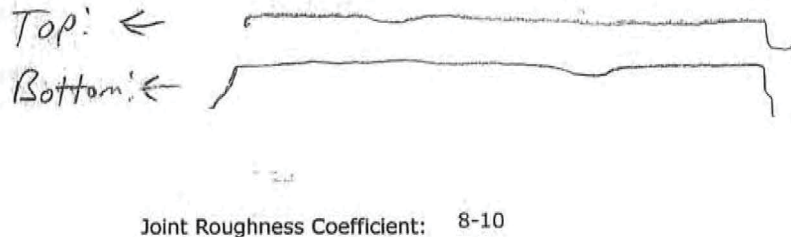
Sliding Friction Initial Shear Surface



Sliding Friction Failure Shear Surface

Normal Load:

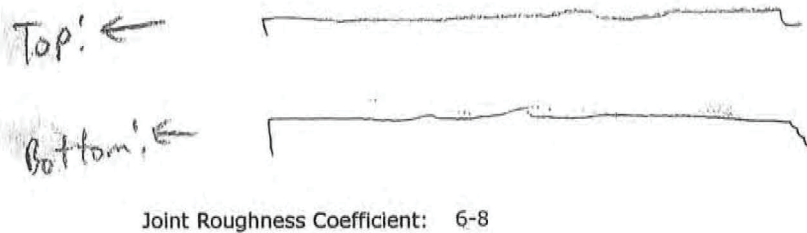
100 psi



Sliding Friction Failure Shear Surface

Normal Load:

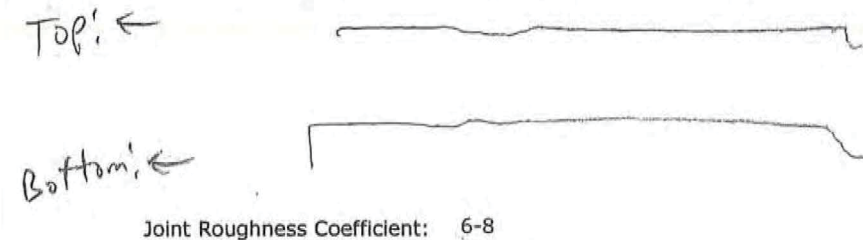
150 psi



Sliding Friction Failure Shear Surface

Normal Load:

200 psi



Note: Surface Roughness measured in the direction of shear displacement. Joint Roughness Coefficient based on ASTM D5607 Figure 4.



| | |
|---------------------|----------------------|
| Client: | AMEC E&I, Inc. |
| Project Name: | Clinch River Project |
| Project Location: | Oak Ridge, TN |
| GTX #: | 301001 |
| Start Date: | 2/25/2014 |
| End Date: | 2/28/2014 |
| Tested By: | jsc <i>JSC</i> |
| Checked By: | mpd <i>mpd</i> |
| Boring ID: | MP-201 |
| Sample ID: | L5-12 |
| Depth, ft: | 53.62-53.85 |
| Sample Description: | NA |

Direct Shear Test of Rock by ASTM D5607-08 ⁽¹⁾

| | |
|-------------------------------------|--|
| Test Profile / Setup Top to bottom: | steel plate / Rock Core Sample / steel plate |
| Sample Preparation: | Sample core cut to length using diamond tipped saw blade. Specimen coated with polyurethane spray. 'Hydro-Stone Super X' encapsulating compound was used to mount the specimen into the specimen holding ring. |
| Test Equipment: | Load cells and LVDTs connected to data acquisition system for shear force, normal load and horizontal displacement readings. |
| Test Condition: | Tested at as-received moisture and density. |
| Horizontal Displacement, in/min: | 0.005 |

| Parameter | Point 1 | Point 2 | Point 3 | Point 4 | Point 5 |
|-----------------------------------|---------|---------|---------|---------|---------|
| Specimen Diameter, inches | 2.40 | NA | NA | NA | NA |
| Specimen Length, inches | 2.47 | NA | NA | NA | NA |
| Specimen Area, in ² | 4.51 | NA | NA | NA | NA |
| Specimen Weight, grams | 473 | NA | NA | NA | NA |
| Bulk Density of Specimen, pcf (2) | 162 | NA | NA | NA | NA |
| Shear Plane Area, in ² | 5.45 | NA | NA | NA | NA |
| Normal Compressive Stress, psi | 115 | NA | NA | NA | NA |
| Peak Shear Stress, psi | 239 | NA | NA | NA | NA |
| Post-Peak Shear Stress, psi | 126 | NA | NA | NA | NA |

| | | |
|----------------------------------|----|---------|
| Peak Friction Angle: | NA | degrees |
| Peak Cohesion: | NA | psi |
| Post Peak Friction Angle: | NA | degrees |
| Post Peak Cohesion: | NA | psi |

| | | |
|---------------------------|-----------|------------|
| Equipment: | Serial #: | Date Next: |
| Balance: | 15606518 | 11/13/2014 |
| Caliper: | 09047598 | 11/6/2014 |
| 10k Horizontal Load Cell: | 473831A | 1/7/2015 |
| 50k Horizontal Load Cell: | 236439 | 11/13/2014 |
| 50k Vertical Load Cell: | 253300 | 11/13/2014 |
| 10k Vertical Load Cell: | 99440A | 1/9/2015 |
| Horizontal LVDT: | 103998 | 12/12/2014 |
| Vertical LVDT: | DSRLVDT-1 | 12/12/2014 |
| Vertical LVDT: | DSRLVDT-2 | 12/12/2014 |
| Vertical LVDT: | DSRLVDT-3 | 12/12/2014 |
| Vertical LVDT: | DSRLVDT-4 | 12/12/2014 |

Notes:

- (1) Deviation approved by Bechtel: Test specimens coated with polyurethane spray
- (2) Specimen volume is determined with three digital caliper measurements of length and diameter. Due to the irregular shape of the specimen, the calculated volume and bulk density values may not represent actual values for the specimen. Vertical LVDT 3, located behind the specimen, did not record data during the test.

JRC Point 1: 14-16

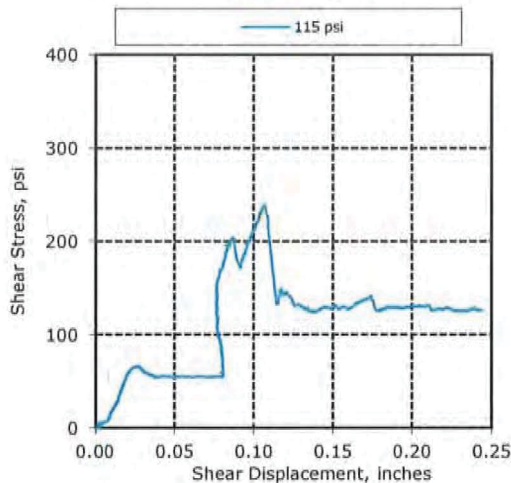
Actual strength parameters may vary and should be determined by an engineer for site-specific conditions.



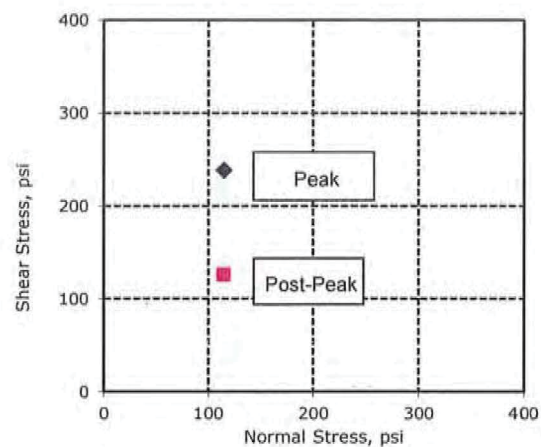
| | |
|---------------------|----------------------|
| Client: | AMEC E&I, Inc. |
| Project Name: | Clinch River Project |
| Project Location: | Oak Ridge, TN |
| GTX #: | 301001 |
| Start Date: | 2/25/2014 |
| End Date: | 2/28/2014 |
| Tested By: | jsc <i>SSC</i> |
| Checked By: | mpd <i>mpd</i> |
| Boring ID: | MP-201 |
| Sample ID: | L5-12 |
| Depth, ft: | 53.62-53.85 |
| Sample Description: | NA |

Direct Shear Test of Rock by ASTM D5607-08

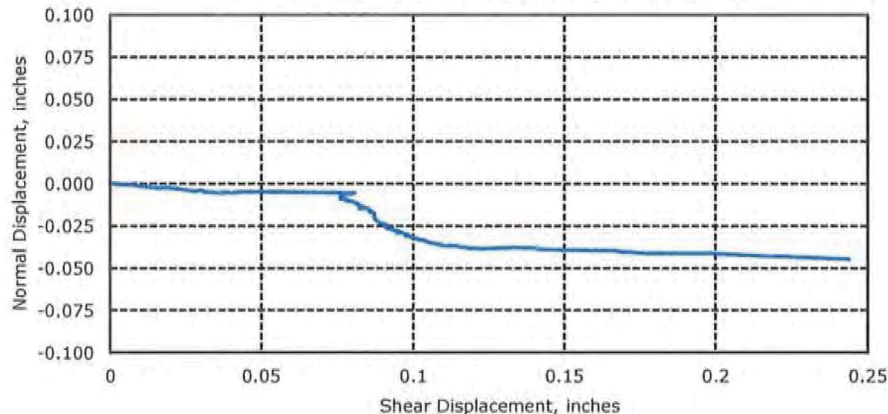
Shear Stress vs. Shear Displacement



Shear Stress vs. Normal Stress



Normal Displacement vs. Shear Displacement



| | | |
|---------------------------|-----------|------------|
| Equipment: | Serial #: | Date Next: |
| Balance: | 15606518 | 11/13/2014 |
| Caliper: | 09047598 | 11/6/2014 |
| 10k Horizontal Load Cell: | 473831A | 1/7/2015 |
| 50k Horizontal Load Cell: | 236439 | 11/13/2014 |
| 50k Vertical Load Cell: | 253300 | 11/13/2014 |
| 10k Vertical Load Cell: | 99440A | 1/9/2015 |
| Horizontal LVDT: | 103998 | 12/12/2014 |
| Vertical LVDT: | DSRLVDT-1 | 12/12/2014 |
| Vertical LVDT: | DSRLVDT-2 | 12/12/2014 |
| Vertical LVDT: | DSRLVDT-3 | 12/12/2014 |
| Vertical LVDT: | DSRLVDT-4 | 12/12/2014 |

| | |
|---------------------|----------------------|
| Client: | AMEC E&I, Inc. |
| Project Name: | Clinch River Project |
| Project Location: | Oak Ridge, TN |
| GTX #: | 301001 |
| Start Date: | 2/25/2014 |
| End Date: | 2/28/2014 |
| Tested By: | jsc <i>JSC</i> |
| Checked By: | mpd <i>mpd</i> |
| Boring ID: | MP-201 |
| Sample ID: | L5-12 |
| Depth, ft: | 53.62-53.85 |
| Sample Description: | NA Before test |

