September 2, 2016

**Executive Summary: Austin Avenue Bridges at North/South San Gabriel River – Forensic Investigation Condition Assessment/Evaluation (Supplemental Testing and Analysis)**

Wiss, Janney, Elstner Associates, Inc. (WJE) provided Aguirre & Fields LP (AF) with a Forensic Investigation Supplemental Testing and Analysis Report on September 1, 2016, documenting their additional testing and analysis of the Austin Avenue Bridges.

In summary, the WJE report covers:

### Material Sampling and Testing
1. Six (6) steel samples were taken from existing steel girder webs.
2. Samples were tested in accordance with American Society for Testing and Materials (ASTM) standards for tensile and hardness properties.
3. The average yield strength of the samples was 38.5ksi with a standard deviation of 0.7ksi.

### Load Rating Analysis and Recommendations
4. Analysis was completed using a yield strength of 37.3ksi in accordance with American Association of State Highway and Transportation Officials (AASHTO) standards.
5. Recommended load restrictions as follows:

<table>
<thead>
<tr>
<th>Weight Limit</th>
<th>Lbs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Single Vehicle</td>
<td>69000</td>
</tr>
<tr>
<td>Single Axle</td>
<td>20000</td>
</tr>
<tr>
<td>Tandem Axle</td>
<td>34000</td>
</tr>
<tr>
<td>Combination Vehicle</td>
<td>79000</td>
</tr>
</tbody>
</table>

- Axle 20,000 lbs (legal limit)
- Tandem axle 34,000 lbs (legal limit)
- Single Gross vehicle 69,000 lbs (legal limit)
- Combination vehicle 79,000 lbs (legal limit is 80,000)

6. **Load restriction recommendations are pending verification from TxDOT.**

At this time, these recommendations are being provided to TxDOT. The City and project team will continue to coordinate with TxDOT in 2016 on the testing/analysis results and follow-up actions.

Summarized by Dave Lubitz, PE and Oscar Aguirre, PE
Via E-mail

September 1, 2016

Mr. David Lubitz, PE
Aguirre & Fields, LP
12708 Riata Vista Circle, Suite A-109
Austin, Texas 78727

Re: Austin Avenue Bridges at San Gabriel River
Supplemental Testing and Analysis
WJE No. 2015.5402.1

Dear Mr. Lubitz:

At the request of Aguirre & Fields, LP (A&F) and in accordance with our proposal dated June 8, 2016, Wiss, Janney, Elstner Associates, Inc. (WJE) has completed supplemental testing and analysis of the Austin Avenue Bridges over the North and South San Gabriel Rivers in Georgetown, Texas. This letter summarizes the work WJE performed.

BACKGROUND

Refer to WJE’s report dated January 12, 2016 for summary information regarding our previous work for the Austin Avenue Bridges and to Figure 1 and Figure 2 for schematic orientation. The bridges are currently load-posted for loads not to exceed 48,000 pounds gross vehicle weight or 21,000 pounds tandem-axle weight based on an assumed steel yield strength of 33 ksi and conditions reported from a routine Texas Department of Transportation (TxDOT) bridge inspection completed in December 2013. The TxDOT report indicated that the inventory load rating factor was 0.79, which corresponds to an Inventory Rating (IR) of HS 15.9. As reported previously, no steel grade was clearly specified on existing project documentation. The AASHTO Manual for Bridge Evaluation (2011)\(^1\) provisions referenced by TxDOT for load rating purposes indicate that the minimum yield stress of unknown steel constructed between 1936 and 1963 may be assumed as 33 ksi unless tested to determine an appropriate value for yield strength. The City of Georgetown requested additional testing and analysis of the structural steel members to determine the plausibility of removing existing load postings.

SUPPLEMENTAL MATERIAL TESTING

Material Sampling

On June 30 and July 1, 2016, Aaron Sterns, PE, Sam Keske, PhD, EIT, and Lane Thompson, all of WJE, visited the site to coordinate steel sample removal from the North and South Bridges. We accessed the bridge with our subconsultant, Coyote Welding of Cedar Park (Coyote), using a 50-foot articulating boom lift and marked three sample removal locations per bridge, as shown in Appendix A. The sample locations were selected to minimize the impact of removal on the structural capacity of the girders; minimize the impact on bridge aesthetics and serviceability; accommodate tensile testing in accordance with ASTM A370, *Standard Test Methods and Definitions for Mechanical Testing of Steel Products*; and represent the
controlling bridge spans (suspended spans between cantilevers) without affecting that span or ongoing traffic service on the bridges.

Coyote used a drill to create pilot holes at sample corners and an oxygen/acetylene torch to cut the samples from the bridge (Figure 3). The remaining holes were ground smooth to remove sharp edges and corners around the sampling voids. The adjacent heat-affected coatings were also ground and sealed with a zinc-rich paint (Figure 4).

**Material Testing**

WJE delivered the six steel samples, identified as Samples N1–N3 and S1–S3 for the North and South Bridges, respectively, to Richard Lewis of Lewis Engineering and Consulting (Lewis). Lewis prepared the samples and tested them in accordance with ASTM A370. Lewis reported mechanical properties to WJE, as shown in Appendix B. Table 1 summarizes the samples and obtained tensile test results. Lewis also obtained Rockwell B hardness test results as summarized in Appendix B; those results are not directly applicable to this report at this time but will be reserved for future use.

The average yield strength of the six samples as reported by Lewis is 38.5 ksi with a standard deviation of 0.73 ksi.

**SUPPLEMENTAL LOAD RATING ANALYSIS**

WJE reanalyzed the load rating of the controlling span using the yield strength value derived from Lewis’s material testing, in accordance with AASHTO Section 6B.5.3.1. Per that section, “the nominal yield value should be substituted in strength formulas and is typically taken as the mean test value minus 1.65 standard deviations.” As such, the span was reanalyzed utilizing a yield strength of 37.3 ksi.

The suspended span’s inventory load rating factor equals 0.96 when calculated using the AASHTO-recommended yield strength value. This factor corresponds to an IR of HS 19.3.

**DISCUSSION AND RECOMMENDATIONS**

Refer to the “Bridge Inspection and Load Rating” section of our previous report dated January 12, 2016 for further background information regarding caveats to the current bridge load ratings, bridge inspection practices, and condition ratings. Based on the revised IR of HS 19.3, the resulting load restrictions, determined in accordance with TxDOT procedures, should be as follows:

- Axle 20,000 lbs (legal limit)
- Tandem axle 34,000 lbs (legal limit)
- Single Gross vehicle 69,000 lbs (legal limit)
- Combination vehicle 79,000 lbs (legal limit is 80,000)

Posting the bridges for the above signifies that nearly all typical commercial vehicles will be permitted to utilize the bridges. Such a posting also indicates that, per TxDOT practice, no Permit Loads (specialized, overweight vehicles) are allowed to utilize the bridges. The corresponding load posting sign is shown in Figure 5.
CLOSING

WJE’s findings and recommendations are based on the material test results and structural analyses that represent known conditions at the time of our assessment. Other conditions may exist, or develop over time, that were not accounted for in our testing or analysis. WJE reserves the right to modify our findings should additional information become available. Our recommendations should be considered preliminary and will require verification by TxDOT before discussed actions are undertaken. If requested, WJE is available and prepared to assist with finalization of analyses or development of a load-posting modification request for TxDOT consideration. This report was prepared for, on behalf of, and for the exclusive use of, Aguirre & Fields.

Sincerely,

WISS, JANNEY, ELSTNER ASSOCIATES, INC.

[Signature]

Aaron Sterns, PE
Senior Associate and Project Manager

[Signature]

Sam Keske, PhD, EIT
Associate II

[Signature]

Brian Merrill, PE
Associate Principal

Attachments:
- Appendix A: Sample Removal Plan
- Appendix B: Lewis Steel Testing Report
### Table 1. Steel Sample Summary

<table>
<thead>
<tr>
<th>Sample ID</th>
<th>Location</th>
<th>Yield Strength (ksi)</th>
<th>Tensile Strength (ksi)</th>
<th>% Elongation</th>
</tr>
</thead>
<tbody>
<tr>
<td>N1</td>
<td>N. bridge, Span 6, Girder 3</td>
<td>39.5</td>
<td>64.4</td>
<td>41</td>
</tr>
<tr>
<td>N2</td>
<td>N. bridge, Span 6, Girder 5</td>
<td>38.8</td>
<td>66.5</td>
<td>38</td>
</tr>
<tr>
<td>N3</td>
<td>N. bridge, Span 6, Girder 7</td>
<td>37.8</td>
<td>66.0</td>
<td>40</td>
</tr>
<tr>
<td>S1</td>
<td>S. bridge, Span 2, Girder 3</td>
<td>38.6</td>
<td>66.0</td>
<td>39</td>
</tr>
<tr>
<td>S2</td>
<td>S. bridge, Span 2, Girder 5</td>
<td>38.9</td>
<td>72.0</td>
<td>36</td>
</tr>
<tr>
<td>S3</td>
<td>S. bridge, Span 2, Girder 7</td>
<td>37.5</td>
<td>64.0</td>
<td>38</td>
</tr>
</tbody>
</table>
FIGURES

Figure 1. Schematic orientation of South Austin Avenue Bridge; Span 3 includes a 56-foot suspended span between 14-1/2-foot cantilevered extensions from Spans 2 and 4.

Figure 2. Schematic orientation of North Austin Avenue Bridge; Span 5 includes a 56-foot suspended span between 14-1/2-foot cantilevered extensions from Spans 4 and 6.
Figure 3. Ongoing torch-cut removal of steel web specimens.

Figure 4. Typical corner grinding and zinc coating application (N3 shown).
<table>
<thead>
<tr>
<th>WEIGHT LIMIT</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>SINGLE VEHICLE</td>
<td>69000 LBS</td>
</tr>
<tr>
<td>SINGLE AXLE</td>
<td>20000 LBS</td>
</tr>
<tr>
<td>TANDEM AXLE</td>
<td>34000 LBS</td>
</tr>
<tr>
<td>COMBINATION VEHICLE</td>
<td>79000 LBS</td>
</tr>
</tbody>
</table>

Figure 5. TxDOT R12-8aT sign, with corresponding load posting weights that should be considered if modifying the existing load posting.
APPENDIX A: SAMPLE REMOVAL PLAN
AUSTIN AVENUE BRIDGE

Steel Sample for Tension Test

NOTES:
1) GRIND SMOOTH TRANSITIONS FROM TORCH/PLASMA CUTS TO DRILLED HOLES
2) APPLY COLD GALVANIZING AT EXPOSED STEEL SURFACES FROM SAMPLE REMOVAL
AUSTIN AVENUE BRIDGE

Steel Sample for Tension Test

1" DIAMETER MAG. DRILLED HOLE, TYP

TORCH OR PLASMA CUT BETWEEN HOLES, TYP

TEST SPECIMEN DEVELOPED BY METALLURGIST

GIRDER DIRECTION

9.00 in

9.50 in

3.50 in

3.00 in

0.25 in TYP

~ SAMPLE ~
SIDEWALK UNDER SPAN 2

APPROX. 30' FROM S. END (FROM 1ST FREESTANDING BENT)

S. SAN GABRIEL RIVER

APPROX. 30' FROM S. END (FROM 1ST FREESTANDING BENT)
SAMPLES AT 3RD, 5TH, AND 7TH GIRDERS OF 9-GIRDER SPAN (MIDDLE AND 2ND FROM MIDDLE ON EITHER SIDE). APPROX. 30' FROM BENTS

INTERMEDIATE DIAPHRAGMS AT 17', 34', 51' FROM END AWAY FROM RIVER

RIVERSIDE BRIDGE BEARING/BENT

BRIDGE DECK JOINT OVER SUSPENDED SPAN. JOINT DOES NOT ALIGN WITH BEARING/BENT

INTERMEDIATE DIAPHRAGMS AT 17', 34', 51'

SAMPLES AT 3RD, 5TH, AND 7TH GIRDERS OF 9-GIRDER SPAN (MIDDLE AND 2ND FROM MIDDLE ON EITHER SIDE). APPROX. 30' FROM BENTS

RIVERSIDE BRIDGE BEARING/BENT

BRIDGE DECK JOINT OVER SUSPENDED SPAN. JOINT DOES NOT ALIGN WITH BEARING/BENT

INTERMEDIATE DIAPHRAGMS AT 17', 34', 51'

9"X3" SAMPLE, TYP. SEE SKETCH

48" TO CENTER OF SAMPLE FROM DIAPH.

1" FLANGES
INTRODUCTION

Six samples of steel plate from the Austin Avenue Bridge were submitted to Lewis Engineering and Consulting, Inc. (LEC), Gainesville, Florida by Wiss, Janney, Elstner Associates, Inc. (WJE), Austin, TX for tensile property testing. LEC advised that the most reliable tensile test data would be obtained using full plate thickness samples rather than subsize machined samples. Based upon the objective of preparing a recommended 2 inch gage length by 0.500 inch gage width test specimen, an overall plate sample size of 9.5 inch long by 3.5 inch wide sample was suggested so that the target dimensioned tensile test specimen could be machined exclusive of any heating effects induced by the plate sample removal procedure. The schematic attached in Appendix A prepared by WJE shows the plate sample dimensions and the location of the tensile test specimen to be removed from it. LEC utilizes the laboratory services of Applied Technical Services (ATS), Marietta, GA for mechanical property testing. The samples were received and documented by LEC prior to sending to ATS. Included in the laboratory documentation was measurement of plate thickness and hardness testing.

TEST METHODS AND RESULTS

Hardness testing on the steel samples prior to submittal for tensile testing was performed in accordance with hardness testing procedures specified in ASTM A370-15 employing an Instron Wilson Model 103R hardness testing instrument. Preliminary calibration was performed with the instrument configured to measure hardness on the Rockwell B (R_B) scale and using Hardness Test Block Serial No. 98T50047 with a calibrated hardness of R_B 63.0. Four hardness measurements were performed on each steel sample, two at each end in the area that would be the grip area following machining into dog-bone shaped flat tensile test specimens. The following hardness data for each steel sample is the average of the four measurements.

It is often very useful to obtain hardness data for steels as there is a long standing and
widely accepted general correlation between hardness and tensile strength. However, the tabulated hardness conversion and tensile data table such as the one published in Table 2 and Table 3 of ASTM A370 has a lower limit on hardness to tensile strength correlation of $R_B^65$. Below that value, the correlation becomes unreliable and for that reason is not published. The tensile strength of steel with a hardness of $R_B^65$ in Table 3 of A370 is 56,000 psi, or 56 ksi.

<table>
<thead>
<tr>
<th>SAMPLE ID</th>
<th>ROCKWELL B HARDNESS</th>
<th>APPROXIMATE TENSILE STRENGTH FROM HARDNESS CONVERSION*</th>
</tr>
</thead>
<tbody>
<tr>
<td>N1</td>
<td>64</td>
<td>---</td>
</tr>
<tr>
<td>N2</td>
<td>62</td>
<td>---</td>
</tr>
<tr>
<td>N3</td>
<td>68</td>
<td>59 ksi</td>
</tr>
<tr>
<td>S1</td>
<td>66.5</td>
<td>57.5 ksi</td>
</tr>
<tr>
<td>S2</td>
<td>62.5</td>
<td>---</td>
</tr>
<tr>
<td>S3</td>
<td>50</td>
<td>---</td>
</tr>
</tbody>
</table>

* From ASTM A370 Table 3

The majority of the hardness data on the bridge plate steels falls close to or below the lower hardness to tensile strength correlation limit. The footnote to Table 2/3 in A370 states that the tensile strength conversions are approximate and should be used cautiously because “it is possible that steels of various compositions and processing histories will deviate in hardness-tensile strength relationship from the data presented in this table.”

However, it was the objective of this testing to measure actual bridge steel hardness values on the steel samples for direct correlation with the tensile strengths measured on the same samples. In this way, further hardness measurements on the bridge steel components can be made and usefully correlated with measured tensile properties rather than relying on the approximate tensile strength values presented in Table 3 of ASTM A370.

TENSILE TEST RESULTS

ATS was requested to prepare flat dog-bone shaped full thickness tensile test specimens in accordance with the dimensions and specifications for full thickness tensile tests in Figure 3 of
ASTM A370. The results are attached in the ATS TENSILE TEST REPORT in Appendix B. Included with the data table are the corresponding stress vs. strain graphs recorded for each individual specimen.

The average tensile strength and yield strength of the group of six bridge steel tensile specimens was 66.4 ksi and 38.5 ksi, respectively. As shown in the ATS TENSILE TEST REPORT, the lowest tensile strength reported was 64 ksi for both Sample N1 and S3 while the highest measured tensile strength was 72 ksi for Sample S2. The tensile elongation ductility of all six tensile specimens was very good, ranging from 36 percent to 41 percent.

A comparison of measured and reported hardness values of the bridge steel samples with measured and reported values of tensile strength show that there is a relatively close grouping for four of the six samples. Slightly skewed in the data is the $R_H$ 62.5 hardness and 72 ksi tensile strength of Sample S2 and the $R_H$ 50 hardness and 64 ksi tensile strength of Sample S3. It is concluded that the low value of $R_H$ 50 for Sample S3 is somewhat inconsistent with the hardness data for the other five samples and should be considered not typical and representative for a bridge steel having a reported tensile strength of 64 ksi. Based upon the hardness and tensile test data for the other five samples, it is concluded that hardness measurements on the subject bridge steels should fall within the range of $R_H$ 62 to 68.

A review of the tensile stress vs strain graphs shows that five of the six test specimens had a yield point followed by a flat stress vs strain curve to failure. One specimen, Sample S2, a both an upper yield point and a lower yield point. In low to moderate strength carbon steels, it is not uncommon for the tensile stress vs strain graph to exhibit an upper and lower yield point. The tensile properties of all six bridge steel samples are compliant with the tensile strength, yield strength and tensile elongation ductility requirements specified in Table 3 of ASTM A36, Standard Specification for Structural Steel.

Laboratory photographs of the fractured ends of the six tensile test specimens are attached in Figures 1 through 6. All six fractures were consistent and similar in necking deformation and fracture appearance.

Prepared and submitted by,

Richard O. Lewis, P.E.

JULY 22, 2016

L3937 WJE Austin Bridge Steel tensile rpt 072216

LEWIS ENGINEERING AND CONSULTING, INC.
Figure 1. Tensile test specimen fracture on sample N1. L3937 071816 04

Figure 2. Tensile test specimen fracture on sample N2. L3937 071816 03
Figure 3. Tensile test specimen fracture on sample N3.  L3937 071816 02

Figure 4. Tensile test specimen fracture on sample S1.  L3937 071816 05
Figure 5. Tensile test specimen fracture on sample S2. L3937 071816 01

Figure 6. Tensile test specimen fracture on sample S3. L3937 071816 06
APPENDIX A

WJE SCHEMATIC OF SAMPLES TO BE REMOVED FOR TESTING
AUSTIN AVENUE BRIDGE
Steel Sample for Tension Test

1" DIAMETER MAG. DRILLED HOLE, TYP
TORCH OR PLASMA CUT BETWEEN HOLES, TYP

~ SAMPLE ~

3.50 in
9.00 in

3.00 in
9.50 in

0.25 in TYP

GIRDER DIRECTION
APPENDIX B

ATS TENSILE TEST REPORT WITH
STRESS-STRAIN GRAPHS
TENSILE TEST REPORT

Ref: D256979 Date: July 13, 2016 Page 1 of 1

Customer: Lewis Engineering and Consulting, Inc., 2106 NW 67th Place, Suite 2, Gainesville, FL 32653
Attention: Richard Lewis, P. E.

Purchase Order #: L3937 Part #/Name: Bridge Girder Web Samples, N2015.5402.1
Material Designation: Steel Specimen Type: Flat Reduced Section
Tensile Test Equipment: Tinius Olsen ATS #: 2246 Cal. Due: 11/4/16
Extensometer: Tinius Olsen ATS #: 2321 Cal. Due: 11/5/16
Lab Comment: Tested per ASTM A370-15. 1Upper yield. 2Lower yield

Test Results

<table>
<thead>
<tr>
<th>Specimen Identification</th>
<th>Thickness, in.</th>
<th>Diameter or Width in.</th>
<th>Area, in.²</th>
<th>Ultimate Load, lbs.</th>
<th>0.2% Offset Load, lbs.</th>
<th>Tensile Strength, psi</th>
<th>Yield Strength, psi</th>
<th>Elong. % in 2 in.</th>
<th>Red. in Area, %</th>
</tr>
</thead>
<tbody>
<tr>
<td>N1</td>
<td>0.649</td>
<td>0.503</td>
<td>0.326</td>
<td>20,866</td>
<td>12,865</td>
<td>64,000</td>
<td>39,500</td>
<td>41</td>
<td>—</td>
</tr>
<tr>
<td>N2</td>
<td>0.628</td>
<td>0.503</td>
<td>0.316</td>
<td>20,972</td>
<td>12,271</td>
<td>66,500</td>
<td>38,800</td>
<td>38</td>
<td>—</td>
</tr>
<tr>
<td>N3</td>
<td>0.632</td>
<td>0.503</td>
<td>0.318</td>
<td>20,945</td>
<td>12,021</td>
<td>66,000</td>
<td>37,800</td>
<td>40</td>
<td>—</td>
</tr>
<tr>
<td>S1</td>
<td>0.646</td>
<td>0.503</td>
<td>0.325</td>
<td>21,376</td>
<td>12,554</td>
<td>66,000</td>
<td>38,600</td>
<td>39</td>
<td>—</td>
</tr>
<tr>
<td>S2</td>
<td>0.640</td>
<td>0.503</td>
<td>0.322</td>
<td>23,130</td>
<td>13,091 1/2,518 3/2</td>
<td>72,000</td>
<td>40,700 1/38,900 2</td>
<td>36</td>
<td>—</td>
</tr>
<tr>
<td>S3</td>
<td>0.633</td>
<td>0.503</td>
<td>0.318</td>
<td>20,351</td>
<td>11,922</td>
<td>64,000</td>
<td>37,500</td>
<td>38</td>
<td>—</td>
</tr>
</tbody>
</table>

ISO 9001

Prepared by: E. Boggs Materials Testing
Approved by: W. R. Allen Materials Testing

This report may not be reproduced except in full without the written approval of ATS. This report represents interpretation of the results obtained from the test specimen and is not to be construed as a guarantee or warranty of the condition of the entire material lot. If the method used is a customer provided, non-standard test method, ATS does not assume responsibility for validation of the method.
Applied Technical Services
1049 Triad Court
Marietta, GA 30062

Metals Tensile w/ Ext.

Reference Number: D256979
Customer: LEW135
Purchase Order: L3937
Material: STEEL

Performed By: EB
Approved By: SM
Test Method: ASTM A370-15
Test Date: 07/12/2016
Test Setting: Metals with Ext - 2 in GL

Sample No.: 1:S2,2015.54
Width, in: 0.503
Thickness, in: 0.64
Area, in²: 0.32192
Ultimate, lbf: 23130.5

LOWER OS @ .2, lbf: 12517.6
UPPER Yield, lbf: 13090.92
Ultimate, psi: 71851.4

LOWER OS @ .2, psi: 38884.1
UPPER Yield, psi: 40665
TE, %: 35.9
Reduction, %: 0.0000
Modulus, psi: 33400000

 Jul 12, 2016  3:24:20 PM
SM: 211206-R0   V7:02.02
Metals Tensile w/ Ext.

Reference Number: D256979
Customer: LEW135
Purchase Order: L3937
Material: STEEL

Performed By: EB
Approved By: SM
Test Method: ASTM A370-15
Test Date: 07/12/2016
Test Setting: Metals with Ext - 2 in GL

Sample No.: 2N32015.54
02.1
Width, in: 0.503
Thickness, in: 0.632
Area, in²: 0.3179
Ultimate, lbf: 20944.7
OS @ .2, lbf: 12021.42
Yield, lbf: 12051.95
Ultimate, psi: 65885.2
OS @ .2, psi: 37815.5
Yield, psi: 37911.5
TE, %: 39.5
Reduction, %: 0.0000
Modulus, psi: 31300000
Applied Technical Services
1049 Triad Court
Marietta, GA 30062

Metals Tensile w/ Ext.

Reference Number D256979
Customer LEW135
Purchase Order L3937
Material STEEL

Performed By EB
Approved By SM
Test Method ASTM A370-15
Test Date 07/12/2016
Test Setting Metals with Ext - 2 in GL

Sample No.: 3N2,2015.54
Width, in: 0.503
Thickness, in: 0.628
Area, in²: 0.31588
Ultimate, lbf: 20971.6
OS @ .2, lbf: 12270.91
Yield, lbf: 12373.27
Ultimate, psi: 66389.9
OS @ .2, psi: 38846.2
Yield, psi: 39170.2
TE, %: 37.6
Reduction, %: 0.6369
Modulus, psi: 34700000
Applied Technical Services  
1049 Triad Court  
Marietta, GA 30062

**Metals Tensile w/ Ext.**

Reference Number  
D256979

Customer  
LEW135

Purchase Order  
L3937

Material  
STEEL

Performed By  
EB

Approved By  
SM

Test Method  
ASTM A370-15

Test Date  
07/12/2016

Test Setting  
Metals with Ext - 2 in GL

Sample No.:  
4:N1,2015.54  
02.1

Width, in:  
0.503

Thickness, in:  
0.649

Area, in²:  
0.32645

Ultimate, lbf:  
20865.9

OS @ .2, lbf:  
12865.24

Yield, lbf:  
12843.09

Ultimate, psi:  
63917.9

OS @ .2, psi:  
39409.8

Yield, psi:  
39341.9

TE, %:  
40.9

Reduction, %:  
0.0000

Modulus, psi:  
32400000
 Metals Tensile w/ Ext.

Reference Number: D256979
Customer: LEW135
Purchase Order: L3937
Material: STEEL

Performed By: EB
Approved By: SM
Test Method: ASTM A370-15
Test Date: 07/12/2016
Test Setting: Metals with Ext - 2 in GL

Sample No.: 6:S3,2015.54
Width, in.: 0.503
Thickness, in.: 0.633
Area, in²: 0.3184
Ultimate, lbf: 20351.1
OS @ .2, lbf: 11921.67
Yield, lbf: 11974.04
Ultimate, psi: 63916.8
OS @ .2, psi: 37442.4
Yield, psi: 37606.9
TE, %: 37.8
Reduction, %: 0.0000
Modulus, psi: 31900000

STRAIN, %