

# **A. APPENDIX A**

MATERIALS LABORATORY FACTUAL REPORT

Report No. 17-001

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## **B. ACCIDENT INFORMATION**

Place : New Martinsville, West Virginia  
Date : August 27, 2016  
Vehicle : AXLX 1702 Liquid Chlorine Tank Car  
NTSB No. : DCA16SH002  
Investigator : Paul Stancil, RPH-20

## **C. COMPONENTS EXAMINED**

AXLX 1702 Liquid Chlorine Tank Car, DOT 105J500W

## **D. APPENDIX A MECHANICAL TEST RESULTS**



**TEST REPORT**

NATIONAL TRANSPORTATION SAFETY BOARD  
ATTENTION: JOE EPPERSON  
490 L'ENFANT PLAZA EAST SW  
WASHINGTON, DC 20594

DATE: October 21, 2016

PO NO: **VERBAL**

LEHIGH NO: **X-70-34**

PAGE: 1 of 1

MATERIAL: AAR TC-128 GRADE B  
SAMPLE DESIGNATION: (1) SAMPLE: 18" X 0.75" THICK X 28" SECTION REMOVED  
FROM A TANK CAR, REF: AXLX 1702

**CHEMICAL ANALYSIS (%)**

Carbon	0.15
Sulfur	0.016
Nitrogen	0.01
Iron	Balance
Phosphorus	0.009
Silicon	0.33
Manganese	1.17
Chromium	0.16
Nickel	0.10
Molybdenum	0.06
Copper	0.18
Aluminum	0.01
Vanadium	0.06
Cobalt	0.01
Titanium	0.002
Niobium	<0.001
Arsenic	0.004
Tin	0.02
Boron	<0.002

Results are for information only.

Procedure: *QA-CH-P-018 Rev 5 (OES)*  
*QA-CH-P-122 Rev 1 (Leco N)*

**Lehigh Testing Laboratories, Inc.**



Peter M. Engelgau, Principal Chemist



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### MECHANICAL PROPERTIES (Per ASTM A370-15) LONGITUDINAL TENSILES

	<u>L-A</u>	<u>L-B</u>	<u>L-C</u>
Width (inches):	1.502	1.566	1.502
Thickness (inches):	0.500	0.598	0.574
Area (square inches):	0.7510	0.9365	0.8621
Yield Strength (psi): 0.2% offset:	70,600	79,600	70,200
Ultimate Tensile Strength (psi):	98,700	93,800	99,900
Elongation (%) in 8":	17	17	16

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Kenneth M. Petito, Supvr., Mechanical Testing



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**MECHANICAL PROPERTIES (Per ASTM A370-15)**  
**TRANSVERSE TENSILES**

	<u>T-A</u>	<u>T-B</u>	<u>T-C</u>
Width (inches):	1.533	1.515	1.509
Thickness (inches):	0.714	0.711	0.698
Area (square inches):	1.0946	1.0772	1.0533
Yield Strength (psi): 0.2% offset:	79,400	73,100	71,200
Ultimate Tensile Strength (psi):	94,800	99,200	97,900
Elongation (%) in 8":	17	18	18

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### IMPACT PROPERTIES (Per ASTM A370-15) LONGITUDINAL

<u>Lehigh No.</u>	<u>Customer ID.</u>	<u>Test Temp.</u>	<u>Imp. Energy (Ft.-Lb.)</u>	<u>Lat. Exp. (Mils)</u>	<u>Shear (%)</u>
X-70-34	REF: AXLX 1702	Room Temp 70° F	15	9	0
		Room Temp 70° F	15	11	0
		Room Temp 70° F	17	13	0
		<b>AVERAGE:</b>	<b>16</b>	<b>11</b>	<b>0</b>
		0° F	16	12	0
		0° F	18	13	0
		0° F	14	10	0
		<b>AVERAGE</b>	<b>16</b>	<b>12</b>	<b>0</b>
		-50° F	5	1	0
		-50° F	6	2	0
		-50° F	5	2	0
		<b>AVERAGE</b>	<b>5</b>	<b>2</b>	<b>0</b>
		-100° F	4	1	0
		-100° F	4	1	0
		-100° F	3	1	0
<b>AVERAGE</b>	<b>4</b>	<b>1</b>	<b>0</b>		

Specimen Size: 10mm X 10mm

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### IMPACT PROPERTIES (Per ASTM A370-15)

#### LONGITUDINAL

<u>Lehigh No.</u>	<u>Customer ID.</u>	<u>Test Temp.</u>	<u>Imp. Energy (Ft.-Lb.)</u>	<u>Lat. Exp. (Mils)</u>	<u>Shear (%)</u>
X-70-34	REF: AXLX 1702	100°F	25	21	20
		100°F	27	22	20
		100°F	32	25	20
		<b>AVERAGE</b>	<b>28</b>	<b>23</b>	<b>20</b>
		150°F	45	36	50
		150°F	45	35	50
		150°F	43	33	50
		<b>AVERAGE</b>	<b>44</b>	<b>35</b>	<b>50</b>
		200°F	58	48	90
		200°F	62	55	100
		200°F	62	54	100
		<b>AVERAGE</b>	<b>61</b>	<b>52</b>	<b>97</b>

Specimen Size: 10mm X 10mm

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### IMPACT PROPERTIES (Per ASTM A370-15) TRANSVERSE

<u>Lehigh No.</u>	<u>Customer ID.</u>	<u>Test Temp.</u>	<u>Imp. Energy (Ft.-Lb.)</u>	<u>Lat. Exp. (Mils)</u>	<u>Shear (%)</u>
X-70-34	REF: AXLX 1702	Room Temp 70° F	14	7	0
		Room Temp 70° F	14	8	0
		Room Temp 70° F	14	7	0
		<b>AVERAGE:</b>	<b>14</b>	<b>7</b>	<b>0</b>
		0° F	9	4	0
		0° F	10	6	0
		0° F	11	6	0
		<b>AVERAGE</b>	<b>10</b>	<b>5</b>	<b>0</b>
		-50° F	4	1	0
		-50° F	4	1	0
		-50° F	4	1	0
		<b>AVERAGE</b>	<b>4</b>	<b>1</b>	<b>0</b>
		-100° F	4	1	0
		-100° F	3	1	0
		-100° F	3	1	0
<b>AVERAGE</b>	<b>3</b>	<b>1</b>	<b>0</b>		

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X-70-34	REF: AXLX 1702	100°F	20	12	20
		100°F	18	11	20
		100°F	17	10	20
		<b>AVERAGE</b>	<b>18</b>	<b>11</b>	<b>20</b>
		150°F	23	15	50
		150°F	21	14	50
		150°F	21	13	50
		<b>AVERAGE</b>	<b>22</b>	<b>14</b>	<b>50</b>
		200°F	28	21	100
200°F	27	19	100		
200°F	32	23	100		
<b>AVERAGE</b>	<b>29</b>	<b>21</b>	<b>100</b>		

Specimen Size: 10mm X 10mm

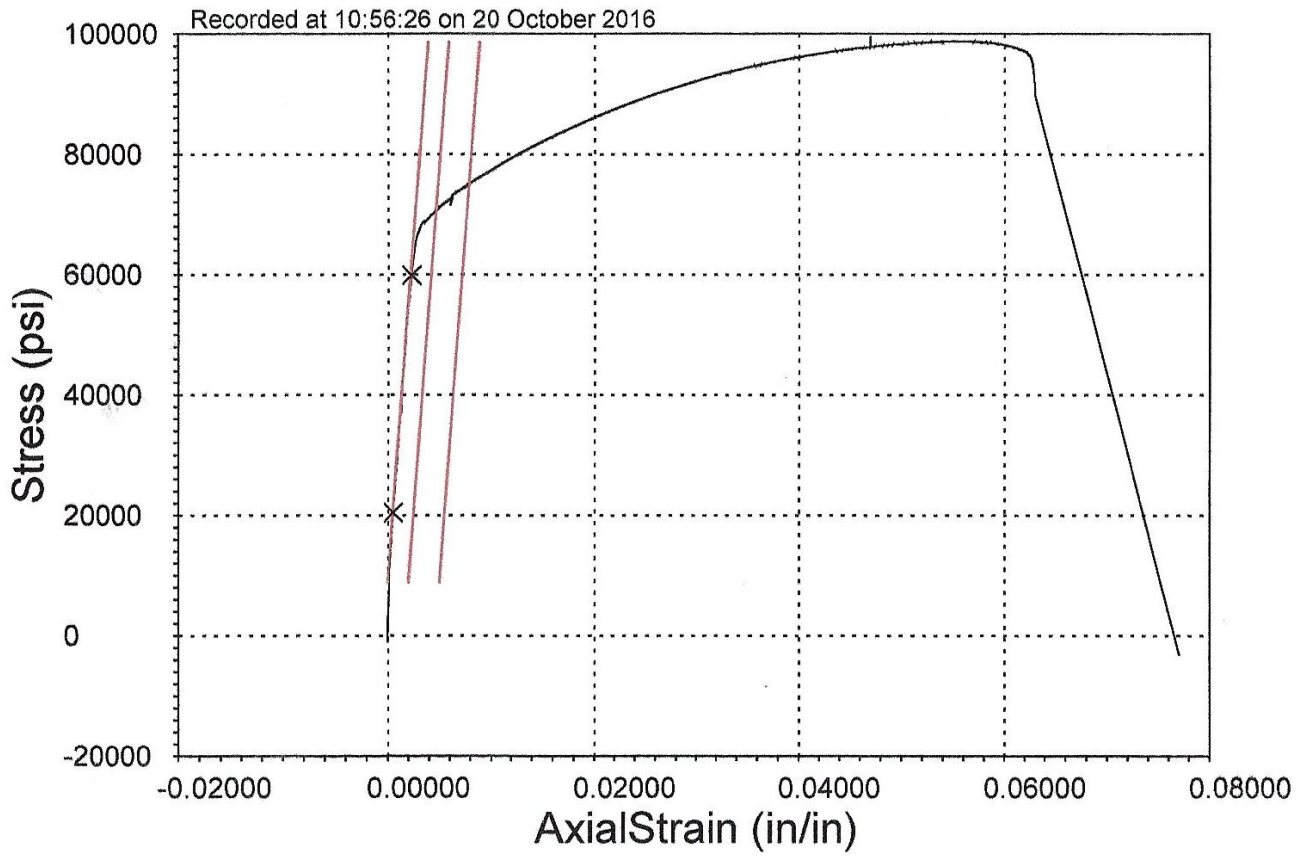
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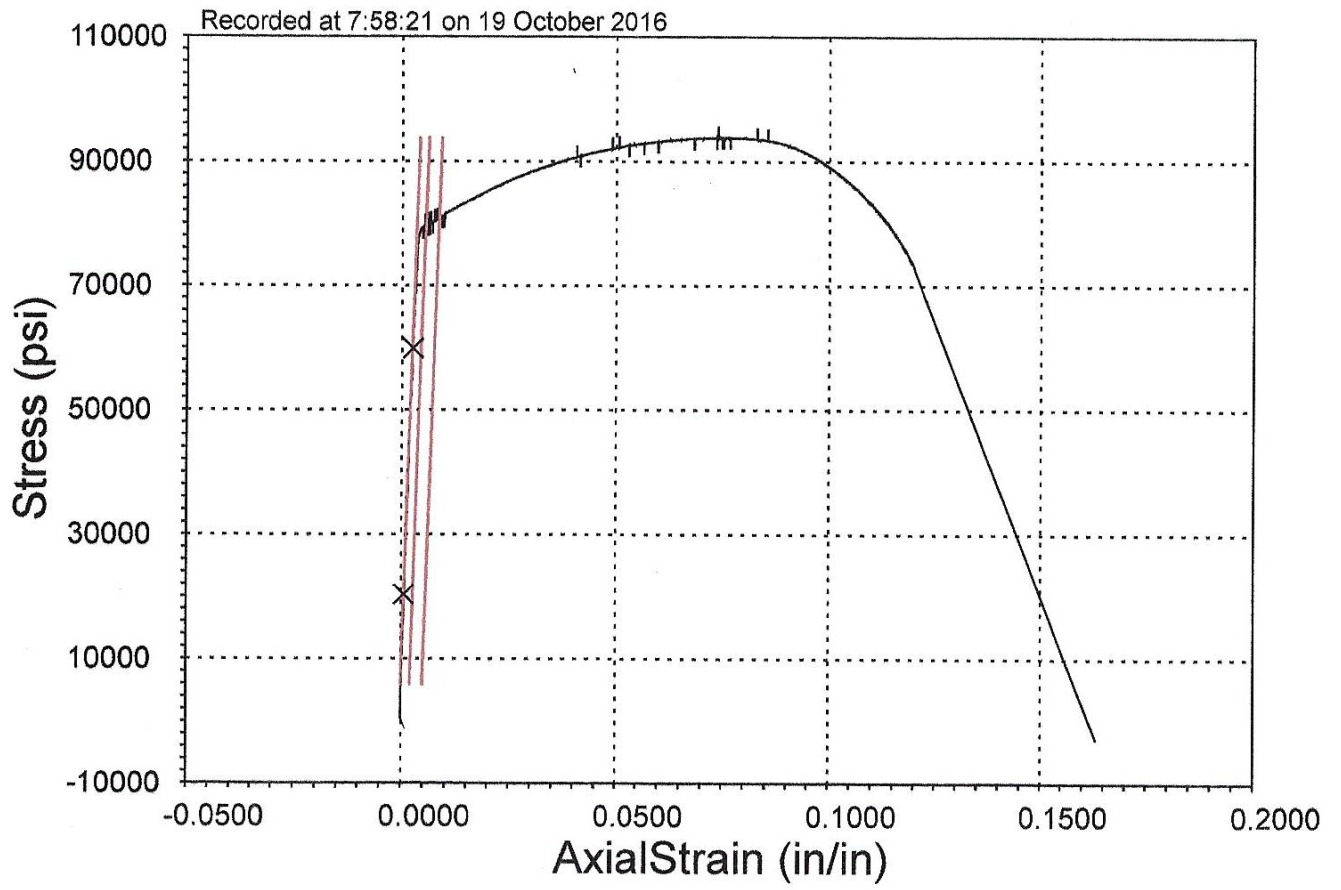


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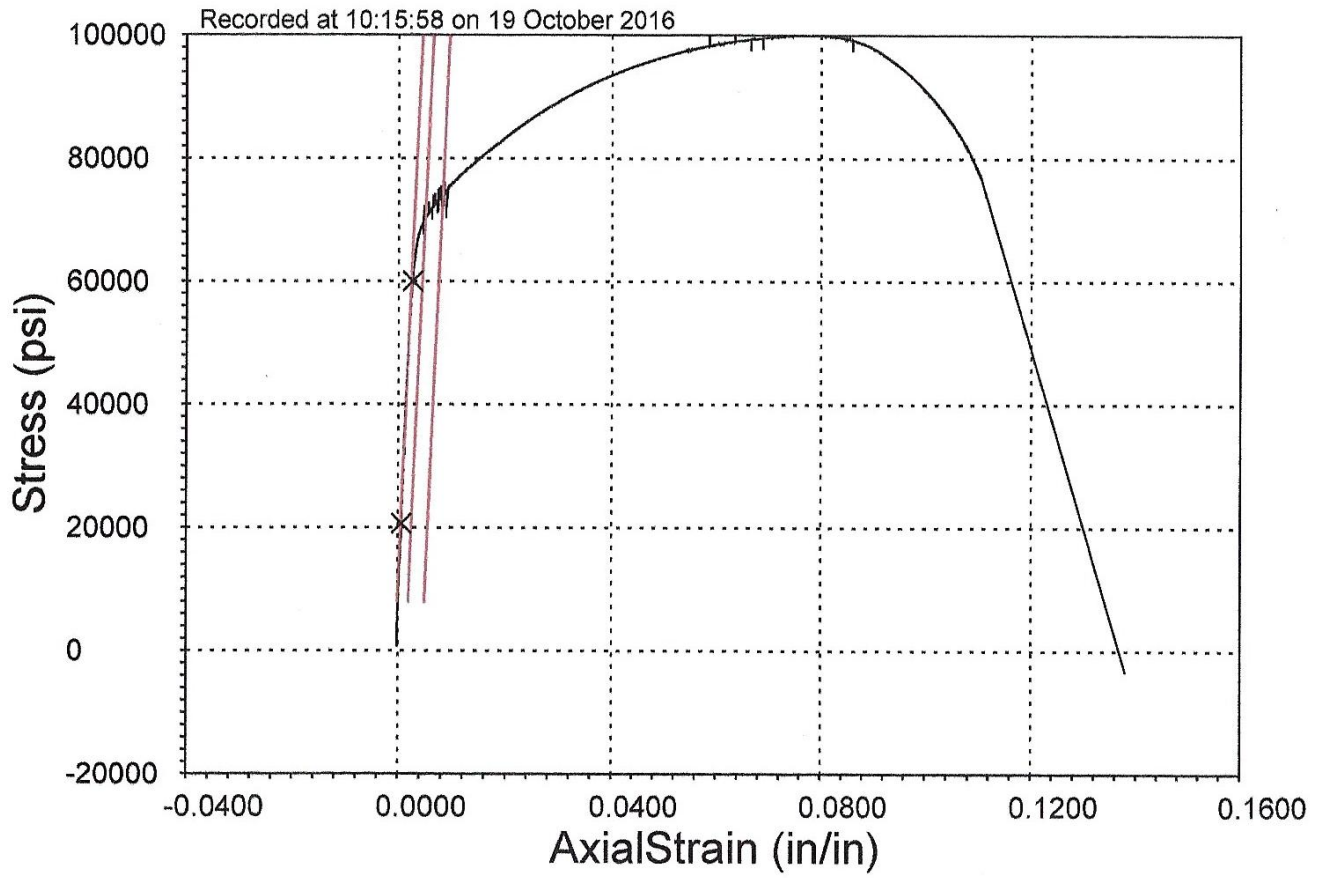




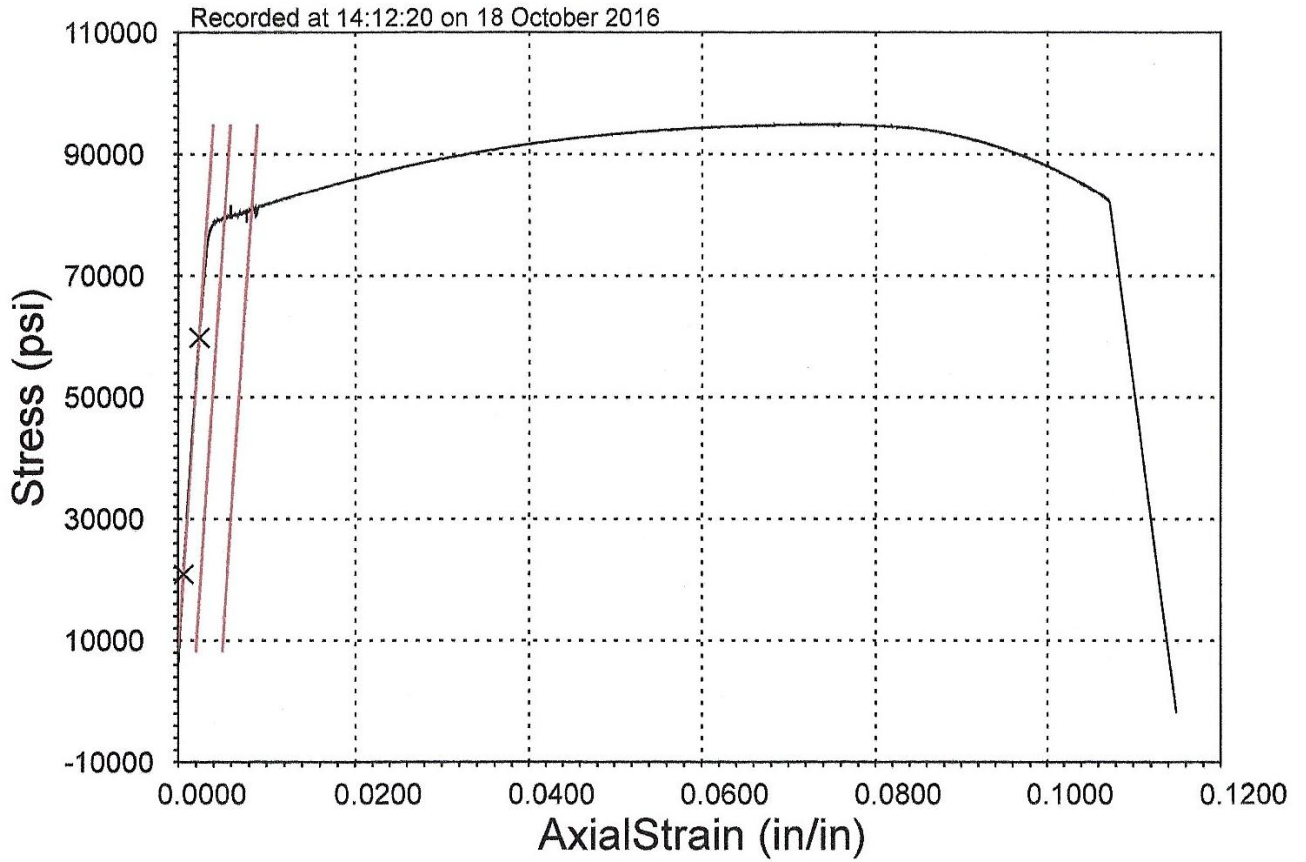
L-A



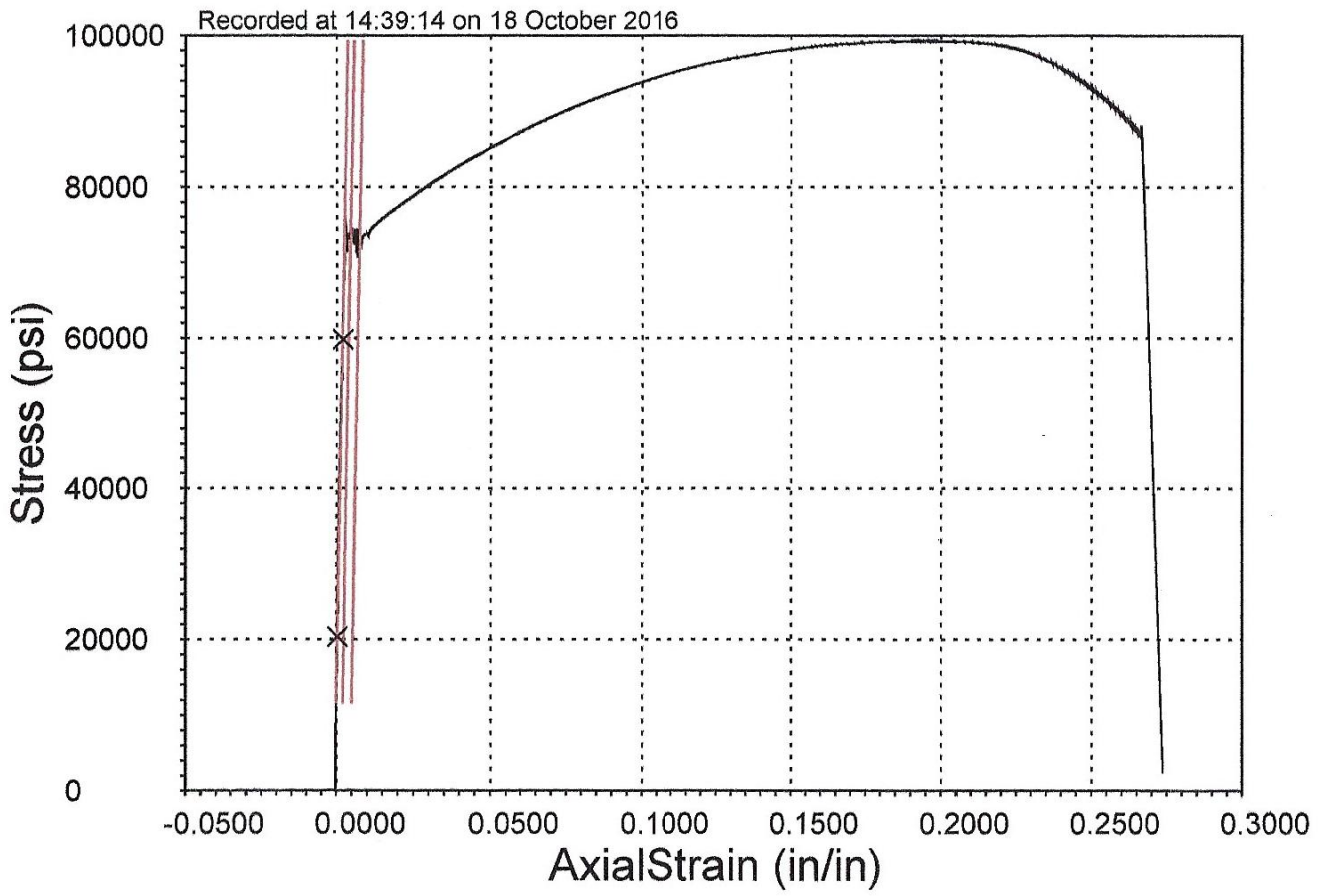
L-B



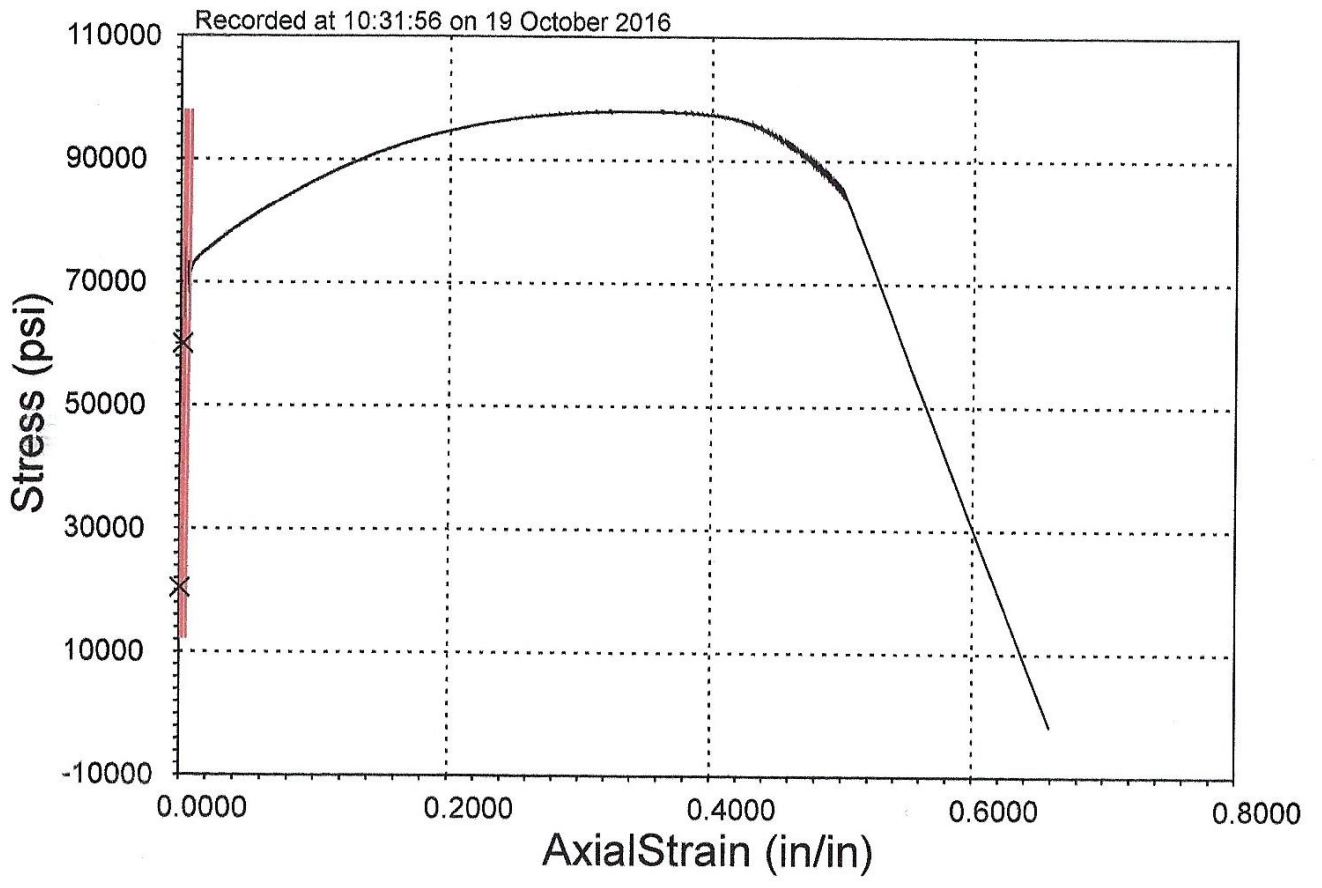
L-C



T-A



T-B



T-C