



## Certified Test Report

<b>CLIENT:</b>	National Transportation Safety Board	<b>CLIENT #:</b>	-
<b>ADDRESS:</b>	490 L'Enfant Plaza SW	<b>PROJECT #:</b>	105664
<b>CITY, STATE</b>	Washington, DC	<b>PURCHASE ORDER #:</b>	Authorization – Mike Budinski
<b>REPORT DATE:</b>	November 22, 2024	<b>CONTACT:</b>	Mike Budinski

**Material Description:** Sections of Tank Car  
**Identification:** NATX 400688 & UTLX 954193  
**Specification:** AAR CIII, Appendix M, Section 5.0: AAR TC128

### TENSILE TEST –ASTM A370 (NATX 400688)

Specimen ID	Dimensions (inches)	Area (in. <sup>2</sup> )	Yield Load (lbf) 0.2% Offset	Yield Strength (psi) 0.2% Offset 50,000 Min.	Ultimate Tensile Load (lbf)	Ultimate Tensile Strength (psi) 81,000 – 101,000	Elongation after Fracture, % (2 in. Gage) 22% Min.	Elongation after Fracture, % (8 in. Gage) 16% Min.
NATX 400688 Longitudinal (1)	1.505 x 0.669	1.0068	70,317	70,000	90,087	89,500	52	25
NATX 400688 Longitudinal (2)	1.503 x 0.666	1.0010	69,238	69,000	89,876	90,000	48	24
NATX 400688 Longitudinal (3)	1.505 x 0.666	1.0023	68,495	68,500	89,641	89,500	44	23
NATX 400688 Transverse (1)	1.503 x 0.669	1.0055	68,932	68,500	90,290	90,000	50	26
NATX 400688 Transverse (2)	1.505 x 0.670	1.0084	68,855	68,500	90,107	89,500	45	24
NATX 400688 Transverse (3)	1.504 x 0.669	1.0062	66,009	65,500	90,112	89,500	46	25

*Summary of Testing: Reported results pertain only to samples submitted for testing.  
 The samples  meet /  do not meet the specified requirement.*



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Material Description: Sections of Tank Car  
 Identification: NATX 400688 & UTLX 954193  
 Specification: AAR CIII, Appendix M, Section 5.0: AAR TC128

## TENSILE TEST –ASTM A370 (UTLX 954193)

Specimen ID	Dimensions (inches)	Area (in. <sup>2</sup> )	Yield Load (lbf) 0.2% Offset	Yield Strength (psi) 0.2% Offset 50,000 Min.	Ultimate Tensile Load (lbf)	Ultimate Tensile Strength (psi) 81,000 – 101,000	Elongation after Fracture, % (2 in. Gage) 22% Min.	Elongation after Fracture, % (8 in. Gage) 16% Min.
UTLX 954193 Longitudinal (1)	1.503 x 0.637	0.9574	46,731	49,000	76,029	76,000	46	25
UTLX 954193 Longitudinal (2)	1.501 x 0.633	0.9501	48,879	51,500	76,159	80,000	50	26
UTLX 954193 Longitudinal (3)	1.502 x 0.635	0.9538	49,598	52,000	76,252	80,000	46	26
UTLX 954193 Transverse (1)	1.501 x 0.635	0.9531	52,727	55,500	75,840	79,500	51	25
UTLX 954193 Transverse (2)	1.500 x 0.635	0.9525	53,649	56,500	75,781	79,500	48	24
UTLX 954193 Transverse (3)	1.502 x 0.635	0.9538	54,076	56,500	75,765	79,500	49	24

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### CHEMICAL ANALYSIS (%), ASTM E415

	C	Mn	S	P	Si	Cr	Mo	V	Ni	Nb	Al	Ti	Cu	Sn
MAX	0.26	1.70	0.015	0.025	0.45	-	-	-	-	0.04 <sup>1</sup>	0.060	0.020	0.35	0.020
MIN	-	1.00	-	-	0.13	-	-	-	-	-	0.015	-	-	-
NATX 400688	0.22	1.36	0.002	0.007	0.26	0.08	0.04	0.06	0.14	< 0.01	0.017	0.002	0.27	0.014
UTLX 954193	0.18	1.32	< 0.001	0.007	0.35	0.17	0.06	0.06	0.02	< 0.01	0.035	0.003	0.03	0.008

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<sup>1</sup> Product analysis per ASTM A20



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### CHARPY IMPACT TEST (V-NOTCH) – ASTM A370 (NATX 400688) – Test

Notch Location	Test Temperature (° F)	Absorbed Energy (FT-LBS)	Lateral Expansion (in.)	Percent Shear, %
Base Metal (Longitudinal)	-30	36	0.025	50
Base Metal (Longitudinal)		53	0.028	90
Base Metal (Longitudinal)		47	0.030	75
Base Metal (Longitudinal)		50	0.016	90
Base Metal (Longitudinal)		50	0.040	90
<b>AVERAGE</b>			47	-

- <sup>1</sup> – Indicates unbroken specimen
- <sup>2</sup> – Indicates unbroken specimen with absorbed energy above 80% machine capacity
- <sup>3</sup> – Indicates unbroken specimen exceeded machine capacity
- <sup>4</sup> – Indicates approximate value

*Summary of Testing: Reported results pertain only to samples submitted for testing.*



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### CHARPY IMPACT TEST (V-NOTCH) – ASTM A370 (NATX 400688)

Notch Location	Test Temperature (° F)	Absorbed Energy (FT-LBS)	Lateral Expansion (in.)	Percent Shear, %
Base Metal (Transverse)	-30	64	0.036	80
Base Metal (Transverse)		50	0.028	90
Base Metal (Transverse)		49	0.028	90
Base Metal (Transverse)		36	0.027	50
Base Metal (Transverse)		49	0.026	90
<b>AVERAGE</b>			50	-

- <sup>1</sup> – Indicates unbroken specimen
- <sup>2</sup> – Indicates unbroken specimen with absorbed energy above 80% machine capacity
- <sup>3</sup> – Indicates unbroken specimen exceeded machine capacity
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### CHARPY IMPACT TEST (V-NOTCH) – ASTM A370 (UTLX 954193)

Notch Location	Test Temperature (° F)	Absorbed Energy (FT-LBS)	Lateral Expansion (in.)	Percent Shear, %
Base Metal (Longitudinal)	-30	102	0.045	80
Base Metal (Longitudinal)		75	0.060	100
Base Metal (Longitudinal)		45	0.037	90
Base Metal (Longitudinal)		51	0.040	100
Base Metal (Longitudinal)		89	0.068	100
<b>AVERAGE</b>			72	-

- <sup>1</sup> – Indicates unbroken specimen
- <sup>2</sup> – Indicates unbroken specimen with absorbed energy above 80% machine capacity
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*Figure 1 - NATX 400688 Microstructure, Surface, Longitudinal Direction, 200X Magnification*



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*Figure 2 - NATX 400688 Microstructure, Surface, Longitudinal Direction, 500X Magnification*

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*Figure 3 - NATX 400688 Microstructure, Longitudinal Direction, Centerline, 200X Magnification*

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*Figure 4 - NATX 400688 Microstructure, Longitudinal Direction, Centerline, 500X Magnification*

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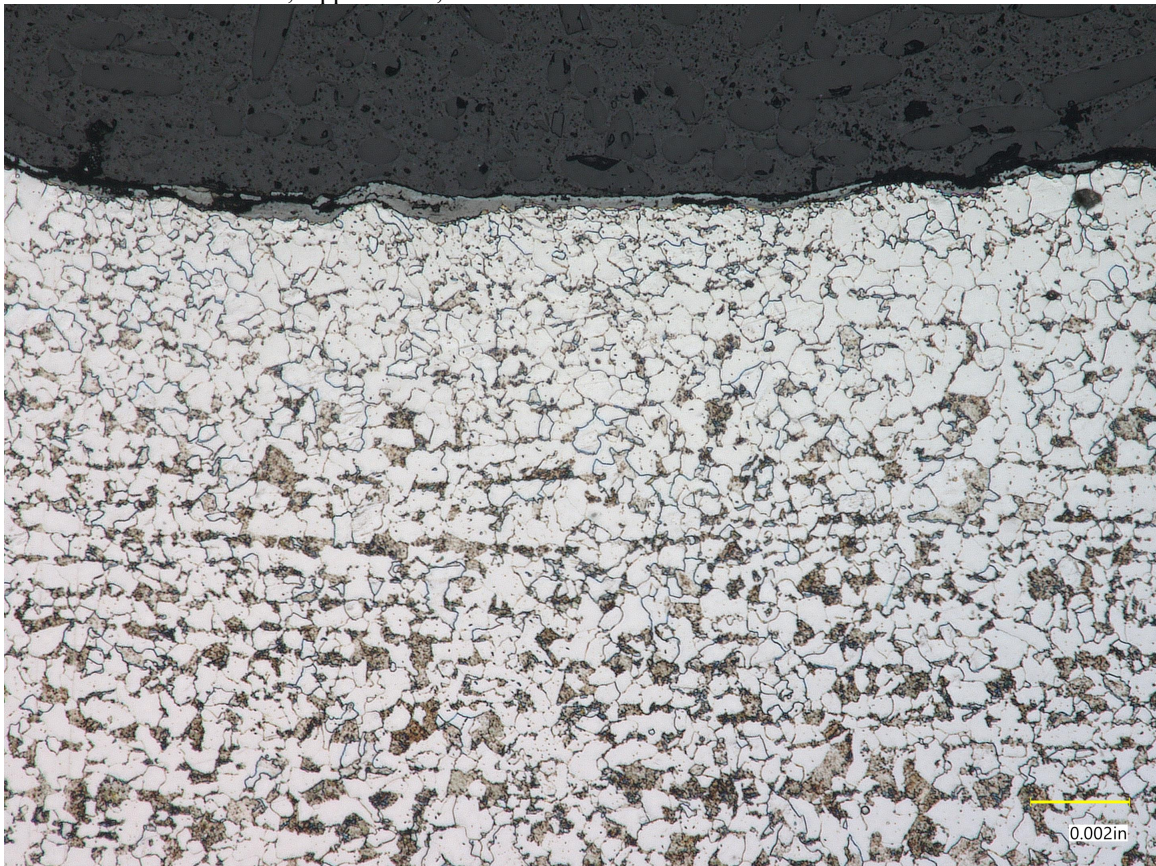


*Figure 5 - UTLX 954193 Microstructure, Longitudinal Direction, Surface, 200X Magnification*

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*Figure 6 - UTLX 954193 Microstructure, Longitudinal Direction, Surface, 500X Magnification*

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*Figure 7 - UTLX 954193 Microstructure, Longitudinal Direction, Centerline, 200X Magnification*

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*Figure 8 - UTLX 954193 Microstructure, Longitudinal Direction, Centerline, 500X Magnification*