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Report No. 131195-01

Sulfide Stress Cracking Testing of TDZ Coating Systems  
P.O. No. 4512835952

Eva Coronado, Ph.D.  
Corrosion Laboratory Manager

December 15, 2020

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## INTRODUCTION

This report presents the results of sulfide stress cracking (SSC) Method A test of TDZ coating systems that you requested, and which was performed by Element Materials Technology (Element). The testing was conducted on 4140 85K yield base metal. Element received 1" OD x 70" LG bar identified as MS-004643-03. Base material MTR documents were provided by the client and they are attached to this report as Appendix A. None of the test results in Appendix A were generated by Element. The coating systems are listed below:

<u>Grade</u>	<u>Coating System Details</u>	<u>Specimen ID</u>
4140	None	545, 552
4140	A / 1.5-2 mil Total TDZ & 1 mil Armorplex / Blue	546 – 548 & 553 – 555
4140	B / 1.5-2 mil Total TDZ & 1 mil Sealer Only / Grey	549 – 551 & 556 – 558

Element was asked to perform SSC tests in accordance with NACE Standard TM0177 Method A using two different test environments. The details are listed below. Test temperature was 75°F, and test duration was 720 hours.

<u>Environment</u>	<u>Specimen ID</u>	<u>Test Solution</u>	<u>Initial pH</u>	<u>Test Gas</u>	<u>Applied Stress</u>
1	545 – 551	Solution A	2.6 – 2.8	100% H <sub>2</sub> S	66% SMYS
2	552 – 558	Solution B	3.4 – 3.6	35% H <sub>2</sub> S / CO <sub>2</sub>	66% SMYS

## SSC METHOD A TEST SPECIMENS

Fourteen (14) standard Method A test specimens were machined from the sample. The specimens were prepared using a low-stress grinder and an automatic longitudinal polisher for the gauge section preparation. A 1000 grit emery cloth was used as the final polishing step. Twelve (12) of the specimens were sent to Atomic Alloys, LLC for coating with two

TDZ coating systems. A representative picture of uncoated and coated specimens is shown in Figures 1 through 3.



**Figure 1: Uncoated test specimen before exposure.**



**Figure 2: Test specimen with Coating A (1.5-2 mil total TDZ & 1 mil Armorplex) before exposure.**

**ARMORGALV® ARMORPLEX BLUE™**



**Figure 3: Test specimen with Coating B (1.5-2 mil total TDZ & 1 mil Sealer only) before exposure.**

**ARMORGALV® - AG3000 -**

After machining and/or coating, the specimens were degreased with alkaline detergent cleaner, followed by a two-step solvent rinse with ethanol and acetone, and warm-air dried. Adequacy of degreasing was determined in accordance with ASTM F 21.

## LOAD APPLICATION

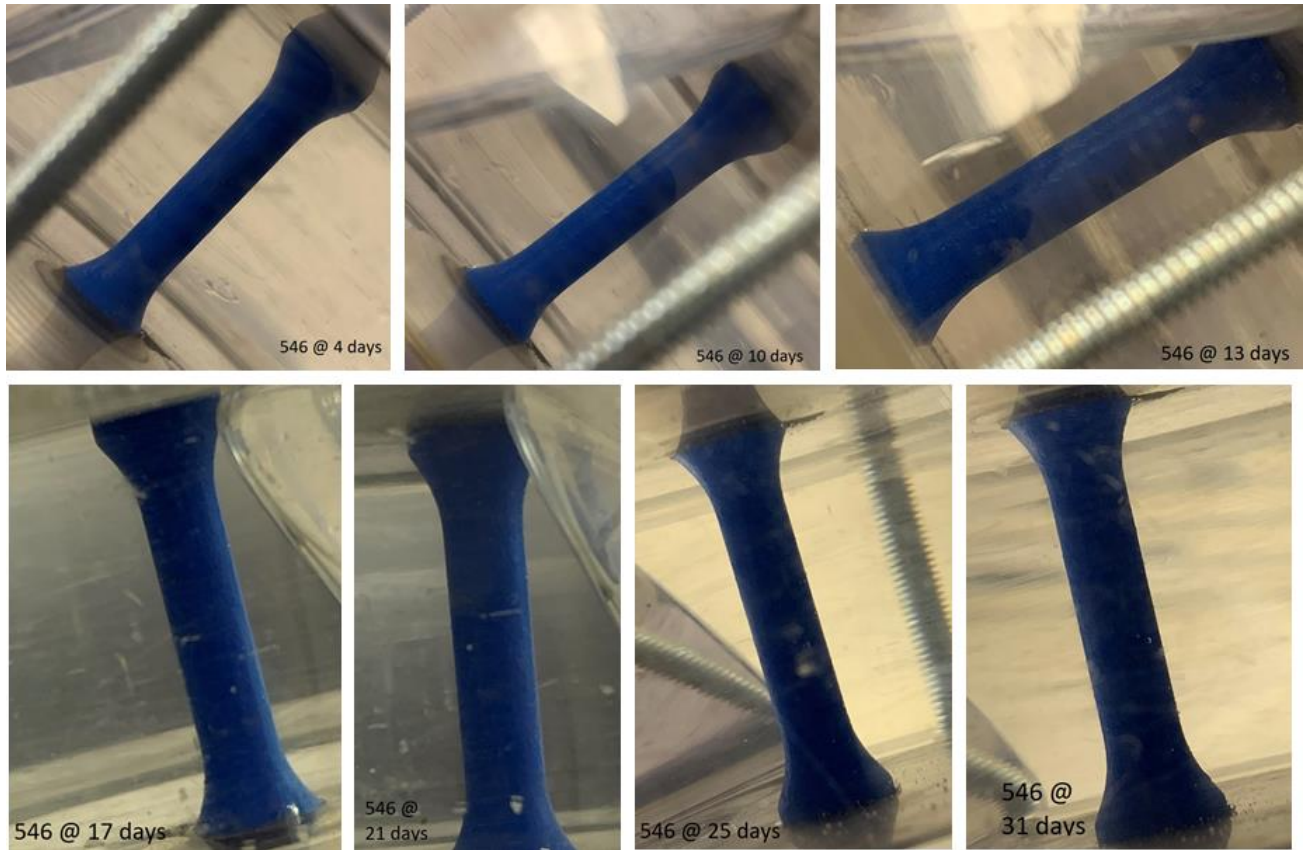
After degreasing, the specimens were sealed in the test cells. The specimens were stressed to 66 percent of the specified minimum yield strength (SMYS). The SMYS was 85 ksi.

The test cells were then deaerated with nitrogen for minimum 1 hour with a flow rate of 500 mL/min before introducing the test solution.

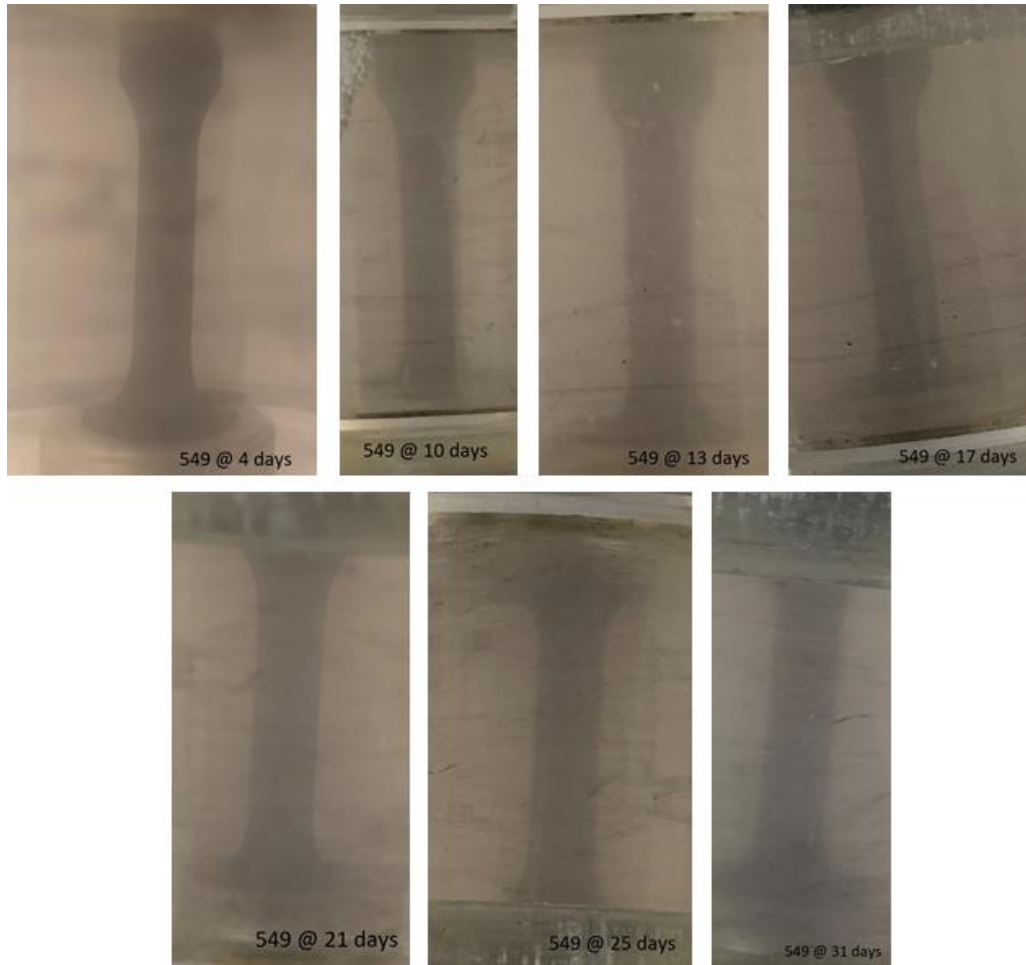
## TEST CONDITION

De-ionized water and reagent grade chemicals were used for the test solution preparation. The test solutions were then deaerated with nitrogen over the weekend with a flow rate of 500 mL/min. The deaerated solution was transferred into each cell, and they were further deaerated with nitrogen for one hour at a flow rate of 500 mL/min. After deaeration, the flow was switched to the test gas at a flow rate of 500 mL/min for one hour and then at a reduced maintenance flow rate for the remainder of the test period (720 hours). The test gas was 100% H<sub>2</sub>S (14.7 psi ppH<sub>2</sub>S) in the case of environment 1 and 35% H<sub>2</sub>S (5 psi ppH<sub>2</sub>S) with balance of CO<sub>2</sub> in the case of environment 2.

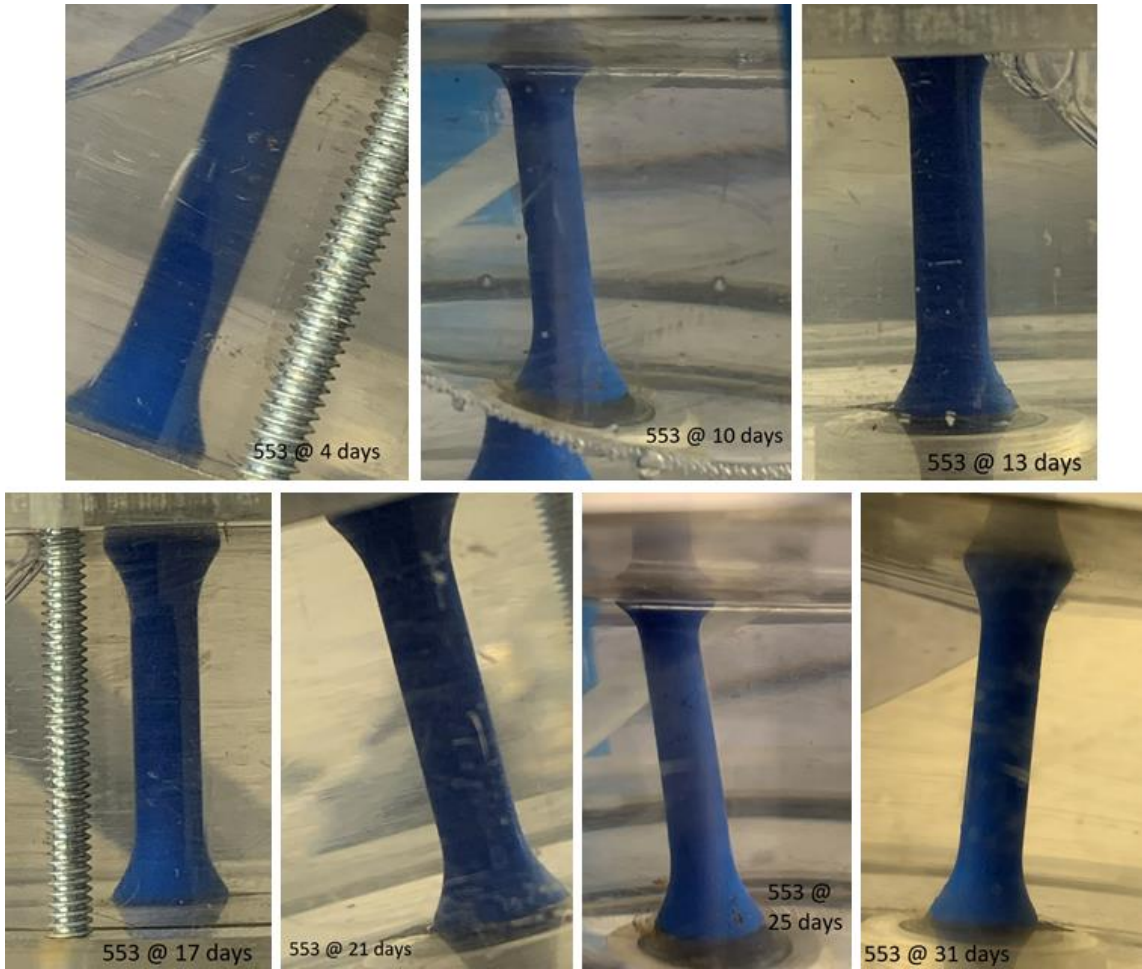
One specimen per coating system and environment was photographed at approximately 100-hour intervals. The pictures are shown in Figures 4 through 7.



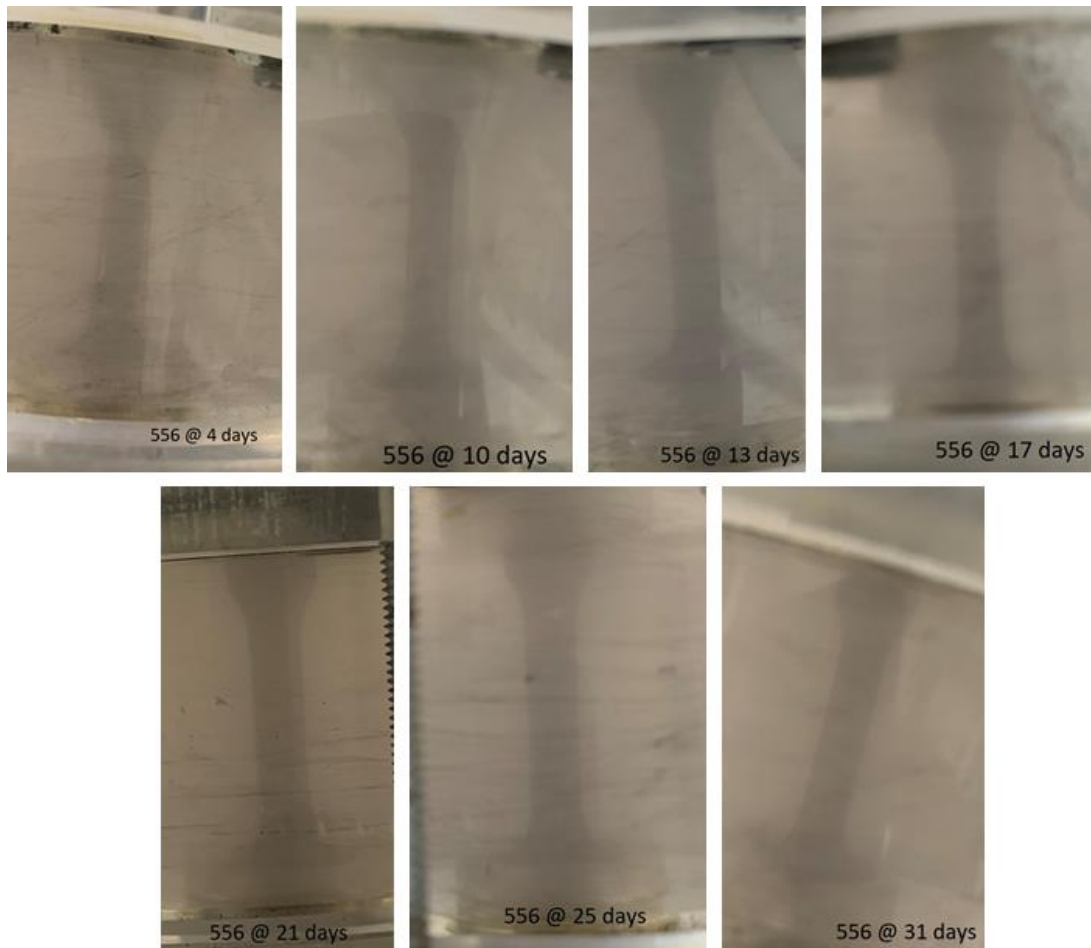
**Figure 4: Test specimen 546 with Coating A (1.5-2 mil total TDZ & 1 mil Armorplex) at 100-hour exposure intervals in environment 1.**



**Figure 5: Test specimen 549 with Coating B (1.5-2 mil total TDZ & 1 mil Sealer only) at 100-hour exposure intervals in environment 1.**



**Figure 6: Test specimen 553 with Coating A (1.5-2 mil total TDZ & 1 mil Armorplex) at 100-hour exposure intervals in environment 2.**



**Figure 7: Test specimen 556 with Coating B (1.5-2 mil total TDZ & 1 mil Sealer only) at 100-hour exposure intervals in environment 2.**

## RESULTS AND CONCLUSIONS

At the end of the test, the final pH from each cell was measured and the H<sub>2</sub>S concentration of the last cell was measured. The cells were then purged with nitrogen at a flow rate of 500 mL/min for 30 minutes to remove the H<sub>2</sub>S. The initial pH, final pH and H<sub>2</sub>S concentration (cH<sub>2</sub>S) and test results are listed in Table 1 below. The specimens were then removed from the cells, cleaned and visually evaluated. Figures 8 and 9 show all specimens after the exposure. Figures 10 through 13 show representative detail of reduced section of one specimen per coating system and environment at 20X magnification.



**Table 1: Test Results Details**

Environment	Specimen ID	Initial pH	Final pH	Final cH <sub>2</sub> S (mg/L)	Result
1	545 (Uncoated)	2.6	3.2	2812*	Pass
	546 (Coating A)	2.6	2.6		Pass
	547 (Coating A)	2.6	2.6		Pass
	548 (Coating A)	2.6	2.7		Pass
	549 (Coating B)	2.6	2.7		Pass
	550 (Coating B)	2.6	3.0		Pass
	551 (Coating B)	2.6	2.9		Pass
2	552 (Uncoated)	3.4	3.5	1045**	Pass
	553 (Coating A)	3.4	3.4		Pass
	554 (Coating A)	3.4	3.4		Pass
	555 (Coating A)	3.4	3.4		Pass
	556 (Coating B)	3.4	3.4		Pass
	557 (Coating B)	3.4	3.4		Pass
	558 (Coating B)	3.4	3.4		Pass

Note: \* Minimum cH<sub>2</sub>S for environment 1 (100% H<sub>2</sub>S / 14.7 psi ppH<sub>2</sub>S) is 2300 mg/L.

\*\* Minimum cH<sub>2</sub>S for environment 2 (35% H<sub>2</sub>S balance CO<sub>2</sub> / 5 psi ppH<sub>2</sub>S) is 805 mg/L.

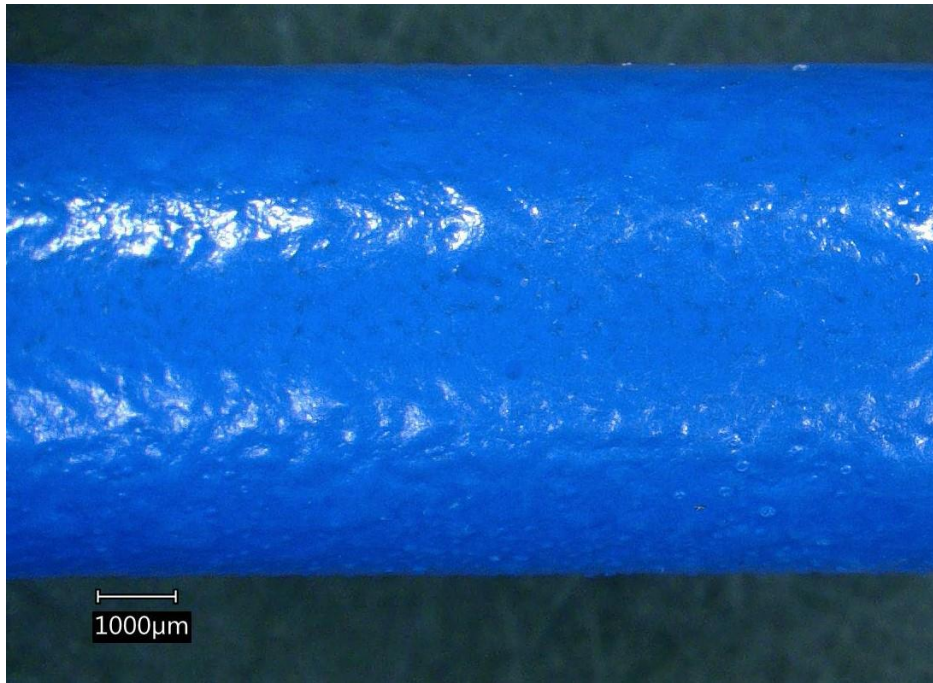
**All specimens passed the test.**



**Figure 8: Test specimens after the 720-hour exposure in environment 1.**



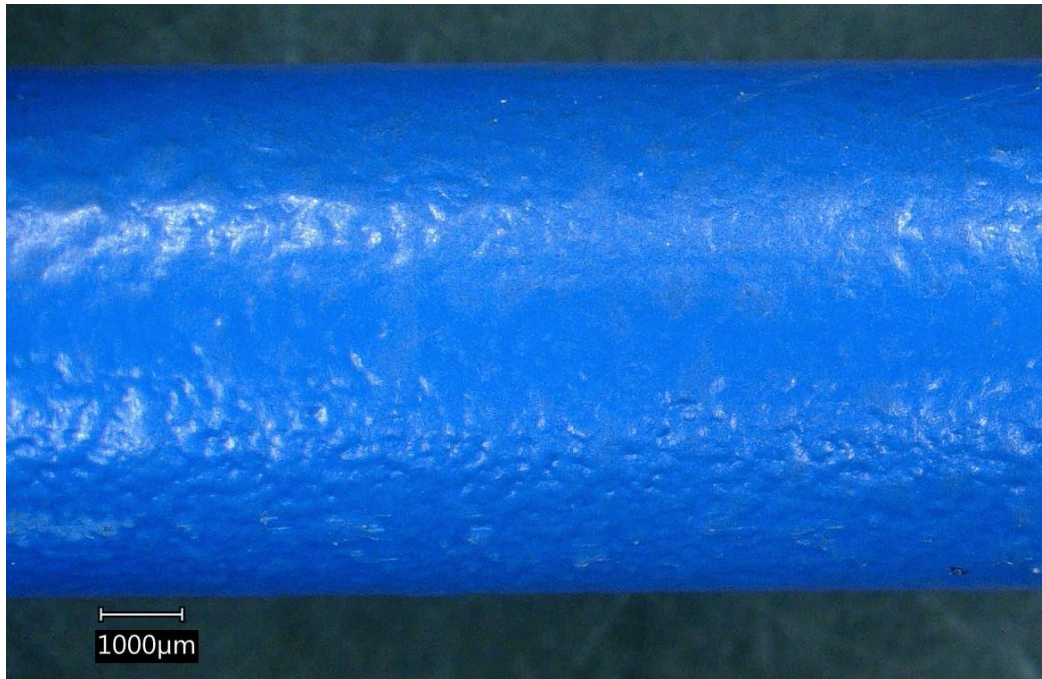
**Figure 9: Test specimens after the 720-hour exposure in environment 2.**



**Figure 10: Test specimen 546 with Coating A (1.5-2 mil total TDZ & 1 mil Armorplex) after exposure in environment 1, at 20X magnification.**



**Figure 11: Test specimen 549 with Coating B (1.5-2 mil total TDZ & 1 mil Sealer only) after exposure in environment 1, at 20X magnification.**



**Figure 12: Test specimen 553 with Coating A (1.5-2 mil total TDZ & 1 mil Armorplex) after exposure in environment 2, at 20X magnification.**



**Figure 13: Test specimen 556 with Coating B (1.5-2 mil total TDZ & 1 mil Sealer only) after exposure in environment 2, at 20X magnification.**

Please call us if you have questions about this information or if we may serve you further.

Sincerely,



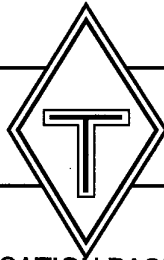
Eva Coronado, Ph.D.  
Corrosion Laboratory Manager

Telephone : (713) 696-6384  
E-mail : [eva.coronado@element.com](mailto:eva.coronado@element.com)

## Appendix A

Base material (1" OD x 70" LG bar identified as MS-004643-03) MTR documents.  
Note: None of the test results were generated by Element

# TURN



# TECH

INCORPORATED

CERTIFICATION PACKAGE FOR

PO# 4512709729-120

THIS CERTIFICATION PACKAGE INCLUDES THE FOLLOWING:

< 9 >	<input checked="" type="checkbox"/>	<u>CHEMICAL CERTIFICATION(S)</u>
< 10 >	<input checked="" type="checkbox"/>	<u>PHYSICAL CERTIFICATION(S)</u>
< 11 >	<input type="checkbox"/>	<u>HARDNESS CERTIFICATION-WITNESS</u>
< 12 >	<input type="checkbox"/>	<u>FURNACE CHART(S)</u>
< 13 >	<input type="checkbox"/>	<u>STRESS RELIEVE CERTIFICATION</u>
< 14 >	<input checked="" type="checkbox"/>	<u>DESCRIPTIVE HEAT TREAT REPORT</u>
< 15 >	<input checked="" type="checkbox"/>	<u>CERTIFICATE OF COMPLIANCE</u>
< 16 >	<input type="checkbox"/>	<u>NITRIDE CERTIFICATION</u>
< 17 >	<input type="checkbox"/>	<u>WELD CERTIFICATION(S)</u>
< 18 >	<input checked="" type="checkbox"/>	<u>VISUAL EXAMINATION CERTIFICATION(S)</u>
< 19 >	<input type="checkbox"/>	<u>VOLUMETRIC NDE (U/T) CERTIFICATION(S)</u>
< 20 >	<input type="checkbox"/>	<u>SURFACE NDE CERTIFICATION(S) (M/P AND/OR L/P)</u>
< 21 >	<input type="checkbox"/>	<u>SURFACE NDE PRIOR TO WELD CERTIFICATION(S)</u>
< 22 >	<input type="checkbox"/>	<u>POSITIVE MATERIAL INSPECTION (P.M.I.)</u>
< 24 >	<input type="checkbox"/>	<u>COATING CERTIFICATION(S)</u>
< 25 >	<input type="checkbox"/>	<u>PRE-MANUFACTURING MEETING</u>
< 26 >	<input type="checkbox"/>	<u>RADIOGRAPH CERTIFICATION(S)</u>
< 27 >	<input type="checkbox"/>	<u>BOND INTEGRITY/FUSION LINE (U/T) CERTIFICATION(S)</u>
< 28 >	<input type="checkbox"/>	<u>OVERLAY THICKNESS (EDDY CURRENT)</u>
< 29 >	<input type="checkbox"/>	<u>THIRD PARTY INSPECTION WITNESS FORM(S)</u>
< 30 >	<input type="checkbox"/>	<u>SET-OUT SHEET(S)</u>
< 31 >	<input type="checkbox"/>	<u>PROPRIETARY THREAD CERTIFICATION(S)</u>
< 32 >	<input type="checkbox"/>	<u>STRESS/LOAD TEST CERTIFICATION(S)</u>
< 33 >	<input type="checkbox"/>	<u>HYDRO-STATIC TEST CERTIFICATION(S)</u>
< 34 >	<input type="checkbox"/>	<u>RUBBER MOLD CERTIFICATION(S)</u>
< 53 >	<input type="checkbox"/>	<u>PLATING CERTIFICATION</u>

INSPECTED AND PACKAGED BY:

DATE:

08/21/20

ISO Certified

32007 Industrial Park Dr.  
Pinehurst, TX 77362

Phone: (281) 356-1290  
E-mail: turn-tech@turn-tech.com





# Certificate of Compliance

Order 01875100  
Customer TURN-TECH INC  
Customer PO 97438  
Size 1.250 ROUND BAR  
Grade HF 4140 (217-237)  
Heat Number H11805912WX  
Lot Number 481385  
Specification MS-4643-03 REV 02  
Customer PT# LG MS-004643-03

Quantity 1 PC 0'-70.50", 1 PC 0'-74"

- 1) Sigma Tube & Bar LLC hereby certifies that the material described above and on the attached Test Report(s) complies with the terms of the order contract, as presently agreed upon.
- 2) This order was processed in accordance with Sigma Tube & Bar's Quality Manual Rev F, dated 22 February 2019.
- 3) No weld repair was performed on this material.

Cody Willeford  
Sales Assistant

VNDR: TURN-TECH	VNDR# 10006457
PO# 4512769729-120	CC SER# 01
P/N: 1" OD X 70" LG	MS# 4643-03 REV 02
QP# N/A	HT# H11805912WX-481385
SIGN: <i>Kristen Troquille</i>	CTNG: N/A

089110, 14(88) 79077 +79078



**JIANGYIN XING CHENG SPECIAL STEEL WORKS CO., LTD.**  
 NO.297, BINJIANG (E) ROAD, JIANGYIN CITY, JIANGSU PROVINCE, CHINA PC:214429  
**PRODUCER'S CERTIFICATE OF CHEMICAL AND PHYSICAL ANALYSIS**

- EN10204 3.1

DESCRIPTION OF GOODS: HOT ROLLED AND FORGED ROUND STEEL BARS  
 CONTRACT NO.: XBUSA18303HOU INVOICE NO.: XBUSA18303HOU-2C PO: 212278  
 STEEL IS FREE FROM MERCURY; NO REPAIR WELDING; STEEL IS FREE FROM ANY HARMFUL RADIOACTIVE CONTAMINATION John Deere

Grade	Batch No.	Heat No.	Size(mm)	Size(inch)	Bundles	Pieces	Weight(MT)	Length(Feet)	Condition of Delivery	Manufacture Process	Free from mercury and any harmful radioactive contamination; NO weld repair.																
ISI4140QT P11	M1811670	H11805912WX	31.75	1.25	3	190	7.92	22	Q+T	EAF+LF+VD+CC+HR																	
C	Si	Mn	P	S	Cu	Ni	Cr	V	Mo	Al	Ca	H	DI(°)	*0001													
MIN- 0.40	0.15	0.75	0.000	0.000	0.00	0.00	0.90	0.00	0.15	0.020	0.0000	0.0000	5.5	0.000													
MAX- 0.43	0.35	1.00	0.025	0.025	0.25	0.25	1.10	0.05	0.25	0.050	0.0099	0.0003	99.0	0.040													
Ladle 0.41	0.26	0.94	0.017	0.004	0.12	0.17	1.05	0.01	0.23	0.026	0.0006	0.0001	6.6	0.021													
Non-Metallic Inclusion													Macro			Grain Size								Dimension		Visual	
A(T) A(H) B(T) B(H) C(T) C(H) D(T) D(H) Ds S O S R C													I/16"		Jominy Test (HRC)												
Max 2.5 2 2 1.5 2 1.5 2 1.5 2 1.5 2 2 2 2													min 5		1 2 3 4 5 6 7 8								OK		OK		
actual 1.0 0.0 0.5 0.5 0.0 0.0 0.5 0.5													max 8		5160 5160 5460 5359 5359 5258 5057												
actual 1.0 0.0 0.5 0.0 0.0 0.0 0.5 0.0													actual 6.5		9 10 11 12 13 14 15 16												
actual 1.0 0.0 0.5 0.0 0.0 0.0 0.5 0.5													actual minmax		4756 4455 4154 3953								UT		Surface		
actual 1.0 0.0 0.5 0.0 0.0 0.0 0.5 0.0													Reduction Ratio actual		56 55 54 53												
actual 1.0 0.0 0.5 0.0 0.0 0.0 0.5 0.0													actual 128.8		18 20 22 24 26 28 30 32								OK		OK		
actual 1.0 0.0 0.5 0.0 0.0 0.0 0.5 0.0													actual minmax		3651 3448 3446 3344												
AVG 1.0 0.0 0.5 0.1 0.0 0.0 0.5 0.2													actual		50 46.5 45 43												
Normalizing		Cooling Media		Austenitizing			Quenching Media		Temp of Quench Media(F)		Tempering		Cooling Method after Tempering		Furnace Hearth Survey & Calibration		Stress Relieving			Furnace Type	Heat Treat Lot						
Temp.(F)	Tolerance	Time(Min)	Temp.(F)	Tolerance	Time(min)	Media	Starting	Finishing	Temp.(F)	Tolerance	Time(min)	Temp.(F)	Tolerance	Time(Min)	Date	Standard	Temp.(F)	Tolerance	Time(Min)	Continuous	M1811670						
			1697	±9	10	Water	77	93.2	1112	±18	330			Air	2017.9.17	AMS-2750											
Mechanical Properties (Longitudinal)													Hardness														
Specimen Location	Yield			Tensile 4D	YS/TS	Elong 2"	Reduct of Area	Specimen Location	Yield			Tensile 4D	YS/TS	Elong 2"	Reduct of Area	Test Location	BEN	Test Location	BHN	Test Location	Test Location	Test Location					
	0.2% offset	0.5% EUL	0.60%						0.2% offset	0.5% EUL	0												min	max	min	max	min
Core	min	110		140		15	45		min					Surface	min	285	1/2R	min	269								
	max	140		160				max							max	341		max									
actual		135		148	0.912	20	56	actual						actual		313		actual		311		actual					
actual		136		148	0.917	21	57	actual						actual		311		actual		311		actual					
actual								actual						actual				actual				actual					
actual								actual						actual				actual				actual					
actual								actual						actual				actual				actual					
actual								actual						actual				actual				actual					
actual								actual						actual				actual				actual					

VNDR: TURN-TECH VNDR# 10006457  
 PO# 4512769729-120 CC SER# 01  
 P/N : 1" OD X 70" LG MS# 4643-03 REV 02  
 QP# N/A HT# H11805912WX-481385  
 SIGN: Kristen Troquille CTNG: N/A



**JIANGYIN XING CHENG SPECIAL STEEL WORKS CO., LTD.**  
 NO.297, BINJIANG (E) ROAD, JIANGYIN CITY, JIANGSU PROVINCE, CHINA PC:214429  
**PRODUCER'S CERTIFICATE OF CHEMICAL AND PHYSICAL ANALYSIS**

-- EN10204 3.1

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Grade	Batch No.	Heat No.	Size (mm)	Size (inch)	Bundles	Pieces	Weight (MT)	Length (Feet)	Condition of Delivery	Manufacture Process	Free from mercury and any harmful radioactive contamination; NO weld repair.											
AISI4140QT P11	M1811670	H11805912WX	31.75	1.25	3	190	7.92	22	Q+T	EAF+LF+VD+CC+HR												
Energy Charpy Impact Test (10x10x55mm V Notch)																						
Specimen Location	Long.			Long.			Long.			Long.			Specimen Location									
	77 F	Shear Zone	Lateral Expans	32 F	Shear Zone	Lateral Expans	14 F	Shear Zone	Lateral Expans	20 F	Shear Zone	Lateral Expans			Shear Zone	Lateral Expans		Shear Zone	Lateral Expans		Shear Zone	Lateral Expans
	ft-lbs	%	mm	ft-lbs	%	mm	ft-lbs	%	mm	ft-lbs	%	mm		ft-lbs	%	mm	ft-lbs	%	mm	ft-lbs	%	mm
Core	min	40		30			1			20				min								
	max									737				max								
actual	77	0.74	75	69	0.68	65	69	0.71	70	59	0.66	65	actual									
actual	74	0.76	70	68	0.70	70	70	0.69	70	65	0.63	60	actual									
actual	76	0.75	75	68	0.71	75	68	0.65	65	61	0.62	60	actual									
actual													actual									
actual													actual									
actual													actual									
actual													actual									
actual													actual									
actual													actual									
Note	Acc. to ASTM A29-16, A322-13, A304-16, A751-14a, ASTM E381-17, E112-13, E8-16a, E10-15a, E45-13, ASTM A370-17, A255-10(14); UT test acc. to ASTM A388 S1; Acc. to ASTM E709-15 or TT, ET, MFLT, Co-Al Treated; Fine grain, fully killed; Nonmetallic inclusion type A-informative purpose; Temperature Control: Contact Thermocouple, Apply to up to 5". ASTM A434-15 Class BD. AISI4140/42; This certificate is written according to EN 10204 3.1 Melted and Manufactured in China, Tensile specimen: RND. 12.5mm, Gage length: 2inch, Charpy specimen: 10x10x55mm.; Stress Free. Hot Rolled, Special Quality Alloy Steel Bars. Steel is free from Mercury contamination, Steel is free from any harmful contamination, No Weld Repairs.; *0001=P+S																					
Remark																						

QUALITY MANGER: Bai Yun

VNDR: TURN-TECH  
 PO# 4512769729-120  
 P/N : 1" OD X 70" LG  
 QP# N/A  
 SIGN: Kristen Traquille

VNDR# 10006457  
 CC SER# 01  
 MS# 4643-03 REV 02  
 HT# H11805912WX-481385  
 CTNG: N/A

# SPECIALTY HEAT TREAT, INC.

## CERTIFICATE OF HEAT TREATMENT

CUST NO:	S196	CUST PH:	281-369-5525		
CUST NAME:	SIGMA TUBE & BAR LLC	CUST PO:	S 01875100 01 SR		
CUST ADDR:	14315 W. HARDY RD. HOUSTON, TX 77060	CUST HN:	H11805912WX		
QUANTITY:	3	MATL:	4140	WGT:	52
LOCATION:	NS-2			STICKER #:	99568
DATE RECD:	7-22-20	DUE DATE:	7-29-20		

DESC:

LT# M1811670

1 1/4"OD X 1 @ 70 1/2"LG; 1 @ 80"LG; 1 TP @ 7"LG

PROCESS INSTRUCTIONS: HEAT TREAT PER MS-004643-03 REV 02

PROCESSED AS FOLLOWS IN A BATCH FURNACE:

MCS: 1 1/4"

CONTROLLED BY FURNACE INSTRUMENT

PROCESS	TIME	TEMP IN DEG F	COOLING METHOD
HARDEN	3 HOURS	1575	QUENCHED TO QUENCH TEMPERATURES
OIL QUENCHED		106-114	
TEMPER	4 HOURS	1290	A/C TO AMBIENT

HARDNESS: CK 6" PROLONGATION (2 PLCS) = 237-237 HBW; CK TP = 237-237 HBW  
CK 1 PC(s) = 228 HBW/P

MECHANICAL PROPERTIES OF A 0.503" DIA TP PER ACCU-TEST LAB #: 936235.00

CORE

TENSILE	YIELD .2% OFF	ELONG IN 2"	REDUCTION
111,200 PSI	96,400 PSI	25.4 %	63.2 %

CHARPY IMPACTS 10X10 MM

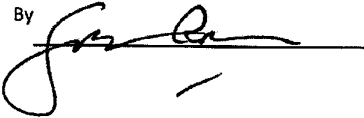
CORE

DIRECTION	TEMPERATURE	FT/LBS	MILS LAT EXP	%SHEAR-%D/F
LONGITUDINAL	-20 °F	97-102-94	70-73-68	100-100-100

HT LOT# 481385

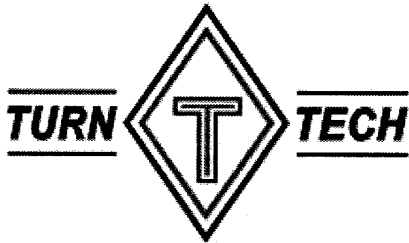
ALL MATERIALS ON THIS ORDER WERE PROCESSED IN ACCORDANCE  
WITH OUR QUALITY MANUAL SHT 01.2 REV 2

SPECIALTY HEAT TREAT, INC.

By 

VNDR: TURN-TECH  
PO# 4512769729-120  
P/N: 1" OD X 70" LG  
QP# N/A  
SIGN: *Kristen Troquille*

VNDR# 10006457  
CC SER# 01  
MS# 4643-03 REV 02  
HT# H11805912WX-481385  
CTNG: N/A



# TURN-TECH, INC.

32007 INDUSTRIAL PARK DRIVE

PINEHURST, TEXAS 77362

## Certificate of Conformance

From: Turn-Tech, Inc

Packing List No: 64189

Today's Date: 08/21/20

Shipping Date: 08/21/20

PO Number: 4512769729

Item #: 120

Part Number: 1" OD X 70" LG MS-004643-03

Material Specification: MS-4643-03 REV 02

Quality Plan: None

Coating Certification: None

<u>Quantity</u>	<u>Shipped</u>	<u>Unit</u>	<u>Description</u>	<u>Job Number</u>
1	EA		1" OD X 70" LG MS-004643-03 1" OD X 70" LG MS-004643-03	79077

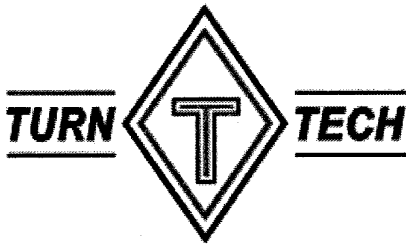
VNDR: TURN-TECH  
PO# 4512769729-120  
P/N: 1" OD X 70" LG  
QP# N/A  
SIGN: *Kristen Troquille*

VNDR# 10006457  
CC SER# 01  
MS# 4643-03 REV 02  
HT# H11805912WX-481385  
CTNG: N/A

We hereby certify that the above mentioned parts meet the requirements of all drawings and specifications listed on the above purchase order, including material, heat treatment, plating and special procedures as applicable.

***Clete Jaeger***

Authorized Signature  
Turn-Tech, Inc



**Turn-Tech, Inc**  
32007 INDUSTRIAL PARK DRIVE  
PINEHURST, TX 77362  
Phone: 281-356-1290  
Fax: 281-356-1293

**Visual Examination Certification**

From: Turn-Tech, Inc  
32007 INDUSTRIAL PARK DRIVE  
PINEHURST, TX 77362

Report Date: 08/20/20  
PO Number: 4512769729      Item #: 120  
Part Number: 1" OD X 70" LG MS-004643-03  
Drawing No: None      Weld Specification: None  
Heat No: H11805912WX-481385      Material Specification: MS-4643-03 REV 02  
Procedure: X-008060 REV 06      Quality Specification: None  
Coating Specification: None

<u>Quantity</u>	<u>Description</u>	<u>Job Number</u>
1 Pcs.	1" OD X 70" LG MS-004643-03 1" OD X 70" LG MS-004643-03	79077

Area(s) Examined:

THIS IS A VISUAL EXAMINATION AFTER FINAL MACHINING FOR SN# 01.

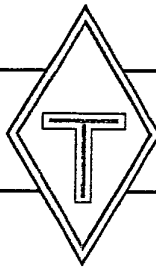
VNDR: TURN-TECH	VNDR# 10006457
PO# 4512769729-120	CC SER# 01
P/N : 1" OD X 70" LG	MS# 4643-03 REV 02
QP# N/A	HT# H11805912WX-481385
SIGN: <i>Kristen Troguille</i>	CTNG: N/A

1 Pcs. Examined

1 Pcs. Accepted

Inspected By: *[Signature]*

**TURN**



**TECH**

INCORPORATED

**QUALIFIED INSPECTION METHOD VISUAL EXAMINATION PERSONNEL**

**ALL TESTING DONE IN ACCORDANCE WITH CAMERON**

**X-008060 REV 06**

ID NUMBER	NAME	QUALIFIED THRU DATES LISTED
<T>2	LORENZO NUNEZ	11/19-11/20
<T>7	SONNY SEBASTIAN	11/19-11/20
<T>9	JORGE GARCIA	11/19-11/20
<T>12	FERNANDO SANCHEZ	11/19-11/20
<T>14	ROBERTO ESPINOZA	11/19-11/20
EMP# 345	CLETE JAEGER	11/19-11/20
<T>10	JUAN LONGORIA	11/19-11/20
<T>15	LUIS MATA	03/20-03/21
<T>17	EDUARDO PENAFIEL	11/19-11/20
EMP# 573	BLAKE URBANOSKY	12/19-12/20

CERTIFIED BY:

JORGE GARCIA

Q.A. MANAGER

*Jorge Garcia*

DATE

Mar 2020

VNDR: TURN-TECH  
PO# 4512769729-120  
P/N: 1" OD X 70" LG  
QP# N/A  
SIGN: *Kristen Proquille*

VNDR# 10006457  
CC SER# 01  
MS# 4643-03 REV 02  
HT# H11805912WX-481385  
CTNG: N/A

**ISO Certified**

32007 Industrial Park Dr.  
Pinehurst, TX 77362

Phone: (281) 356-1290  
E-mail: turn-tech@turn-tech.com

# Hardness Value Report

Job# 79077

Turn-Tech, Inc.

SHEET 1 OF 1

PART #:	1" OD X 70" LG MS-004643-03
MACH DET:	None
PROC:	X-008065 REV 09

QUANTITY:	1
MS #:	MS-4643-03 REV 02
HEAT #:	H11805912WX-481385
QP #:	None
DESC:	1" OD X 70" LG MS-004643-03
HARDNESS PERFORMED PER BOM & DWG	

MATERIAL HARDNESS RANGE: 217-237 HB

TESTING TYPE (A, B, OR C): HBW

AMBIENT TEMPERATURE: 71°F

EMPLOYEE #: T-14

SERIAL#  
↓  
HARDNESS VALUE  
↓

1) <u>229</u>	11)	21)	31)	41)	51)	61)	71)	81)	91)
2)	12)	22)	32)	42)	52)	62)	72)	82)	92)
3)	13)	23)	33)	43)	53)	63)	73)	83)	93)
4)	14)	24)	34)	44)	54)	64)	74)	84)	94)
5)	15)	25)	35)	45)	55)	65)	75)	85)	95)
6)	16)	26)	36)	46)	56)	66)	76)	86)	96)
7)	17)	27)	37)	47)	57)	67)	77)	87)	97)
8)	18)	28)	38)	48)	58)	68)	78)	88)	98)
9)	19)	29)	39)	49)	59)	69)	79)	89)	99)
10)	20)	30)	40)	50)	60)	70)	80)	90)	100)

VANDR: TURN-TECH  
 PO# 4512769729-120  
 P/N: 1" OD X 70" LG  
 QP# N/A  
 SIGN: *Kristen Tompkins*

VANDR# 10006457  
 CC SER# 01  
 MS# 4643-03 REV 02  
 HT# H11805912WX-481385  
 CTNG: N/A

NOTES:

REVIEWED BY:

*Ray E. Guini*

DATE:

8/6/20



TURN-TECH, INC.

CONTROL CHART

JOB# 79077

CUST #:	A916
PO# - ITEM#:	4512769729      ITEM#: 120
QUANTITY:	1

PART #:	1" OD X 70" LG MS-004643-03
MACH. DET.:	None
DESC.:	1" OD X 70" LG MS-004643-03
QP#:	None

MS #:	MS-4643-03 REV 02
HEAT #:	H11805912WX-481385
COATING:	None
WELDING:	None

EMPLOYEE #:

S37

SN

SER #:

1

PRINT DIM. TOLERANCE

1.000	+0.005 -0.000
70.00	±.5

PART DIM. PART DIM. PART DIM. PART DIM. PART DIM. PART DIM. PART DIM. PART DIM. PART DIM.

1.004									
70.500									

GAGE#

INSPECTOR:

*George E. Garcia*

DATE: 8 120 120

SHEET 1 OF 1

VNDR: TURN-TECH  
 PO# 4512769729-120  
 P/N : 1" OD X 70" LG  
 QP# N/A  
 SIGN: *Kristen Troquille*

VNDR# 10006457  
 CC SER# 01  
 MS# 4643-03 REV 02  
 HT# H11805912WX-481385  
 CTNG: N/A