



SERIAL NUMBER: N-081 (P)

MOLD SIZE \_\_\_\_\_ BY \_\_\_\_\_

DATE FURNACED \_\_\_\_\_

ORDER DATE 04 APR 18 SHIP DATE: 18 APR 18 PO NNMAC0897Z

FOR SLB SIZE 2.750 TYPE SK-RC

THREAD 1 1/2 MT OTHER UPDRILL

MATRIX (H) \_\_\_\_\_ WEIGHT \_\_\_\_\_

MATRIX (S) \_\_\_\_\_ WEIGHT \_\_\_\_\_

BINDER \_\_\_\_\_ WEIGHT \_\_\_\_\_

BLANK \_\_\_\_\_ TJ \_\_\_\_\_

BILLET 22-165-500 TUBE \_\_\_\_\_

WELD BY \_\_\_\_\_ MPI BY \_\_\_\_\_ MPI PIC \_\_\_\_\_

THREAD GAGE 46986 STAND OFF .375

FINAL DIAMOND GRIND SIZE 2.750

LENGTH TO WELD \_\_\_\_\_

FINISHED PIC UH SHIPPED BY AH DATE 6/27

SHORT BIT & TOOL CO  
225 GOLD STREET  
GARLAND TX 75042  
972-205-1011  
main@shortbits.com



CERTIFICADO DE CALIDAD DE  
 QUALITY CERTIFICATE  
 MILITARY TEST CERTIFICATE  
 CERTIFICADO DE CALIDAD

Nº 574693

OUR MANAGEMENT SYSTEM IS CERTIFIED TO ISO 9001 / TS 16949 / ISO 14001

NO. FISCAL INVOICE	69862.00	PERIODO DE EJECUCION	CS1 209134	ORDEN DE PRODUCTO	16445557 - 812508050	OTRO PRODUCTO	ALSI 4140	PRODOTTO/PRODUCT	LOT/ALICHI
CLIENTE/CUSTOMER		MATERIAL/INFORMACION	899658	OTRO PRODUCTO	812508050	OTRO PRODUCTO	899658	PRODOTTO/PRODUCT	LOT/ALICHI
CHICAGO STEEL AND IRON - BAR DIVISI		MATERIAL/INFORMACION	899658	OTRO PRODUCTO	812508050	OTRO PRODUCTO	899658	PRODOTTO/PRODUCT	LOT/ALICHI
ANALISIS QUIMICO/ANALISIS DE COMPOSICION		MATERIAL/INFORMACION	899658	OTRO PRODUCTO	812508050	OTRO PRODUCTO	899658	PRODOTTO/PRODUCT	LOT/ALICHI

C	Mn	Si	P	S	Cr	Ni	Mo	V	Cu	Sn	Al	Ti	Nb	N	B	Pb	Ca	H
0.42	0.93	0.28	0.011	0.006	1.02	0.16	0.22	0.004	0.15	0.009	0.026	0.0020	0.005	0.0093	0.0003	0.001	0.0008	0.00020

Elongation	Hardness
9	HB
10.5	302

ANÁLISIS METALÚRGICO/ANÁLISIS METALLOGRÁFICO TESTS							
Austenitic Grain Size							
7							
NO. ROLLO/NO. DE INGENIERIA/NO. DE INGENIERIA							
AI	AH	BT	BH	CT	CH	DT	DH

MATERIALES/INFORMACION																						
S	R	C																				
1	2	1																				
TEMPERATURA DE HARDENABILIDAD																						
DI	DI	1/16	2/16	3/16	4/16	5/16	6/16	7/16	8/16	9/16	10/16	11/16	12/16	13/16	14/16	15/16	16/16	18/16	20/16	22/16	24/16	26/16
0.39	162.38	59.0	59.0	58.0	58.0	58.0	58.0	58.0	58.0	57.0	57.0	57.0	57.0	57.0	56.0	56.0	56.0	55.0	55.0	53.0	52.0	50.0

TEMPERATURA DE HARDENABILIDAD		
28/16	30/16	32/16
HRC	HRC	HRC
49.0	48.0	48.0



C E R T I F I C A T E O F H E A T T R E A T M E N T

LONE STAR HEAT TREATING CORPORATION  
3939 BLAFFER  
HOUSTON, TX 77026

CUSTOMER: BAR SOURCE INTERNATIONAL  
PURCHASE ORDER NO.: 31725

DESCRIPTION: 3 1/2"OD X 357"RL HN 22165500  
TAG# 55453 (10) 55452 (10) 55455 (10) 55456 (10)  
55454 (3) 55580 (10) 55660 (10) 55658 (10)  
55457 (10)

NUMBER OF PARTS: 83 TYPE OF MATERIAL: 4140

SHIPPED ON OUR WO #: 535479 DATE OF ORDER: 12/22/14

HEAT TREATING SPECIFICATIONS:

Q&T & TEST TO BSI SPEC BSI-002 REV 4 UT PER ASTM  
A388 PER SPEC S/C EXTRA BRINELL TEST TENSILE  
CHARPY MAINTAIN TRACEABILITY CERT W/MATL

PROCESS AS FOLLOWS:

HEATED IN A CONTINUOUS FURNACE TO 1601F IN 48.8 MINUTES

WATER SPRAY QUENCHED

HEATED IN A CONTINUOUS FURNACE TO 1154F IN 39.5 MINUTES

INSPECTED 83 PIECES CHECKED 293-311 HBW SURFACE  
CHECKED 302-311 HBW 1" BELOW  
CHECKED 311-311 HBW MID RADIUS

FIVE TEST PIECES PROLONGATION 3 1/2"OD X 14"LG

S/N 535479-03 HN 22165500 MID RADIUS  
MECHANICALS REFERENCED FROM ACCU TEST REPORT 705666.00 REV A  
ATTACHED

S/N 535479-20 HN 22165500 MID RADIUS  
MECHANICALS REFERENCED FROM ACCU TEST REPORT 705667.00 REV A  
ATTACHED

S/N 535479-40 HN 22165500 MID RADIUS  
MECHANICALS REFERENCED FROM ACCU TEST REPORT 705668.00 REV A  
ATTACHED

C E R T I F I C A T E   O F   H E A T   T R E A T M E N T

SHIPPED ON OUR WO #: 535479


DATE OF ORDER: 12/22/14

S/N 535479-60    HN 22165500    MID RADIUS  
MECHANICALS REFERENCED FROM ACCU TEST REPORT 705669.00 REV A  
ATTACHED

S/N 535479-80    HN 22165500    MID RADIUS  
MECHANICALS REFERENCED FROM ACCU TEST REPORT 705670.00 REV A  
ATTACHED

SEE ULTRASONIC TEST REPORT ATTACHED

Furnaces and instruments are calibrated to AMS 2750E. Reported Heat treat times and temperatures are taken from the furnace chart recorder. Our quality system is certified in accordance with AS9100 Cert # 47512. Mechanical testing conforms to the requirements of ASTM A370 and only applies to the sample tested or inspected. Frequency of all testing is dictated by Specification, customer purchase order and our quality manual QM-01 Rev 13. While at Lone Star Heat Treating this material did not come in contact with Mercury nor was it subject to any weld repairs.

LONE STAR HEAT TREATING CORPORATION  
  
Todd Pritchard  
Prod. Mgr.

IN-LINE HARDNESS TEST				FURNACE#	357	
	PO#	31725				
SERIAL	BHN	BHN	BHN	HEAT		
NUMBER	END	MIDDLE	END	NUMBER	LENGTH	BUNDLE
535479-01	302	302	302	22165500	19-5	55454
535479-02	311	302	311	22165500	25-2	55454
535479-03	302	311	302	22165500	28-2	55454
535479-04	302			22165500	29-7	55658
535479-05	311			22165500	29-7	55658
535479-06	311			22165500	29-5	55658
535479-07	302			22165500	29-6	55658
535479-08	302			22165500	29-6	55658
535479-09	302	302		22165500	29-7	55658
535479-10	311	302	311	22165500	29-7	55658
535479-11		302		22165500	29-6	55658
535479-12		302		22165500	29-7	55658
535479-13		302		22165500	19-5	55658
535479-14		302		22165500	29-7	55453
535479-15			302	22165500	29-7	55453
535479-16			311	22165500	29-6	55453
535479-17			302	22165500	29-6	55453
535479-18			302	22165500	29-7	55453
535479-19	311			22165500	29-7	55453
535479-20	302	311	302	22165500	28-4	55453
535479-21	311			22165500	29-7	55453
535479-22	302			22165500	29-8	55453
535479-23	311			22165500	29-7	55453
535479-24	302			22165500	29-7	55660
535479-25		311		22165500	29-7	55660
535479-26		311		22165500	28-10	55660
535479-27		302		22165500	29-7	55660
535479-28		302		22165500	29-7	55660
535479-29			311	22165500	29-7	55660
535479-30	302	311	321	22165500	29-7	55660
535479-31			311	22165500	29-7	55660
535479-32			302	22165500	29-7	55660
535479-33			311	22165500	29-8	55660
535479-34	302			22165500	29-7	55456
535479-35	311			22165500	29-6	55456
535479-36	311			22165500	29-7	55456

				<b>FURNACE#</b>	357	
	<b>PO#</b>	31725				
<b>SERIAL</b>	<b>BHN</b>	<b>BHN</b>	<b>BHN</b>	<b>HEAT</b>		
<b>NUMBER</b>	<b>END</b>	<b>MIDDLE</b>	<b>END</b>	<b>NUMBER</b>	<b>LENGTH</b>	<b>BUNDLE</b>
535479-37	302			22165500	29-6	55456
535479-38	302			22165500	29-6	55456
535479-39	302			22165501	29-6	55456
535479-40	311	302	311	22165501	28-2	55456
535479-41		302		22165502	29-6	55456
535479-42		302		22165502	29-8	55456
535479-43		302		22165503	29-6	55456
535479-44			302	22165503	29-7	55452
535479-45			302	22165504	29-6	55452
535479-46			311	22165504	29-6	55452
535479-47			302	22165505	29-6	55452
535479-48	311			22165505	29-7	55452
535479-49	302	302	302	22165506	29-7	55452
535479-50	302			22165506	29-7	55452
535479-51	302			22165507	29-7	55452
535479-52	302			22165507	29-8	55452
535479-53	311			22165508	29-6	55452
535479-54	302			22165508	29-6	55580
535479-55		302		22165509	29-7	55580
535479-56		302		22165509	29-7	55580
535479-57		302		22165510	29-5	55580
535479-58		302		22165510	29-6	55580
535479-59			302	22165511	29-7	55580
535479-60	302	302	311	22165511	28-1	55580
535479-61			311	22165512	29-7	55580
535479-62			302	22165512	29-6	55580
535479-63			302	22165513	29-7	55580
535479-64			302	22165513	29-5	55457
535479-65			311	22165514	29-7	55457
535479-66		302		22165514	29-7	55457
535479-67		311		22165515	29-1	55457
535479-68		302		22165515	29-3	55457
535479-69		302		22165516	29-3	55457
535479-70	302	302	302	22165516	29-4	55457
535479-71		302		22165517	29-3	55457
535479-72		302		22165517	29-6	55457





LLP P.O. Box 802404 ♦ Houston, TX 77280-2404 ♦ Telephone (713) 460-3655 ♦ FAX (713) 460-3695

Report Date: 01/12/15  
Report No: 705666.00  
Rev.: A  
Cust Acct: LON220

To: Lone Star Heat Treat  
P. O. Box 15621  
Houston, TX 77220-5621

Ordered By: Todd PO#: 535479-03  
Material: 4140 3-1/2"OD x 14"LG test pc  
ID/Heat: 22165500  
Job Info: LSHT Hardness 302-311 HBW

Tensile Test Results

No./Location	Size (In.)	Area (In^2)	Ult. Load (lbs.)	Yield (psi)	Tensile (psi)	Elong. (%)	R. of A. (%)	Hardness
1	.506			126,500	144,400	19.0	58.7	32.2 HRC
	.6% EUL			126,500				

Unless otherwise stated, yield stress is 0.2% offset, gauge length is 2 in. for 1/2 in. bars or 1 in. for 1/4 in. bars.

Charpy Test Results

No.	Temp	Location	Foot-Pounds	% Shear	Mils Lat Exp
1	-20°F	LCVN	64-60-61	100-100-100	32-29-30
2	-20°F	TCVN	31-28-28	70-65-65	22-20-20
3	-4°F	LCVN	71-69-68	100-100-100	28-27-27
4	-4°F	TCVN	31-32-31	65-65-65	20-22-21
5	+50°F	LCVN	70-75-71	100-100-100	45-47-46
6	+50°F	TCVN	45-48-42	90-100-90	26-29-23
7	+72°F	LCVN	71-70-80	100-100-100	43-42-45
8	+72°F	TCVN	46-48-45	100-100-100	37-39-37

Unless otherwise stated, Charpy impact specimens are V-notch 10 x 10 mm.

Mechanical testing performed at mid-radius.

Document

Reviewed By:

*Yvonne Barajas*  
Yvonne Barajas  
Documentation Specialist

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LLP P.O. Box 802404 ♦ Houston, TX 77280-2404 ♦ Telephone (713) 460-3655 ♦ FAX (713) 460-3695

Report Date: 01/12/15  
 Report No: 705667.00  
 Rev.: A  
 Cust Acct: LON220

To: Lone Star Heat Treat  
 P. O. Box 15621  
 Houston, TX 77220-5621

Ordered By: Todd PO#: 535479-20  
 Material: 4140 3-1/2"OD x 14"LG test pc  
 ID/Heat: 22165500  
 Job Info: LSHT Hardness 302-311 HBW

Tensile Test Results								
No./Location	Size (in.)	Area (in <sup>2</sup> )	Ult. Load (lbs.)	Yield (psi)	Tensile (psi)	Elong. (%)	R. of A. (%)	Hardness
1	.506			130,800	148,800	18.4	59.5	32.5 HRC
	.6% EUL			130,100				

Unless otherwise stated, yield stress is 0.2% offset, gauge length is 2 in. for 1/2 in. bars or 1 in. for 1/4 in. bars

Charpy Test Results					
No.	Temp	Location	Foot-Pounds	% Shear	Mils Lat Exp
1	-20°F	LCVN	60-65-63	85-100-100	40-43-41
2	-20°F	TCVN	30-27-27	75-75-75	21-17-18
3	-4°F	LCVN	67-69-67	100-100-100	47-48-47
4	-4°F	TCVN	32-33-35	70-70-70	22-23-25
5	+50°F	LCVN	71-77-71	100-100-100	45-47-44
6	+50°F	TCVN	39-43-40	100-100-100	22-27-26
7	+72°F	LCVN	71-71-71	100-100-100	43-44-44
8	+72°F	TCVN	37-36-39	100-100-100	27-26-28

Unless otherwise stated, Charpy impact specimens are V-notch 10 x 10 mm.

Mechanical testing performed at mid-radius.

Document

Reviewed By:

*Yvonne Barajas*  
 Yvonne Barajas  
 Documentation Specialist

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P.O. Box 802404 ♦ Houston, TX 77280-2404 ♦ Telephone (713) 460-3655 ♦ FAX (713) 460-3695

Report Date: 01/12/15  
 Report No: 705668.00  
 Rev.: A  
 Cust Acct: LON220

To: Lone Star Heat Treat  
 P. O. Box 15621  
 Houston, TX 77220-5621

Ordered By: Todd PO#: 535479-40  
 Material: 4140 3-1/2"OD x 14"LG test pc  
 ID/Heat: 22165500  
 Job Info: LSHT Hardness 302-311 HBW

Tensile Test Results								
No./Location	Size (In.)	Area (In <sup>2</sup> )	Ult. Load (lbs.)	Yield (psi)	Tensile (psi)	Elong. (%)	R. of A. (%)	Hardness
1	.505			133,100	150,500	18.5	56.5	34.3 HRC
	.6% EUL			132,900				

Unless otherwise stated, yield stress is 0.2% offset, gauge length is 2 in. for 1/2 in. bars or 1 in. for 1/4 in. bars.

Charpy Test Results					
No.	Temp	Location	Foot-Pounds	% Shear	Mils Lat Exp
1	-20°F	LCVN	58-59-47	100-100-80	34-34-30
2	-20°F	TCVN	23-21-23	55-50-55	16-15-16
3	-4°F	LCVN	60-60-60	100-100-100	36-36-38
4	-4°F	TCVN	24-26-24	65-65-65	14-15-14
5	+50°F	LCVN	70-69-68	100-100-100	47-44-45
6	+50°F	TCVN	36-38-37	100-100-100	25-27-26
7	+72°F	LCVN	68-65-73	100-100-100	47-46-49
8	+72°F	TCVN	38-37-37	100-100-100	27-26-26

Unless otherwise stated, Charpy Impact specimens are V-notch 10 x 10 mm.

Mechanical testing performed at mid-radius.

Document Reviewed By:

*Yvonne Barajas*  
 Yvonne Barajas  
 Documentation Specialist

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Report Date: 01/12/15  
 Report No: 705669.00  
 Rev.: A  
 Cust Acct: LON220

To: Lone Star Heat Treat  
 P. O. Box 15621  
 Houston, TX 77220-5621

Ordered By: Todd PO#: 535479-60  
 Material: 4140 3-1/2"OD x 14"LG test pc  
 ID/Heat: 22165500  
 Job Info: LSHT Hardness 302-311 HBW

**Tensile Test Results**

No./Location	Size (In.)	Area (In <sup>2</sup> )	Ult. Load (lbs.)	Yield (psi)	Tensile (psi)	Elong. (%)	R. of A. (%)	Hardness
1	.504 .6% EUL			133,500 133,300	150,700	19.0	58.9	34.8 HRC

Unless otherwise stated, yield stress is 0.2% offset, gauge length is 2 in. for 1/2 in. bars or 1 in. for 1/4 in. bars.

**Charpy Test Results**

No.	Temp	Location	Foot-Pounds	% Shear	Mils Lat Exp
1	-20°F	LCVN	57-37-49	85-75-80	28-23-25
2	-20°F	TCVN	25-24-24	70-70-70	17-16-16
3	-4°F	LCVN	62-62-61	100-100-100	36-36-35
4	-4°F	TCVN	25-26-29	70-70-70	18-19-21
5	+50°F	LCVN	69-67-64	100-100-100	41-40-38
6	+50°F	TCVN	36-36-36	100-100-100	23-21-22
7	+72°F	LCVN	71-70-63	100-100-100	45-44-40
8	+72°F	TCVN	36-36-36	100-100-100	22-23-23

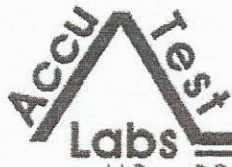
Unless otherwise stated, Charpy Impact specimens are V-notch 10 x 10 mm.

Mechanical testing performed at mid-radius.

Document Reviewed By:

*Yvonne Barajas*  
**Yvonne Barajas**  
 Documentation Specialist

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L.L.P. P.O. Box 802404 ♦ Houston, TX 77280-2404 ♦ Telephone (713) 460-3655 ♦ FAX (713) 460-3695

Report Date: 01/12/15  
Report No: 705670.00  
Rev.: A  
Cust Acct: LON220

To: Lone Star Heat Treat  
P. O. Box 15621  
Houston, TX 77220-5621

Ordered By: Todd PO#: 535479-80  
Material: 4140 3-1/2"OD x 14"LG test pc  
ID/Heat: 22165500  
Job Info: LSHT Hardness 302-311 HBW

**Tensile Test Results**

No./Location	Size (in.)	Area (in <sup>2</sup> )	Ult. Load (lbs.)	Yield (psi)	Tensile (psi)	Elong. (%)	R. of A. (%)	Hardness
1	.504 .6% EUL			128,800 128,700	146,200	19.3	61.2	32.2 HRC

Unless otherwise stated, yield stress is 0.2% offset, gauge length is 2 in. for 1/2 in. bars or 1 in. for 1/4 in. bars.

**Charpy Test Results**

No.	Temp	Location	Foot-Pounds	% Shear	Mils Lat Exp
1	-20°F	LCVN	56-66-59	75-100-75	34-40-37
2	-20°F	TCVN	25-27-26	45-45-45	16-16-17
3	-4°F	LCVN	73-60-71	100-80-85	44-28-40
4	-4°F	TCVN	27-31-29	55-55-55	21-23-22
5	+50°F	LCVN	83-71-84	100-100-100	56-47-57
6	+50°F	TCVN	42-40-43	85-85-85	27-27-28
7	+72°F	LCVN	79-81-87	100-100-100	52-53-54
8	+72°F	TCVN	42-44-46	90-90-90	31-32-35

Unless otherwise stated, Charpy Impact specimens are V-notch 10 x 10 mm.

Mechanical testing performed at mid-radius.

Document Reviewed By:

*Yvonne Barajas*  
Yvonne Barajas  
Documentation Specialist

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3939 Blaffer, Houston, Texas. 77026

731.672.6616 www.lshit.com

### Ultrasonic Certification Report

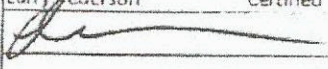
Report Number :	535479	Pc #:	031725 REV 02	Date:	03/31/2015
Company :	Bar Source International				
Specification :	BSI-002 Rev 4				
Acceptance Criteria :	ASTM-A388/ API 6A				

### Ultrasonic Inspection

Equipment :	Sonatest 250	Calibration Date:	12/02/2013	S/N #:	1005128		
Longitudinal:	Size: 1" od	MHZ:	2.25	SN#:	45000		
Shear Wave:	Size:	Deg:		MHZ:		SN#:	
Part Condition :	clean	RMS:	250	Couplant:	cellulose		
Longitudinal Standardization :	80%fsh 1/8" Flat Bottom Hole			Ref DB:	64	DB:	70
Shear Standardization :				Ref DB:		DB:	

Material:	4140				
Heat #:	22165500				
Size:	3 1/2" od x 35 7"-35 8" R/L				
Total Pcs:	93	Acceptable:	83	Rejectable:	0

--

Technician:	Larry Pederson	Certified 3-21-2008	SNT-TC LEVEL II
			

Rev:		Date:	
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This report represents the results obtained from the test and is not to be construed as a guarantee or warranty of the materials listed. Lone Star Heat Treating Corp shall not be held liable for misinterpretation of Conditions, Loss, damage, or Death rising from or attributable to performance of a test. This report applies only to the material tested and or inspected and does not represent the quality of apparently similar or identical material.