



SERIAL NUMBER: N-052-053 COOK DATE: 2/28/17

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

ORDER DATE 20 FEB 18 SHIP DATE: 05 MAR 18 PO \_\_\_\_\_

FOR LB SIZE 5.875 TYPE MZ-36S

THREAD 23/8 DAC OTHER \_\_\_\_\_

MATRIX (H) 1743 WEIGHT 7.12

MATRIX (S) 1786 WEIGHT 3.84

BINDER 23679 WEIGHT 8.7

BLANK 143480 TJ 22165500

BILLET \_\_\_\_\_ SLEEVE- 22085862

WELD BY Allen MPI BY JM MPI PIC JM

THREAD GAGE \_\_\_\_\_ STAND OFF .625

NOTES \_\_\_\_\_

FINAL DIAMOND GRIND SIZE 5.875

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

FINISHED PIC TAKEN BY ALLEN SHIPPED BY JM DATE: 3-7-18

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

|                  |                                   |
|------------------|-----------------------------------|
| Document Number: | F-Q-018                           |
| Revision:        | Orig.                             |
| Date of Origin:  | 8/12/2012                         |
| Manual:          | P-Q-001                           |
| Page:            | PAGE 1 OF 1                       |
| Title:           | MATERIAL PROPERTIES CERTIFICATION |



|                  |                        |
|------------------|------------------------|
| CUSTOMER:        | Short Bits             |
| CUSTOMER PO#:    | VICKIE E MAIL 12-08-17 |
| ITEM ID:         | PWMP010                |
| ITEM DESCRIPTION | MP MATRIX POWDER H     |
| ITEM LOT #       | MPW1743                |
| DATE             | 12/11/2017             |
| WEIGHT           | 100 lb.                |

| CHEMICAL COMPOSITION<br>(Weight Percent) |         |         |         |
|------------------------------------------|---------|---------|---------|
| Element                                  | Minimum | Maximum | RESULT  |
| Total Carbon (Tc)                        | 5.4     | 5.90    | 5.65    |
| Free Carbon (Fc)                         | -       | 0.04    | 0.03    |
| Iron (Fe)                                | -       | 1.00    | 0.02    |
| Nickel (Ni)                              | 1.5     | 2.50    | 2.01    |
| Tungsten (T)                             |         |         | Balance |

| PRODUCT SIZING<br>(Weight Percent) |         |         |        |
|------------------------------------|---------|---------|--------|
| Sieve                              | Minimum | Maximum | RESULT |
| (U.S. Standard Mesh per ASTM B214) |         |         |        |
| +80                                | 4.0     | 8.0     | 5.8    |
| -80 + 120                          | 13.0    | 17.0    | 15.5   |
| -120+ 170                          | 13.0    | 17.0    | 14.7   |
| -170 + 230                         | 13.0    | 17.0    | 15.1   |
| -230 + 325                         | 13.0    | 17.0    | 15.7   |
| -325                               | 29.00   | 37.00   | 33.2   |

| PHYSICAL PROPERTIES                |         |           |        |
|------------------------------------|---------|-----------|--------|
| Testing Procedure                  | Minimum | Maximum   | RESULT |
| Apparent Density ASTM B212 (g/cc)  | 7.2     | 8.1       | 7.2    |
| Tap Density ASTM B527 (g/cc)       | 9.2     | 10.4      | 10.3   |
| Hall Flow Rate ASTM B213 (sec/50g) |         | Must Flow | 12.8   |

|                  |                                   |
|------------------|-----------------------------------|
| Document Number: | F-Q-018                           |
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|                  |                                  |
|------------------|----------------------------------|
| CUSTOMER:        | Short Bits                       |
| CUSTOMER PO#:    | VICKIE E MAIL 1-18-18            |
| ITEM ID:         | PWCTPM002                        |
| ITEM DESCRIPTION | CTPM CRYSTALLINE W 80 X 325 MESH |
| ITEM LOT #       | MPW1786                          |
| DATE             | 1/22/2018                        |
| WEIGHT           | 100 lb.                          |

| CHEMICAL COMPOSITION<br>(Weight Percent) |         |         |        |
|------------------------------------------|---------|---------|--------|
| Element                                  | Minimum | Maximum | RESULT |
| Tungsten (W)                             | 99.5    | -       | 99.99  |

| PRODUCT SIZING<br>(Weight Percent) |         |         |        |
|------------------------------------|---------|---------|--------|
| Sieve                              | Minimum | Maximum | RESULT |
| (U.S. Standard Mesh per ASTM B214) |         |         |        |
| +80                                | -       | 5.0     | 0.3    |
| -80 + 325                          | -       | -       | 92.5   |
| -325                               | -       | 10.00   | 7.2    |

| PHYSICAL PROPERTIES                |         |           |        |
|------------------------------------|---------|-----------|--------|
| Testing Procedure                  | Minimum | Maximum   | RESULT |
| Apparent Density ASTM B212 (g/cc)  | 7.2     | 9.2       | 8.4    |
| Tap Density ASTM B527 (g/cc)       | 9.0     | 10.5      | 9.8    |
| Hall Flow Rate ASTM B213 (sec/50g) |         | Must Flow | 9.2    |



330 Belmont Avenue, Brooklyn, NY 11207-4000 U.S.A  
tel: +1.718.342.4900 fax: +1.718.342.0175

## Certificate of Analysis

September 06, 2017

To: Short Bits & Tool  
225 Gold Street  
Garland, TX 750426648 USA

Customer Order No: Verbal/Vicki

Customer ID: SHORTC

Sales Order No: 28918

Material: 4483D

BELMONT *Virgin Grade Binder Alloy*

Shape: 1/2" x 1/2" x 3/4" Tumbled Sheared Pcs.

Packaging: 250 Lb. Drums

Lot: 23679

|                |        |
|----------------|--------|
| Copper (Cu)    | 47.68  |
| Manganese (Mn) | 23.60  |
| Nickel (Ni)    | 20.06  |
| Zinc (Zn)      | 8.18   |
| Boron (B)      | 0.19   |
| Iron (Fe)      | 0.07   |
| Silicon (Si)   | 0.17   |
| Lead (Pb)      | < 0.05 |
| Tin (Sn)       | < 0.05 |

BELMONT METALS, INC.

Nasir Naseer

QC Administraot





ASIL ÇELİK  
SANAYİ ve TİCARET A.Ş.  
http://www.asilcelik.com.tr

## KALİTE BELGESİ QUALITY CERTIFICATE / MILL TEST CERTIFICATE



|                                                                                                          |                                           |                                        |                                            |                                           |
|----------------------------------------------------------------------------------------------------------|-------------------------------------------|----------------------------------------|--------------------------------------------|-------------------------------------------|
| Döküman No / Document Number<br>1410430                                                                  |                                           | Tarih / Date<br>08.10.2014             | Sayfa / Page<br>1                          |                                           |
| Müşteri / Customer<br>COMMERCIAL METALS COMPANY                                                          | Müşteri Sip. No. / Your Order No<br>69421 | Sip. No. / Our Order No.<br>1111407974 | Belge Norm / Document Norm<br>EN 10204/3.1 | Sip. Miktarı / Order (Kg)<br>40000        |
| Kalite / Quality<br>AISI 8620                                                                            | Kesit / Dimension<br>Y/Rd 4.50 "          | Döküm No. / Heat No.<br>143480         | Ağırlık / Weight (Kg)<br>91128 Lbs         | Adet / Number of pieces<br>87             |
| Malzeme / Product<br>HOT ROLLED ROUND STEEL BARS<br>ACC.TO TD-PUR-430 (3.21.2007) & ASTM A388, A322, A29 |                                           |                                        |                                            | Onaylayan / Approved By<br>Subutay SEZGİN |

Çelik Yapım Metodu / Steelmaking Process : Ark Ocağı / EAF, Pota Fırını / LF, Vakumda Gaz Alma / VD  
Pota Kimyasal Analizi / Ladle Chemical Composition (%)

| C   | Si  | Mn  | P    | S    | Cr  | Mo  | Ni  | Al   | Cu  | Sn   | V    |
|-----|-----|-----|------|------|-----|-----|-----|------|-----|------|------|
| .21 | .26 | .79 | .009 | .020 | .51 | .20 | .54 | .025 | .20 | .011 | .011 |

Sertleşebilirlik / End Quench Test J1/16 inch (HRC)

|    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| 1  | 2  | 3  | 4  | 5  | 6  | 7  | 8  | 9  | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 |
| 46 | 45 | 40 | 33 | 29 | 26 | 25 | 24 | 23 | 23 | 22 | 21 | 21 | 21 | 20 | 20 | 19 | 18 | 18 | 18 | 17 | 16 | 16 | 15 |

Mekanik Özellikler / Mechanical Properties

Sertlik  
Hardness

197 HB

Tane Büyüklüğü  
Grain Size  
(ASTM E-112)

7 -- 8

Ezme Oranı  
Reduction Ratio

Ingot : 29.1/1

% 100 ULTRASONIC TESTED ACC. TO ASTM A388 AND THE RESULTS WERE OK.  
% 100 MIX-UP CONTROLLED & SURFACE CRACK TESTED.  
FREE FROM RADIOACTIVITY & FREE FROM MERCURY. NO WELD REPAIR PERFORMED.  
COUNTRY OF ORIGIN : TURKEY



YUKARIDA BELİRTİLEN MALZEMELERİN TEST EDİLDİĞİ VE SİPARİŞ ŞARTLARINA UYGUN OLDUĞU ONAYLANIR.  
WE HEREBY CERTIFY, MATERIAL DESCRIBED ABOVE HAS BEEN TESTED AND COMPLIES WITH THE TERMS OF ORDER CONTRACT.

Santral / Central  
Tel. : +90 224 280 61 00  
Faks : +90 224 280 62 00  
Fabrika / Head Office & Plant  
Gemiç Köyü Mevki 16800 Orhangazi / BURSA

Satınalma / Purchasing  
+90 224 280 61 20  
+90 224 280 61 30  
Çelik Servis Merkezi / Steel Service Center  
TOSB Organize San. Böl. 13. Sok. No:3 41420  
Şekerpınar/KOCAELİ

İç Satış / Domestic Sales  
+90 262 781 60 00  
+90 262 781 60 05

Dış Satış / Export  
+90 262 781 60 00  
+90 262 781 60 05

Vergi Dairesi : Büyük Mükellefler Vergi Dairesi Başkanlığı  
Vergi No : 0860052518 Ticaret Sicil : 125642 / 72672



ISO 9001:2008  
Certificate number: 30993



ISO/TS 16949:2009  
Certificate number: 20164



ISO 14001:2004  
Certificate number: 10638

CERTIFICADO DE QUALIDADE  
QUALITY CERTIFICATE  
MILL'S TEST CERTIFICATE  
CERTIFICADO DE CALIDAD

Nº 574693

OUR MANAGEMENT SYSTEM IS CERTIFIED TO ISO9001 / TS16949 / ISO14001

|                                                                |                                     |                                             |                                                      |                                      |                                                                               |                                      |      |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |
|----------------------------------------------------------------|-------------------------------------|---------------------------------------------|------------------------------------------------------|--------------------------------------|-------------------------------------------------------------------------------|--------------------------------------|------|-------|------|-------|-------|--------|-------|--------|--------|-------|--------|---------|-------|-------|-------|-------|-----|
| NOTA FISCAL/INVOICE<br><b>055741</b>                           | PESO/WEIGHT (Kg)<br><b>69862,00</b> | PEO CLIENTE/CUST ORDER<br><b>CSI 209134</b> | ORD FORNEC/ORD-SUPPLY<br><b>16445557 - 812508050</b> | QUALIDADE/GRADE<br><b>AISI 4140</b>  | PRODUTO/PRODUCT<br><b>BARRA LAMINADA REDONDA</b>                              | LOTE/BATCH<br><b>90217050</b>        |      |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |
|                                                                |                                     |                                             |                                                      |                                      | SEM TOTO<br><b>BRUTO</b>                                                      | CORRIDA/HEAT<br><b>22.165.500</b>    |      |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |
| CLIENTE/CUSTOMER<br><b>CHICAGO STEEL AND IRON - BAR DIVISI</b> |                                     |                                             | MATERIAL/MATERIAL<br><b>899658</b>                   | BITOLA/SIZE (mm)<br><b>88,900 mm</b> | NORMA/SPECIFICATION<br><b>CSI - 4140 (CHICAGO STEEL)-Rev.01 de 06.03.2011</b> | REDUÇÃO/REDUCTION<br><b>42,40 :1</b> |      |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |
| ANALISE QUIMICA/CHEMICAL COMPOSITION                           |                                     |                                             |                                                      |                                      |                                                                               |                                      |      |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |
| 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 |       |       |       |       |     |
| ENSAIOS MECÂNICOS/MECHANICAL PROP                              |                                     |                                             |                                                      |                                      |                                                                               |                                      |      |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |
| Elongation                                                     |                                     |                                             |                                                      |                                      |                                                                               |                                      |      |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |
| Hardness                                                       |                                     |                                             |                                                      |                                      |                                                                               |                                      |      |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |
| %<br>10.5                                                      |                                     |                                             |                                                      |                                      |                                                                               |                                      |      |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |
| HB<br>302                                                      |                                     |                                             |                                                      |                                      |                                                                               |                                      |      |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |
| ENSAIOS METALOGRAFICOS/METALLOGRAPHIC TESTS                    |                                     |                                             |                                                      |                                      |                                                                               |                                      |      |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |
| Austenitic                                                     |                                     |                                             |                                                      |                                      |                                                                               |                                      |      |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |
| Grain Size                                                     |                                     |                                             |                                                      |                                      |                                                                               |                                      |      |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |
| 7                                                              |                                     |                                             |                                                      |                                      |                                                                               |                                      |      |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |
| MICROINCLUSÕES/INCLUSION RATING NUMBERS                        |                                     |                                             |                                                      |                                      |                                                                               |                                      |      |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |
| AT                                                             | AH                                  | BT                                          | BH                                                   | CT                                   | CH                                                                            | DT                                   | DH   |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |
| 1.00                                                           | 1.00                                | 0.00                                        | 0.00                                                 | 0.00                                 | 0.00                                                                          | 0.50                                 | 0.50 |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |
| MACROGRAFIA/MACROGRAPHY                                        |                                     |                                             |                                                      |                                      |                                                                               |                                      |      |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |
| S                                                              | R                                   | C                                           |                                                      |                                      |                                                                               |                                      |      |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |
| 1                                                              | 2                                   | 1                                           |                                                      |                                      |                                                                               |                                      |      |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |
| TEMPERABILIDADE/HARDENABILITY                                  |                                     |                                             |                                                      |                                      |                                                                               |                                      |      |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |
| 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 |     |
| in                                                             | mm                                  | HRC                                         | HRC                                                  | HRC                                  | HRC                                                                           | HRC                                  | HRC  | HRC   | HRC  | HRC   | HRC   | HRC    | HRC   | HRC    | HRC    | HRC   | HRC    | HRC     | HRC   | HRC   | HRC   | HRC   | HRC |
| 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  |     |
| TEMPERABILIDADE/HARDENABILITY                                  |                                     |                                             |                                                      |                                      |                                                                               |                                      |      |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |
| 28/16                                                          | 30/16                               | 32/16                                       |                                                      |                                      |                                                                               |                                      |      |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |
| HRC                                                            | HRC                                 | HRC                                         |                                                      |                                      |                                                                               |                                      |      |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |
| 49.0                                                           | 48.0                                | 48.0                                        |                                                      |                                      |                                                                               |                                      |      |       |      |       |       |        |       |        |        |       |        |         |       |       |       |       |     |



ISO 9001:2008  
Certificate number: 30010



ISO/TS 16949:2009  
Certificate number: 30554



ISO 14001:2004  
Certificate number: 70026

CERTIFICADO DE QUALIDADE  
QUALITY CERTIFICATE  
MILL'S TEST CERTIFICATE  
CERTIFICADO DE CALIDAD

Nº 574693

OUR MANAGEMENT SYSTEM IS CERTIFIED TO ISO9001 / TS16949 / ISO14001

|                                                         |                              |                                       |                                               |                               |                                                                        |                               |
|---------------------------------------------------------|------------------------------|---------------------------------------|-----------------------------------------------|-------------------------------|------------------------------------------------------------------------|-------------------------------|
| NOTA FISCAL/INVOICE<br>055741                           | PESO/WEIGHT (Kg)<br>69862,00 | PEÇ./CLIENTE/CUST ORDER<br>CSI 209134 | ORD.FORNEC/ORD SUPPLY<br>16445557 - 812508050 | QUALIDADE/GRADE<br>AISI 4140  | SEM TOTO<br>BRUTO                                                      | CORRIDA/HEAT<br>22.165.500    |
| CLIENTE/CUSTOMER<br>CHICAGO STEEL AND IRON - BAR DIVISI |                              |                                       | MATERIAL/MATERIAL<br>899658                   | BITOLA/SIZE (mm)<br>88,900 mm | NORMA/SPECIFICATION<br>CSI - 4140 (CHICAGO STEEL)-Rev.01 de 06.03.2011 | REDUÇÃO/REDUCTION<br>42,40 :1 |

OBSERVAÇÕES/OBSERVATIONS

Made in Brazil - Size 3.50 in - Color Code: Black - Round Bars As Rolled, Untreated - UT 100% approved as ASTM A388 with criterium FBH max 2,00mm - EF, LF, VD and Ingot Casting - Inspected by magnetic particles - Free of Mercury, Welding and Radioactivity - ASTMs: E112, E45[A], A29, A322, E381, A370 and A711[max. 20%], EN 10204\_3.1. All standards refer to the 2010

DEPARTAMENTO DA QUALIDADE/QUALITY DEPARTMENT

PINDAMONHANGABA, 30.04.2012

Ildo Jânio Souza de Oliveira - CREA 117203

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 TETS 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

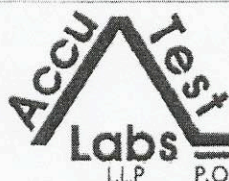
SEE ULTRASONIC TEST REPORT ATTACHED

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.



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  
Material: 4140 3-1/2"OD x 14"LG test pc  
ID/Heat: 22165500  
Job Info: LSHT Hardness 302-311 HBW

PO#: 535479-03

#### Tensile Test Results

| No./Location | Size<br>(in.) | Area<br>(in <sup>2</sup> ) | Ult. Load<br>(lbs.) | Yield<br>(psi) | Tensile<br>(psi) | Elong.<br>(%) | R. of A.<br>(%) | 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.

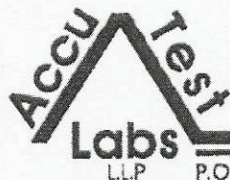
Mechanical testing performed at mid-radius.

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<br>(in.) | Area<br>(in <sup>2</sup> ) | Ult. Load<br>(lbs.) | Yield<br>(psi) | Tensile<br>(psi) | Elong.<br>(%) | R. of A.<br>(%) | 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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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<br>(in.)   | Area<br>(in <sup>2</sup> ) | Ult. Load<br>(lbs.) | Yield<br>(psi)     | Tensile<br>(psi) | Elong.<br>(%) | R. of A.<br>(%) | Hardness |
|--------------|-----------------|----------------------------|---------------------|--------------------|------------------|---------------|-----------------|----------|
| 1            | .506<br>.6% EUL |                            |                     | 126,500<br>126,500 | 144,400          | 19.0          | 58.7            | 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     | 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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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<br>(in.)   | Area<br>(in <sup>2</sup> ) | Ult. Load<br>(lbs.) | Yield<br>(psi)     | Tensile<br>(psi) | Elong.<br>(%) | R. of A.<br>(%) | Hardness |
|--------------|-----------------|----------------------------|---------------------|--------------------|------------------|---------------|-----------------|----------|
| 1            | .504<br>.6% EUL |                            |                     | 128,800<br>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.lshtr.com

# Ultrasonic Certification Report

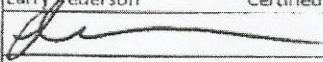
|                      |                          |       |              |       |            |
|----------------------|--------------------------|-------|--------------|-------|------------|
| Report Number:       | 535479                   | Po #: | 031725 REV02 | Date: | 03/31/2015 |
| Company:             | Bar Source International |       |              |       |            |
| Specification:       | BSI-002 Rev 4            |       |              |       |            |
| Acceptance Criteria: | ASTM-A388/API 6A         |       |              |       |            |

## Ultrasonic Inspection

|                               |                              |                   |            |           |            |
|-------------------------------|------------------------------|-------------------|------------|-----------|------------|
| Equipment:                    | Sonatest 250                 | Calibration Date: | 12/02/2015 | S/N #:    | 1005128    |
| Longitudinal:                 | Size: 1" od                  | MHZ:              | 2.25       | SN#:      | 45000      |
| Shear Wave:                   | Size:                        | Deg:              |            | MHZ:      |            |
| Part Condition:               | clean                        | RMS:              | 250        | Couplant: | cellulose  |
| Longitudinal Standardization: | 80%fsh 1/8" Flat Bottom Hole |                   |            | Ref DB:   | 6.4 DB: 70 |
| Shear Standardization:        |                              |                   |            | Ref DB:   |            |

|             |                             |
|-------------|-----------------------------|
| Material:   | 4140                        |
| Heat #:     | 22165500                    |
| Size:       | 3 1/2" od x 35.7"-35.8" R/L |
| Total Pcs:  | 83                          |
| Acceptable: | 83                          |
| Rejectable: | 0                           |

|  |
|--|
|  |
|--|

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

|      |  |       |  |
|------|--|-------|--|
| Rev: |  | Date: |  |
|------|--|-------|--|

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.



ISO 9001:2008  
Certificate Number: 50010



ISO/TS 16949:2009  
Certificate Number: 38554



ISO 14001:2004  
Certificate Number: 70638

CERTIFICADO DE QUALIDADE

QUALITY CERTIFICATE

CERTIFICADO DE CALIDAD

Page 1/2

OUR MANAGEMENT SYSTEM IS CERTIFIED TO ISO9001 / TS16949 / ISO14001

|                                                                  |                                    |                                               |                                                                           |                                                    |               |               |               |             |              |             |             |             |             |             |             |             |
|------------------------------------------------------------------|------------------------------------|-----------------------------------------------|---------------------------------------------------------------------------|----------------------------------------------------|---------------|---------------|---------------|-------------|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| PART NUMBER                                                      | PESO/WEIGHT (KG)<br>22.402,000     | MATERIAL/MATERIAL<br>705009664                | PRODUTO/PRODUCT<br>HOT ROLLED ROUND BAR<br>NO HEAT TREATMENT<br>AS ROLLED | Cert. N°<br>0000012623<br>CORRIDA/HEAT<br>22085862 |               |               |               |             |              |             |             |             |             |             |             |             |
| CLIENTE/CLIENT<br>MAGELLAN CORPORATION                           | QUALIDADE/GRADE<br>AISI 8620/8620H | BITOLA/SIZE<br>5.0000 "                       |                                                                           |                                                    |               |               |               |             |              |             |             |             |             |             |             |             |
| NORMA/SPECIFICATION<br>MIC 13016 ADDENDUM 9 AUG. 2016 31.08.2016 |                                    |                                               |                                                                           |                                                    |               |               |               |             |              |             |             |             |             |             |             |             |
| Nota Fiscal/Invoice<br>0000007760                                | Pedido/Cust.Order<br>211139        | Ord-Fornec/Ord-Supply<br>4337314 - 8106902574 | Lote/Batch<br>2208586206                                                  | Peso/Weight (Kg)<br>22.402,000                     |               |               |               |             |              |             |             |             |             |             |             |             |
| ANÁLISE QUÍMICA/CHEMICAL COMPOSITION                             |                                    |                                               |                                                                           |                                                    |               |               |               |             |              |             |             |             |             |             |             |             |
| C<br>%                                                           | Mn<br>%                            | Si<br>%                                       | P<br>%                                                                    | S<br>%                                             | Cr<br>%       | Ni<br>%       | Mo<br>%       | V<br>%      | Cu<br>%      | Sn<br>%     | Al<br>%     | Ti<br>%     | Nb<br>%     | N<br>%      | B<br>%      | Pb<br>%     |
| 0,210                                                            | 0,87                               | 0,33                                          | 0,012                                                                     | 0,026                                              | 0,52          | 0,49          | 0,17          | 0,0030      | 0,170        | 0,0110      | 0,0250      | 0,0012      | 0,0040      | 0,0096      | 0,0005      | 0,0020      |
| H<br>%                                                           | Ca<br>%                            | W<br>%                                        | Co<br>%                                                                   | As<br>%                                            | Zr<br>%       | Sb<br>%       | Zn<br>%       | Al+Nb<br>%  | Cu+10Sn<br>% | DI<br>"     |             |             |             |             |             |             |
| 0,00011                                                          | 0,0012                             | 0,0020                                        | 0,0070                                                                    | 0,0040                                             | 0,0010        | 0,0004        | 0,0010        | 0,0290      | 0,2800       | 2,1949      |             |             |             |             |             |             |
| ENSAIOS MECÂNICOS/MECHANICAL PROP                                |                                    |                                               |                                                                           |                                                    |               |               |               |             |              |             |             |             |             |             |             |             |
| Mid Radius<br>Hardness<br>HB<br>183                              |                                    | Surface<br>Hardness<br>HB<br>183              |                                                                           |                                                    |               |               |               |             |              |             |             |             |             |             |             |             |
| ENSAIOS METALOGRAFICOS/METALLOGRAPHIC TESTS                      |                                    |                                               |                                                                           |                                                    |               |               |               |             |              |             |             |             |             |             |             |             |
| Austenitic<br>Grain Size<br>6                                    |                                    |                                               |                                                                           |                                                    |               |               |               |             |              |             |             |             |             |             |             |             |
| MICROINCLUSÕES/INCLUSION RATING NUMBER                           |                                    |                                               |                                                                           |                                                    |               |               |               |             |              |             |             |             |             |             |             |             |
| ASTM/SAE                                                         |                                    |                                               |                                                                           |                                                    |               |               |               |             |              |             |             |             |             |             |             |             |
| A - TS<br>2,0                                                    | A - HS<br>1,5                      | B - TS<br>0,0                                 | B - HS<br>0,0                                                             | C - TS<br>0,0                                      | C - HS<br>0,0 | D - TS<br>0,5 | D - HS<br>0,5 |             |              |             |             |             |             |             |             |             |
| MACROGRAFIA/MACROGRAPHY                                          |                                    |                                               |                                                                           |                                                    |               |               |               |             |              |             |             |             |             |             |             |             |
| Macro S<br>1                                                     | Macro R<br>1                       | Macro C<br>1                                  |                                                                           |                                                    |               |               |               |             |              |             |             |             |             |             |             |             |
| TEMPERABILIDADE/HARDENABILITY                                    |                                    |                                               |                                                                           |                                                    |               |               |               |             |              |             |             |             |             |             |             |             |
| 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"      |
| HRC<br>46,2                                                      | HRC<br>45,7                        | HRC<br>42,2                                   | HRC<br>38,4                                                               | HRC<br>34,9                                        | HRC<br>31,9   | HRC<br>29,9   | HRC<br>28,2   | HRC<br>27,0 | HRC<br>26,2  | HRC<br>25,2 | HRC<br>24,4 | HRC<br>23,8 | HRC<br>23,2 | HRC<br>22,8 | HRC<br>22,4 | HRC<br>21,7 |
| 20/16"                                                           | 22/16"                             | 24/16"                                        | 26/16"                                                                    | 28/16"                                             | 30/16"        | 32/16"        |               |             |              |             |             |             |             |             |             |             |
| HRC<br>21,3                                                      | HRC<br>21,0                        | HRC<br>20,9                                   | HRC<br>20,8                                                               | HRC<br>20,8                                        | HRC<br>20,7   | HRC<br>20,6   |               |             |              |             |             |             |             |             |             |             |



ISO 9001:2008  
Certificate Number: 30010



ISO/TS 16949:2009  
Certificate Number: 38554



ISO 14001:2004  
Certificate Number: 70638

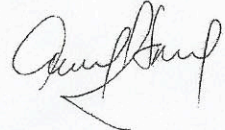
CERTIFICADO DE QUALIDADE

QUALITY CERTIFICATE

CERTIFICADO DE CALIDAD

Page 2/2

OUR MANAGEMENT SYSTEM IS CERTIFIED TO ISO9001 / TS16949 / ISO14001

|                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |                                |                                                                                                                                                                                                                         |                                         |                          |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------|--------------------------|
| PART NUMBER                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | PESO/WEIGHT (KG)<br>22.402,000 | MATERIAL/MATERIAL<br>705009664                                                                                                                                                                                          | PRODUTO/PRODUCT<br>HOT ROLLED ROUND BAR | Cert. N°<br>0000012623   |
| CLIENTE/CLIENT<br>MAGELLAN CORPORATION                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |                                | QUALIDADE/GRADE<br>AISI 8620/8620H                                                                                                                                                                                      | NO HEAT TREATMENT<br>AS ROLLED          | CORRIDA/HEAT<br>22085862 |
| GRAU DE REDUÇÃO/REDUCTION RATE<br>26,2000 : 1                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |                                | BITOLA/SIZE<br>5.0000 "                                                                                                                                                                                                 |                                         |                          |
| OBSERVAÇÕES/OBSERVATIONS<br>Color code: Orange and Green. Ca-Al Treated<br>Material according A29/A29M, John Deere JDM AO QL-2 and CAT 1E02743<br>US test 100% approved as ASTM A388/A388M-11<br>EF, LF, VD and Ingot Casting<br>No Weld Repair, Mercury and Radioactivity Free.<br>EN 10204_3.1 - ASTMs: E112-13, E45[A]-13, E381-01, A322-13,<br>A304-11, A751-11, A370-12a, A255-10, A711/A711M-07 and E10-12.<br>All standards refers to the 2013 volume.<br>Made in Brazil. Rod. Luiz Dumont Villares, km 2 Pindamonhangaba SP - Brazil |                                | DEPARTAMENTO DA QUALIDADE / QUALITY DEPARTMENT<br>PINDAMONHANGABA. 25.02.2017<br><br><br><br>ANDRÉ L. SILVA FAGUNDES CREA 0682601000 |                                         |                          |
| ENVIRONMENTAL RECOMENDATIONS RELATED TO PRODUTCS:<br>In order to contribute with the environment and sustainable development of our productive chain,<br>we recommend to our clients to dispose accordingly the waste related to our products, according<br>to the environmental legislation of your region, state or country.                                                                                                                                                                                                               |                                |                                                                                                                                                                                                                         |                                         |                          |