

Brammer Standard Company, Inc.

# Certificate of Analysis

BS 06J

Reference Material for Steel Alloy Number 8620

	<b>Certified Value<sup>1</sup></b>	<b>Estimate of Uncertainty<sup>2</sup></b>		<b>Information Values<sup>3</sup></b>
Analysis listed as percent by weight				
<b>C</b>	<b>0.198</b>	0.006	<b>B</b>	0.0003
<b>Mn</b>	<b>0.80</b>	0.01	<b>N</b>	0.007
<b>P</b>	<b>0.013</b>	0.0014	<b>O</b>	0.002
<b>S</b>	<b>0.026</b>	0.001	<b>Pb</b>	<0.001
<b>Si</b>	<b>0.23</b>	0.015	<b>Ti</b>	<0.003
<b>Cu</b>	<b>0.122</b>	0.003	<b>V</b>	<0.006
<b>Ni</b>	<b>0.44</b>	0.01	<b>W</b>	<0.005
<b>Cr</b>	<b>0.49</b>	0.012	<b>Zn</b>	0.005
<b>Mo</b>	<b>0.17</b>	0.005		
<b>As</b>	<b>0.004</b>	0.001		
<b>Ca</b>	<b>0.0007</b>	0.0002		
<b>Co</b>	<b>0.006</b>	0.001		
<b>Sn</b>	<b>0.007</b>	0.001		
<b>Al</b>	<b>0.028</b>	0.001		

<sup>1</sup> The certified value listed is the present best estimate of the true value based on the results of an interlaboratory testing program.

<sup>2</sup> The uncertainties listed are based on value judgments of the material inhomogeneity and the 95% confidence interval. The half-width confidence interval C(95%) is shown on page 2.

<sup>3</sup> Information values are not certified and are provided for information only.

See reverse side for more information.

Certificate Number 06J-012201p1

Analysis	*	C	*	Mn	*	P	*	S	*	Si	*	Cu	*	Ni	*	Cr
1	C	0.189	AIC	0.796	AIC	0.012	C	0.025	AIC	0.228	XRF	0.12	AIC	0.426	AES	0.482
2	AES	0.197	AIC	0.802	AIC	0.0122	C	0.0251	AIC	0.228	AIC	0.121	XRF	0.44	XRF	0.49
3	C	0.1985	AIC	0.803	AES	0.0123	C	0.026	AES	0.231	AES	0.121	AES	0.44	AIC	0.491
4	C	0.199	AES	0.804	AES	0.014	C	0.0262	AIC	0.250	AIC	0.122	AIC	0.446	AIC	0.493
5	C	0.20	XRF	0.81	AIC	0.014	C	0.0262			AIC	0.124	AIC	0.449	AIC	0.509
6	C	0.200					C	0.0263								
7	C	0.201					AES	0.0281								
Average		0.1978		0.803		0.0129		0.0261		0.234		0.1216		0.440		0.493
Std Dev		0.0041		0.005		0.0010		0.0010		0.011		0.0015		0.009		0.010
Certified		0.198		0.80		0.013		0.026		0.23		0.122		0.44		0.49
# Labs		7		5		5		7		4		5		5		5
t		2.4469		2.7764		2.7764		2.4469		3.1824		2.7764		2.7764		2.7764
C(95%)		0.0038		0.006		0.0013		0.0009		0.017		0.0019		0.011		0.012

Analysis	*	Mo	*	Al	*	As	*	Ca	*	Co	*	Sn	*	B
1	XRF	0.17	AIC	0.027	AIC	0.0041	AES	0.0006	AIC	0.005	AIC	0.0067	AIC	0.00005
2	AIC	0.170	AIC	0.0270	AIC	0.0045	AES	0.0006	AIC	0.0054	AIC	0.007	AES	0.0003
3	AES	0.17	AES	0.0277	AIC	0.0050	AIC	0.00078	AES	0.0055	AIC	0.0073	AES	0.0005
4	AIC	0.170	AIC	0.028					AIC	0.0056	AES	0.0075		
5	AIC	0.171	AES	0.028					XRF	0.007				
Average		0.1702		0.0275		0.00453		0.00066		0.0057		0.0071		0.0003
Std Dev		0.0004		0.0005		0.00045		0.00010		0.0008		0.0003		0.0002
Certified		0.17		0.028		0.004		0.0007		0.006		0.007		(0.0003)
# Labs		5		5		3		3		5		4		
t		2.7764		2.7764		4.3027		4.3027		2.7764		3.1824		
C(95%)		0.0006		0.0006		0.00112		0.00026		0.0009		0.0006		

Analysis	*	N	*	O	*	Pb	*	Ti	*	V	*	W	*	Zn
1	FU	0.0068	FU	0.0024	OES	0.00010	AIC	0.0008	AIC	0.0013	AIC	<0.002	AIC	0.0044
2	FU	0.0076			AIC	0.0002	XRF	0.001	AES	0.0014	AIC	0.0008	AIC	0.0046
3	FU	0.0078					AIC	0.001	AIC	0.002	XRF	0.002		
4							AES	0.0019	XRF	0.005	AES	0.0043		
5														
Average		0.00740				0.0002		0.0012		0.0024				0.0045
Std Dev		0.00053				0.0001		0.0005		0.0017				0.0001
Information		(0.007)		(0.002)		(<0.001)		(<0.003)		(<0.006)		(<0.005)		(0.005)

\* Methods of analysis listed below.

Data in parentheses are not certified but are provided for information only.

Data listed as mass fraction expressed as percent.

$C(95\%) = (t \ x \ sd) / \sqrt{n}$  The half-width confidence interval, where  $t$  is the appropriate Student's  $t$  value,  $sd$  is the interlaboratory standard deviation, and  $n$  is the number of acceptable mean values. For further information regarding the confidence interval for the certified value see ISO Guide 35:1989 section 4.

## Methods of Analysis

Code	Element	Method
AES	various	AES - Spark Source Optical Emission Spectrometry
AIC	various	AES - ICP -Inductively Coupled Plasma
C	C, S	Combustion-Infrared Absorption (ASTM E 1019)
FU	N, O	Inert gas Fusion Method (ASTM E 1019)
XRF	various	XRF spectrometry

**Co-operating Laboratories:** The co-operating laboratories were:

**Laboratory**

AK Steel Research, Middletown, Ohio  
Brammer Standard Co., Inc., Houston, Texas  
Crucible Specialty Steel, Syracuse, New York  
J. Dirats and Co., Inc., Westfield, Massachusetts  
LECO Corporation, St. Joseph, Michigan  
VHG Laboratories, Inc., Manchester, New Hampshire

**Laboratory contact**

Howard Vail  
Richard P. Beaumont  
William Mastroe  
Eric E. Dirats  
Dennis Lawrenz  
Julie M. McIntosh

**Certification Process:** The requirements of ISO Guide 31, ISO Guide 34, ISO Guide 35, and ASTM Standard Guides E 1724 and E 1831 were followed for the preparation of this reference material and certificate of analysis. This is a reference material as defined by ISO Guide 30.

**Analysis:** Chemical analyses were made on chips prepared by a lathe from the certified portion of the discs in accordance with ASTM Standard Practice E 1806. The laboratories participating in the testing normally followed the requirements of ISO Guide 25. The individual values listed on page 2 are the average of each analyst's results. Methods of analysis used were a combination of ASTM Standard Test Methods E 350 and E 1019 plus additional ICP and AA spectrometric methods.

**Outliers:** Some outlying data was excluded from the data listed on page 2 due to technical assessment of the cooperating laboratories and statistical evaluation.

**Traceability:** The following Certified Reference Materials were used to validate the analytical data listed on page 2: NIST SRM 11h, 15h, 19g, 32e, 139b, 293, 337a, 361, 362, 365, 2165, 2166; ECRM 085-1, 088-1, 097-1.

**Homogeneity:** This Reference Material was tested for homogeneity using ASTM Standard Method E 826 and found acceptable. It was also examined by optical emission spectrometry using ASTM Standard Test Method E 415 and found to be compatible with the following Certified Reference Materials: NIST SRM 1222, 1765; SS 451/1, 456/2, 457/1; JSS 169-6; CKD 181A.

**Validity statement:** ISO Guide 31 requires that a validity period statement be included in the certificate of analysis. This Reference Material is valid for 20 years from the certificate date.

**Source:** This material was produced by North Star Steel Michigan, Monroe, Michigan. It was melted by an electric arc furnace, vacuum degassed and aluminum killed.

**Form:** This Reference Material is in the form of a round bar, approximately 47 mm in diameter and 150 mm long.

**Use:** This Reference Material is intended for use in optical emission and x-ray spectrometric methods of analysis.

**Certified area:** The entire depth of the disc may be used.

**Caution:** As with any bar material, avoid optical emission spectrometric burns in the center of the disc (5 mm radius), as some segregation may be present.

**Sample Preparation:** For best analytical results, use the same method for preparing the analytical surface on all reference materials as you use for production specimens. Avoid overheating the disc during surface preparation.

**Certificate Number:** The unique identification number for this certificate of analysis is 06J-012201-px, where x indicates the page number. Refer to future Brammer Standard Company catalogs for information on any revisions to this or other Brammer Standard reference materials. You may also obtain information on revisions of certificates from the internet at [brammerstandard.com](http://brammerstandard.com).

**Safety Notice:** A Material Safety Data Sheet (MSDS) is not required for this material. This material will not release or otherwise result in exposure to a hazardous chemical, under normal conditions of use. Inquiries concerning this Reference Material should be directed to:

Brammer Standard Co., Inc.  
14603 Benfer Road  
Houston, Texas 77069-2895 USA

Phone: (281) 440-9396

Fax: (281) 440-4432

Certified by: \_\_\_\_\_ on January 22, 2001.

G. R. Brammer

**Certificate Number 06J-012201p3**

**By Certificate Number 10539, the Quality System of Brammer Standard Company, Inc., is registered to**

**ISO 9002:1994 by National Quality Assurance, U.S.A.**

**Brammer Standard Company's Chemical Laboratory is accredited to ISO Guide 25 by A2LA.  
(Certificate Number 656.01)**

## **References:**

*ASTM documents available from ASTM, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959,  
Telephone: 610-832-9500 Fax: 610-832-9555 e-mail: service@astm.org Website: www.astm.org*

E 350 - 97 Standard Test Methods for Chemical Analysis of Carbon Steel, Low-Alloy Steel, Silicon Electrical Steel, Ingot Iron, and Wrought Iron

E 415 - 85 (Reapproved 1999) Standard Test Method for Optical Emission Vacuum Spectrometric Analysis of Carbon and Low-Alloy Steel

E 826 - 85 (Reapproved 1996) Standard Practice for Testing Homogeneity of Materials for the Development of Reference Materials

E 1019 - 2000 Standard Test Methods for Determination of Carbon, Sulfur, Nitrogen, and Oxygen in Steel and in Iron, Nickel, and Cobalt Alloys

E 1724 - 95 Standard Guide for Testing and Certification of Metal and Metal-Related Reference Materials

E 1806 - 96 Standard Practice for Sampling Steel and Iron for Determination of Chemical Composition

E 1831 - 96 Standard Guide for Preparing Certificates for Reference Materials Relating to Chemical Composition of Metals, Ores, and Related Materials.

*ISO Guides available from Global Engineering - www.global.ihs.com*

ISO Standard 17025 (First edition, 1999), General requirements for the competence of calibration and testing laboratories.

ISO Guide 25 (Third edition, 1990), General requirements for the competence of calibration and testing laboratories.

ISO Guide 30 (Second edition, 1991), Terms and definitions used in connection with reference materials.

ISO Guide 31 (Second edition, 2000), Contents of certificates of reference materials.

ISO Guide 33 (Second edition, 2000), Uses of certified reference materials.

ISO Guide 34 (Second edition, 1999), Quality system guidelines for the production of reference materials.

ISO Guide 35 (Second edition, 1989), Certification of reference materials - General and statistical principles.

*Other useful documents available from NIST, U.S. Department of Commerce, Gaithersburg, MD 20899.*

NIST Special Publication 260-100, Handbook for SRM Users

NIST Special Publication 829, Use of NIST Standard Reference Materials for Decisions on Performance of Analytical Chemical Methods and Laboratories

**Certificate Number 06J-012201p4**