

Brammer Standard Company, Inc.

Certificate of Analysis

B.S. 53E

AISI Grade E52100 Low Alloy Steel

Carbon	1.08	Aluminum	0.003
Manganese	0.37	Cobalt	0.011
Phosphorus	0.007	Nitrogen	0.0086
Sulfur	0.012	Tin	0.005
Silicon	0.24	Titanium	0.002
Copper	0.11	Vanadium	0.004
Nickel	0.26		
Chromium	1.45		
Molybdenum	0.10		

(analysis listed as percent by weight)

Some of the co-operating laboratories were:

Brammer Standard Co., Inc., Houston, Texas
Carpenter Technology, Reading, Pennsylvania
Crobaugh Laboratories, Cleveland, Ohio
Crucible Specialty Metals, Syracuse, New York
Hoesch Stahl AG, Dortmund, Germany
J. Dirats and Co., Inc., Westfield, Massachusetts
Midstates Analytical Laboratories, Inc., Tulsa, Oklahoma
National Spectrographic Laboratories, Cleveland, Ohio
Spectrochemical Laboratories, Pittsburgh, Pennsylvania
VHG Laboratories, Inc., Manchester, New Hampshire

Note: This is a revision of the original certificate of analysis. The material was retested by additional laboratories in 1991 and 1992. Additional elements are now certified. Also, as a result of the retesting, the certified analysis has been revised slightly for C, S, Al, and Sn.

See reverse side for more information.

Certificate Number REV53E-040892

Brammer Standard Company, Inc., 14603 Benfer Road, Houston, TX 77069
Telephone (281) 440-9396 Fax (281) 440-4432

BS 53E

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Analysis	C	Mn	P	S	Si	Cu	Ni	Cr	Mo
1	1.058	0.355	0.006	0.0103	0.24	0.10	0.25	1.42	0.092
2	1.07	0.36	0.006	0.011	0.24	0.103	0.257	1.45	0.093
3	1.077	0.36	0.006	0.012	0.24	0.105	0.26	1.45	0.094
4	1.08	0.37	0.007	0.0127	0.24	0.105	0.26	1.455	0.0956
5	1.08	0.37	0.008	0.013	0.242	0.12	0.27	1.46	0.097
6	1.082	0.38		0.013	0.25	0.12		1.47	0.10
7	1.0867	0.39							0.115
Average	1.076	0.369	0.0066	0.0120	0.242	0.109	0.259	1.451	0.098
Std Dev	0.010	0.012	0.0009	0.0011	0.004	0.009	0.007	0.017	0.008
Certified	1.08	0.37	0.007	0.012	0.24	0.11	0.26	1.45	0.10

Analysis	Al	Co	N	O	Sn	Ti	V
1	0.003	0.008	0.0083	0.0024	0.004	0.0012	0.003
2	0.003	0.011	0.0084		0.004	0.002	0.0031
3	0.003	0.011	0.0085		0.0045	0.0026	0.0032
4	0.003	0.012	0.0087		0.005	0.0029	0.004
5	0.0034	0.013	0.0091		0.005	0.003	0.004
6	0.004	0.013			0.0066		0.005
7	0.004						
Average	0.0033	0.0113	0.00860		0.0049	0.0023	0.0037
Std Dev	0.0005	0.0019	0.00032		0.0010	0.0007	0.0008
Certified	0.003	0.011	0.0086 (0.0024)		0.005	0.002	0.004

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

Chemical analyses were made on millings from cross-sections of the bars. The individual values listed above are the average of each analyst's results.

Methods of analysis used were a combination of ASTM Standard Methods E 350, E 415, E 1019, plus additional ICP, and AA spectrometric methods. The following Certified Reference Materials were used to validate the analytical data listed above: NIST SRM 32e, 125b, 361 to 365; BAM 039-2, 044-1; BCS 455/1, 456/1, 458/1; ECRM 085-1, 088-1, 096-1, 184-1, 481-1; GBW 01402; IMZ 1.22, 1.74

This Reference Material was tested for homogeneity using ASTM Standard Method E 826 and found acceptable. It was also examined by optical emission spectrometry and found to be compatible with the following NIST Certified Reference Materials: SRM 1222, 1224, 1225, 1261A to 1265A, 1761 to 1767

The bar stock used for this material was produced by hot-rolling billets and annealing. The entire depth of the disc may be used.

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. Phone: (281) 440-9396
 14603 Benfer Road
 Houston, Texas 77069-2895 USA Fax: (281) 440-4432

Certified by: _____ on March 20, 1992.

G. R. Brammer