Brammer Standard Company, Inc.

Certificate of Analysis

B.S. 170B

Cobalt Base Alloy 6B

Carbon	1.12	Molybdenum	0.81
Manganese	1.41	Tungsten	3.98
Phosphorus	0.006	Vanadium	0.006
Sulfur	<0.001	Niobium	0.027
Silicon	0.71	Aluminum	0.21
Copper	0.016	Boron	(0.0004)
Nickel	2.49	Iron	0.91
Chromium	30.52		

(analysis listed as percent by weight)

Some of the co-operating laboratories were:

AB Sandvik Steel, Sandvicken, Sweden
Allegheny Ludlum Steel Corp., Brackenridge, Pennsylvania
Allegheny Ludlum Steel Corp., Lockport, New York
Brammer Standard Co., Inc., Houston, Texas
Crucible Research, Pittsburgh, Pennsylvania
J. Dirats and Co., Inc., Westfield, Massachusetts
Hoesch Stahl AG, Dortmund, Germany
Howmet Corporation, Dover, New Jersey
Charles C. Kawin Company, Broadview, Illinois
Ledoux & Company, Teaneck, New Jersey
Jeffrey A. Nunes Laboratories, Inc., Washington, Pennsylvania
PTL Testing Laboratory, Inc., Trenton, New Jersey
SKODA Concern Plzen, Central Research Institute, Plzen, Czechoslovakia
TCR Engineering Services, Bombay, India
VHG Laboratories, Inc., Manchester, New Hampshire

CAUTION: Because this Reference Material contains a high percent of nickel, chromium, and tungsten, care must be taken in its application. Make certain that corrections are made for possible element interference and dilution effects.

See reverse side for more information.

Certificate Number 170B-R080591V

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

BS 170B 170B-R080591V

Analysis	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	W
1	1.10	1.373	0.005	<0.0002	0.67	0.0153	2.436	30.46	0.79	3.92
2	1.106	1.376	0.005	<0.001	0.69	0.0156	2.48	30.47	0.80	3.92
3	1.10	1.39	0.0060	0.00047	0.70	0.016	2.50	30.50	0.80	3.93
4	1.12	1.42	0.0062	0.0008	0.703	0.0171	2.51	30.50	0.805	3.96
5	1.120	1.43	0.0072		0.72		2.51	30.52	0.81	3.96
6	1.13	1.43			0.73			30.57	0.82	4.02
7	1.13	1.44			0.74			30.60	0.821	4.04
8		1.45							0.825	4.05
9									0.828	
10									0.83	
Average	1.115	1.414	0.0059		0.708	0.0160	2.487	30.517	0.813	3.98
Std Dev	0.013	0.030	0.0009		0.024	0.0008	0.031	0.051	0.014	0.054
Certified	1.12	1.41	0.006	<0.001	0.71	0.016	2.49	30.52	0.81	3.98

Analysis	V	Fe	Al	Nb	B
1	0.004	0.871	0.199	0.0229	0.00035
2	0.0055	0.88	0.20	0.023	0.0004
3	0.006	0.902	0.21	0.0243	
4	0.007	0.903	0.22	0.026	
5		0.91	0.22	0.027	
6		0.92	0.235	0.028	
7		0.92		0.030	
8		0.921		0.032	
9		0.94			
Average	0.0056	0.907	0.214	0.0267	0.0004
Std Dev	0.0013	0.021	0.014	0.0033	
Certified	0.006	0.91	0.21	0.027	(0.0004)

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 354, E 1019, plus additional ICP, and AA spectrometric methods. The following Certified Reference Material was used to validate the analytical data listed above: BAM 328-1

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 1199, SRM 1200

The bar stock used for this material was produced by hot-rolling billets. 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 G. R. Brammer _____ on August 5, 1991