

Brammer Standard Company, Inc.

Certificate of Analysis

B.S. 544A

CDA Copper Alloy 544

Copper	(88.4)	Silicon	<0.002
Tin	4.42	Manganese	<0.002
Lead	4.16	Phosphorus	0.021
Zinc	3.42	Arsenic	0.011
Iron	0.092	Antimony	0.040
Nickel	0.16	Carbon	(0.003)
Aluminum	(0.0005)	Sulfur	0.038

(analysis listed as percent by weight)

Some of the co-operating laboratories were:

Brammer Standard Co. Inc., Houston, Texas
J. Dirats and Co., Inc., Westfield, Massachusetts
VHG Labs, Manchester, New Hampshire

Values in parentheses are not certified and are provided for information only.

Certificate of Analysis revised on February 12, 1998, to change copper and carbon to uncertified value. New Brammer Standard Company certification procedures requires at least three analyses for each certified element. Original Certificate of Analysis was dated March 3, 1992.

See data on reverse side.

Certificate No. REV544A-021298

Brammer Standard Company, Inc., 14603 Benfer Road, Houston, TX 77069-2895
Telephone (281) 440-9396 Fax (281) 440-4432

B.S. No. 544A

Certificate Number 544A-REV021298

Analysis	Cu	Sn	Pb	Zn	Fe	Ni	Al	Si
1	88.31	4.37	4.13	3.406	0.086	0.148	0.0002	0.001
2	88.53	4.406	4.171	3.42	0.089	0.154	0.0006	<0.002
3		4.42	4.19	3.42	0.090	0.158	0.0007	<0.002
4		4.44		3.43	0.097	0.165		
5		4.45			0.0978	0.165		
Average	88.420	4.417	4.164	3.419	0.0920	0.1580	0.0005	
Std Dev	0.156	0.031	0.031	0.010	0.0052	0.0073	0.0003	
Certified (88.4)		4.42	4.16	3.42	0.092	0.16	(0.0005)	<0.002

Analysis	Mn	P	As	Sb	Ag	C	S
1	0.00008	0.020	0.008	0.038	0.0075	0.0025	0.036
2	0.0003	0.022	0.010	0.040		0.0036	0.0385
3	<0.001	0.022	0.0101	0.0401			0.041
4	<0.002		0.012	0.042			
5			0.013				
Average		0.0213	0.0106	0.0400		0.0031	0.0385
Std Dev		0.0012	0.0019	0.0016		0.0008	0.0025
Certified	<0.002	0.021	0.011	0.040	(0.008)	(0.003)	0.038

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 54-86a, E 478, plus additional ICP, and AA spectrometric methods. The following Certified Reference Materials were used to validate the analytical data listed above: NIST SRM 871, SRM 872; BAM 227, BAM 228, BAM 361; BCS 183/4, and IPT 10A, IPT 15.

This Reference Material was tested for homogeneity by optical emission spectrometry using ASTM Standard Method E 826 and found acceptable. NIST had no similar Certified Reference Materials procurable in solid form for spectrometric comparison during the testing of this material.

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 Fax: (281) 440-4432
 USA

Certified by _____ on February 12, 1998.
 G. R. Brammer