Brammer Standard Company, Inc.

# Certificate of Analysis

## B.S. 675A

Copper Alloy 675

| | | | |
|---|---|---|---|
| Copper | 58.5 | Silicon | (0.005) |
| Tin | 0.80 | Manganese | 0.32 |
| Lead | 0.074 | Phosphorus | 0.010 |
| Zinc | 39.1 | Arsenic | 0.003 |
| Iron | 1.12 | Antimony | 0.0011 |
| Nickel | 0.019 | Carbon | (0.0007) |
| Aluminum | <0.002 | Sulfur | (0.0005) |

*(analysis listed as percent by weight)*

Some of the co-operating laboratories were:

Brammer Standard Co., Inc., Houston, Texas
Colonial Metals, Columbia, Pennsylvania
J. Dirats and Co., Inc., Westfield, Massachusetts
Metals Analysis Inc., Huntington Park, California
Technical Service Laboratories Inc., Mississauga, Ontario, Canada
VHG Labs, Manchester, New Hampshire

See data on reverse side.

Certificate No. 675A-060591

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

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| Analysis | Cu | Sn | Pb | Zn | Fe | Ni | Al | Si |
|---|---|---|---|---|---|---|---|---|
| 1 | 58.28 | 0.786 | 0.065 | 38.82 | 1.05 | 0.016 | 0.0003 | 0.001 |
| 2 | 58.35 | 0.788 | 0.067 | 39.13 | 1.09 | 0.017 | 0.0009 | 0.003 |
| 3 | 58.37 | 0.80 | 0.072 | 39.15 | 1.099 | 0.017 | 0.001 | 0.006 |
| 4 | 58.37 | 0.80 | 0.073 | 39.18 | 1.14 | 0.02 | <0.001 | 0.009 |
| 5 | 58.82 | 0.808 | 0.077 | 39.21 | 1.15 | 0.02 | | |
| 6 | 58.905 | 0.81 | 0.080 | 39.30 | 1.17 | 0.023 | | |
| 7 | | 0.812 | 0.082 | | | | | |
| Average | 58.516 | 0.801 | 0.0737 | 39.132 | 1.117 | 0.019 | | 0.0048 |
| Std Dev | 0.272 | 0.010 | 0.0064 | 0.164 | 0.045 | 0.003 | | 0.0035 |
| Certified | 58.5 | 0.80 | 0.074 | 39.1 | 1.12 | 0.019 | <0.002 | (0.005) |

| Analysis | Mn | P | As | Sb | Ag | C | S |
|---|---|---|---|---|---|---|---|
| 1 | 0.29 | 0.008 | 0.002 | 0.0009 | 0.0044 | 0.0006 | 0.0004 |
| 2 | 0.306 | 0.009 | 0.0025 | 0.0011 | | 0.0007 | 0.0005 |
| 3 | 0.321 | 0.009 | 0.0034 | 0.0012 | | | |
| 4 | 0.322 | 0.0098 | 0.0042 | 0.0013 | | | |
| 5 | 0.325 | 0.010 | | | | | |
| 6 | 0.33 | 0.011 | | | | | |
| 7 | 0.331 | | | | | | |
| 8 | 0.339 | | | | | | |
| Average | 0.320 | 0.0095 | 0.0030 | 0.0011 | 0.0044 | 0.0007 | 0.0005 |
| Std Dev | 0.016 | 0.0010 | 0.0010 | 0.0002 | | 0.0001 | 0.0001 |
| Certified | 0.32 | 0.010 | 0.003 | 0.0011 | | (0.0007) | (0.0005) |

Data in parentheses are 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 54-86a, E 62-89, E 478-89a, plus additional ICP, and AA spectrometric methods. The following Certified Reference Materials were used to validate the analytical data listed above: NIST SRM 37e, 158a, 393, 394, 400, 454; BAM 222, 223, 224, 227, 228, 361; IPT 10a, 15; BCS 183/3.

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 NIST Certified Reference Materials SRM 1103, 1104, 1107, C1110, C1111, C1115, C1119.

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:

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Houston, Texas 77069 USA

Phone: (281) 440-9396
Fax: (281) 440-4432

Certified by _____ on June 5, 1991.
G. R. Brammer