

Brammer Standard Company, Inc.

Certificate of Analysis

B.S. 2B

Chill-cast Iron

Carbon	2.00	Vanadium	0.014
Manganese	0.21	Niobium	0.007
Phosphorus	0.084	Cobalt	0.015
Sulfur	0.064	Tungsten	0.040
Silicon	2.36	Arsenic	0.067
Copper	0.105	Zirconium	0.010
Nickel	0.063	Antimony	0.044
Chromium	1.94	Cerium	(0.007)
Molybdenum	0.039	Boron	0.0047
Tin	0.026	Tellurium	0.013
Aluminum	0.008	Lead	0.011
Titanium	0.084		

Several laboratories in three countries cooperated in providing the analytical data for this cast iron Reference Material. The methods of analysis were classical "wet" analysis, atomic absorption and plasma excitation techniques. Combustion instruments were used for carbon and sulfur analysis.

Listed below are some of the cooperating laboratories:

Alpha Research Laboratory, Stevensville, Michigan, USA
Brammer Standard Company, Inc., Houston, Texas, USA
Midstates Analytical Laboratories, Tulsa, Oklahoma, USA
Turret Alloys, Ltd., Analytical Services, Sheffield, England
Sluzba Vyzkumu, Praha, Czechoslovakia
VHG Labs, Inc., Manchester, New Hampshire, USA

This material was produced by the American Cast Iron Pipe Company, (ACIPCO), Birmingham, Alabama, USA.

See reverse side for more information.

Certificate No. 2B-031192

BS 2B Cast Iron

Number	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Sn	Al	V	Nb
1	1.956	0.186	0.079	0.061	2.31	0.100	0.060	1.91	0.030	0.023	0.0070	0.013	0.006
2	1.960	0.190	0.083	0.063	2.32	0.100	0.061	1.93	0.034	0.025	0.0075	0.014	0.007
3	1.960	0.208	0.083	0.063	2.34	0.102	0.061	1.94	0.040	0.025	0.0077	0.014	0.007
4	2.000	0.210	0.085	0.065	2.39	0.106	0.061	1.94	0.040	0.026	0.0080	0.014	0.008
5	2.010	0.215	0.090	0.067	2.39	0.110	0.066	1.94	0.042	0.026	0.0090	0.014	0.009
6	2.030	0.220			2.39	0.112	0.070	1.96	0.044	0.029	0.0090	0.014	
7	2.060	0.234			2.41				0.045			0.015	
Average	1.9966	0.2090	0.0840	0.0638	2.364	0.1050	0.0632	1.937	0.0393	0.0257	0.0080	0.0140	0.0074
Std.Dev.	0.0401	0.0167	0.0040	0.0023	0.040	0.0052	0.0040	0.016	0.0054	0.0020	0.0008	0.0006	0.0011
Certified	2.00	0.21	0.084	0.064	2.36	0.105	0.063	1.94	0.039	0.026	0.008	0.014	0.007

Number	Co	Ti	W	As	Zr	Sb	Ce	B	Te	Pb	Mg
1	0.013	0.079	0.035	0.064	0.009	0.039	0.004	0.0043	0.011	0.0090	0.0005
2	0.014	0.082	0.040	0.067	0.010	0.041	0.006	0.0045	0.012	0.0100	
3	0.014	0.084	0.040	0.069	0.011	0.043	0.011	0.0047	0.013	0.0110	
4	0.014	0.085	0.041	0.069	0.011	0.045		0.0048	0.016	0.0110	
5	0.016	0.086	0.045			0.046		0.0050		0.0110	
6	0.016	0.086				0.047				0.0120	
7		0.088				0.048				0.0130	
Average	0.0145	0.0843	0.0402	0.0673	0.0103	0.0441	0.0070	0.0047	0.0130	0.0110	
Std.Dev.	0.0012	0.0030	0.0036	0.0024	0.0010	0.0033	0.0036	0.0003	0.0022	0.0013	
Certified	0.015	0.084	0.040	0.067	0.010	0.044	(0.007)	0.0047	0.013	0.011	

Notes

- 1 - This white iron material is made for the calibration of x-ray fluorescence and optical emission spectrometers. For best results, chill-cast your specimens to produce a graphite-free zone in the area to be analyzed.
- 2 - Because of the exotic composition of these materials and the limitations of some instrument sources, an averaging of two to four analyses may be required.
- 3 - Beware of interelement effects.
- 4 - Always use the same method of surface preparation on the Reference Materials and all specimens to be analyzed for optimum results.

Chemical analyses were performed on chips taken from cross-sections of the discs. 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 322, E 350, E 351, E 485, E 1019(modified), plus additional ICP, and AA spectrometric methods. The following Certified Reference Materials were used to validate the analytical data listed above: NIST SRM 32e, 122h, 125b, 361, 362, 363, 364; BAM 039-2, 044-1; BCS 455/1, 456/1, 458/1; ECRM 085-1, 088-1, 096-1, 184-1, 481-1, 483-1; GBW 01402; IMZ 1.74, 1.22/1

This Reference Material was tested for homogeneity using ASTM Standard Method E 826 and found acceptable for all certified elements. It was also examined by optical emission spectrometry and found to be compatible with the following Certified Reference Materials: NIST SRM C1137a, C1145a, C1146a, C1150a; CKD 232 - 239A, CKD 241 - 249

This material was chill-cast white by a rapid unidirectional solidification procedure with the addition of inoculants. It was given a stress relief heat treatment for one hour at 590° C (below graphitizing temperature). The certified portion for each disc is the portion extending upward 10 mm from the larger diameter surface. Shrinkage cavities may appear in the top portion of some discs. The shrinkage cavities will not affect the certified portion.

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 USA Fax: (281) 440-4432

Certified by: _____
G. R. Brammer

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