

Brammer Standard Company, Inc.

# Certificate of Analysis

B.S. 28

**Chill-cast Iron**

Carbon	2.88	Aluminum	0.020
Manganese	0.22	Antimony	<0.001
Phosphorus	0.034	Cerium	0.006
Sulfur	0.001	Cobalt	0.001
Silicon	2.16	Tellurium	(0.021)
Copper	0.009	Tin	<0.001
Nickel	1.04	Titanium	0.010
Chromium	0.068	Niobium	0.036
Molybdenum	0.002	Vanadium	0.006
Magnesium	0.095		

*(analysis listed as percent by weight)*

Some of the co-operating laboratories were:

Brammer Standard Co., Inc., Houston, Texas  
CKD PRAHA, Praha, Czechoslovakia  
Crucible Specialty Metals, Syracuse, New York  
J. Dirats and Co., Inc., Westfield, Massachusetts  
Charles C. Kawin Company, Broadview, Illinois  
TCR Engineering Service Pvt. Ltd., Bombay, India  
Tyler Pipe Company, Tyler, Texas  
VHG Laboratories, Inc., Manchester, New Hampshire

CAUTION: Because this Reference Material contains a high percent of carbon and silicon, 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 28-120191

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

Analysis	C	Mn	P	S	Si	Cu	Ni	Cr	Mo	Mg
1	2.845	0.21	0.032	0.0005	2.12	0.0079	1.01	0.064	0.0018	0.093
2	2.87	0.21	0.033	0.0005	2.13	0.008	1.039	0.067	0.002	0.093
3	2.879	0.215	0.033	0.0006	2.147	0.0085	1.04	0.0674	0.002	0.093
4	2.88	0.221	0.034	0.002	2.167	0.009	1.048	0.068	0.0021	0.094
5	2.88	0.225	0.0358	0.002	2.18	0.009	1.052	0.070	0.0024	0.0952
6	2.882	0.229	0.036	0.002	2.19	0.0095	1.07	0.070	0.003	0.1003
7	2.888	0.23	0.037	0.0022	2.21	0.010			0.003	
8	2.91	0.235								
Average	2.879	0.222	0.0344	0.0014	2.163	0.0088	1.043	0.0677	0.0023	0.0948
Std Dev	0.018	0.009	0.0019	0.0008	0.033	0.0008	0.020	0.0022	0.0005	0.0029
Certified	2.88	0.22	0.034	0.001	2.16	0.009	1.04	0.068	0.002	0.095

Analysis	Al	Sb	Ce	Co	Te	Sn	Ti	Nb	V
1	0.017	0.0001	0.0057	0.0010	0.018	0.00012	0.008	0.034	0.005
2	0.019	0.0002	0.006	0.0010	0.020	0.00015	0.009	0.034	0.005
3	0.020	0.00026	0.0062	0.0011	0.0207	0.0003	0.0096	0.035	0.0055
4	0.020	<0.001	0.0067	0.0013	0.021	0.00059	0.0101	0.036	0.006
5	0.021	<0.001		0.0020	0.023	<0.001	0.0103	0.0368	0.0067
6	0.022				0.0234	<0.001	0.011	0.037	0.008
7							0.011	0.0393	
Average	0.0198		0.0062	0.0013	0.0210		0.0099	0.0360	0.0060
Std Dev	0.0017		0.0004	0.0004	0.0020		0.0011	0.0019	0.0012
Certified	0.020	<0.001	0.006	0.001	(0.021)*	<0.001	0.010	0.036	0.006

\* Tellurium is inhomogeneous in the discs.

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 analytical 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 elements except tellurium. 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. 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.  
14603 Benfer Road  
Houston, Texas 77069 USA

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

Certified by: G. R. Brammer \_\_\_\_\_ on December 1, 1991.