

Brammer Standard Company, Inc.

# Certificate of Analysis (Revised)

B.S. 183

## Reference Material for Greek Ascoloy Steel

Carbon	0.16	Molybdenum	0.35
Manganese	0.43	Vanadium	0.12
Phosphorus	0.020	Niobium	(0.003)
Sulfur	0.013	Cobalt	0.029
Silicon	0.33	Tin	(0.0016)
Copper	0.068	Titanium	0.003
Nickel	2.00	Tungsten	2.77 *
Chromium	12.81		

*(analysis listed as percent by weight)*

\* The tungsten value was revised on September 30, 1996, after a new interlaboratory testing program using more sophisticated methods of sample preparation for wet chemical analysis. The original value was certified at 2.63% on December 16, 1987.

Data in parentheses are not certified but provided for information.

Some of the co-operating laboratories were:

Allegheny Ludlum Steel Corp., Brackenridge, PA  
Allegheny Ludlum Steel Corp., Lockport, NY  
Alpha Research Laboratories, Stevensville, MI  
Brammer Standard Co., Houston, TX  
Carpenter Technology, Reading, PA  
Crucible Steel, Syracuse, NY  
Dirats Laboratories, Westfield, MA  
Earle M. Jorgensen Company, Seattle, WA  
Metals Analysis, Inc., Huntington Park, CA  
Turret Alloys Ltd., Analytical Services, Sheffield, England  
VHG Labs, Andover, MA

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 data on reverse side.

Certificate No. 2REV183-120996

**Brammer Standard Company, Inc., 14603 Benfer Road, Houston, TX 77069**  
**Telephone (281) 440-9396 Telex 775376 Fax (281) 440-4432**

Analysis Number	C	Mn	P	S	Si	Cu	Ni	Cr	Mo
1	0.160	0.403	0.018	0.012	0.310	0.060	1.95	12.75	0.340
2	0.160	0.420	0.018	0.013	0.320	0.065	1.98	12.77	0.340
3	0.164	0.430	0.019	0.013	0.329	0.068	2.00	12.79	0.350
4	0.165	0.430	0.020	0.013	0.340	0.070	2.00	12.80	0.360
5	0.170	0.430	0.020	0.014	0.340	0.070	2.02	12.81	0.363
6		0.440	0.022		0.350	0.073	2.02	12.85	0.370
7		0.450					2.02	12.93	
8		0.450					2.04		
Average	0.1638	0.4316	0.0195	0.0130	0.3315	0.0677	2.004	12.814	0.3538
Std.Dev.	0.0041	0.0156	0.0015	0.0007	0.0147	0.0046	0.028	0.060	0.0125
Certified	0.16	0.43	0.020	0.013	0.33	0.068	2.00	12.81	0.35

continued

Analysis Number	Co	Nb	W	V	Ti	Sn
1	0.025	0.002	2.693	0.115	0.002	0.0005
2	0.029	0.003	2.726	0.116	0.002	0.0010
3	0.029	0.003	2.777	0.123	0.003	0.0015
4	0.030	0.004	2.780	0.128	0.004	0.0020
5	0.030		2.787	0.130		0.0030
6	0.032		2.80			
7			2.808			
8			2.815			
Average	0.0292	0.0030	2.773	0.1224	0.0028	0.0016
Std.Dev.	0.0023	0.0008	0.042	0.0068	0.0010	0.0010
Certified	0.029	(0.003)	2.77*	0.12	0.003	(0.0016)

Data in parentheses is not certified but provided for information only.

\* The tungsten value was revised on September 30, 1996, after a new interlaboratory testing program was completed. The original value was certified at 2.63% on December 16, 1987.

Chemical analyses were made on millings from the cross-section of the bars. The values listed above are the individual laboratory's analytical results.

Methods of analysis used were a combination of ASTM Standard Methods for classical wet chemistry, ICP and AA spectrometric methods, and combustion instruments for carbon and sulfur.

Inquiries concerning this Reference Material should be directed to:

Brammer Standard Co., Inc                      Phone: (281) 440-9396  
 14603 Benfer Road                              Fax: (281) 440-4432  
 Houston, Texas 77069 USA

Certified by: G. R. Brammer on December 9, 1996.