Brammer Standard Company, Inc.

Provisional Certificate of Analysis

BS 45C

Certified Reference Material for ASTM Steel Grade A182 F11 - UNS Number K11572

Analysis listed as percent by weight

	Estimated Analysis[1]		Estimated Analysis[1]
Al	**0.019**	**N**	**0.007**
As	**0.001**	**Nb**	**0.002**
B	**0.0003**	**Ni**	**0.079**
C	**0.12**	**O**	**<0.005**
Ca	**0.0009**	**P**	**0.008**
Co	**0.006**	**S**	**0.017**
Cr	**1.37**	**Sb**	**0.003**
Cu	**0.13**	**Si**	**0.69**
Fe	**96.5**	**Sn**	**0.007**
H	**<0.0005**	**Ti**	**0.001**
Mg	**0.0002**	**V**	**0.003**
Mn	**0.48**	**W**	**0.003**
Mo	**0.58**	**Zr**	**0.001**

[1] The estimated value listed is the present best estimate of the true value. Values are given in weight percent.

Form: This CRM is machined in the form of a disc, approximately 38mm in diameter and 19mm thick by Brammer Standard Company, Inc.

A detailed final certificate of analysis will be supplied by December 18, 2025

Brammer Standard Company, Inc., 14603 Benfer Road, Houston, TX 77069-2895 USA
Telephone: (281) 440-9396 Fax (281) 440-4432 Website: www.brammerstandard.com

45C	Al	As	B	Be	Bi	C	Ca	Ce	Co	Cr	Cu	Fe	H	Mg
CSONH						0.118							0.000032	
BSC SAES	0.0184	0.0032	0.0003			0.117	0.0008		0.0076	1.39	0.127	96.47		0.000085
BSC GDS	0.0194	0.0001	0.000052			0.118	0.0007		0.0055	1.37	0.128	96.48		0.0003
MTR	0.018	0.001	0.0004			0.12	0.0012		0.005	1.36	0.13		0.00008	
Average	0.0186	0.00143	0.000251			0.11825	0.0009		0.00603	1.37333	0.12833	96.475	0.000056	0.000193
Certificate	**0.019**	**0.001**	**0.0003**			**0.12**	**0.0009**		**0.006**	**1.37**	**0.13**	**96.5**	**<0.0005**	**0.0002**

45C	Mn	Mo	N	Nb	Ni	O	P	Pb	S	Sb	Si	Sn	Ta	Ti
CSONH			0.0083			0.0008			0.0188					
BSC SAES	0.483	0.567			0.0784		0.0081		0.0166	0.0017	0.682	0.0073		0.002
BSC GDS	0.49	0.573		0.002	0.0783		0.0076		0.0168	0.0019	0.7			0.0005
MTR	0.48	0.59	0.0050	0.002	0.08		0.007		0.014	0.004	0.69	0.007		0.001
Average	0.48433	0.57667	0.00665	0.002	0.0789	0.0008	0.00757		0.01655	0.00253	0.69067	0.00715		0.001167
Certificate	**0.48**	**0.58**	**0.007**	**0.002**	**0.079**	**<0.005**	**0.008**		**0.017**	**0.003**	**0.69**	**0.007**		**0.001**

45C	V	W	Zn	Zr
CSONH				
BSC SAES	0.0037	0.0022		0.0017
BSC GDS	0.0023	0.0038		0.0003
MTR	0.002			
Average	0.00267	0.003		0.001
Certificate	**0.003**	**0.003**		**0.001**

Homogeneity: This Certified Reference Material (CRM) was tested for homogeneity using ASTM Standard Method E826 and found acceptable. It was also examined by spark atomic emission spectrometry and found to be compatible with the following Reference Materials: BS 45, 45A, 45B, 55D, 55E, 1981, 4011, 4031.

Validity statement: ISO Guide 31 states that the certification should contain an expiration date for all materials where instability has been demonstrated or is considered possible, after which the certified value is no longer guaranteed by the certifying body. The certification of BS 45C is valid indefinitely. The certification is nullified if this CRM is damaged, contaminated, or otherwise modified.

Storage: This CRM must be stored in a cool, dry, non-corrosive environment.

Source: The bar stock for this CRM was produced by Steel Dynamics, Inc.; Pittsboro, In.

Certified Area: The entire depth of the CRM may be used.

Caution: As with any bar material, avoid spark atomic emission spectrometric burns in the center of the CRM (5 mm radius), as some segregation may be present.

Sample Preparation: For best analytical results, use the same method for preparing the analytical surface on all reference materials as used for production specimens. Avoid overheating the sample during surface preparation.

Caution: CRM contains significant insoluble soft metal inclusions. Surface smearing may occur. Spark atomic emission spectrometers may require extended preburns to compensate.

Safety Notice: A Safety Data Sheet (SDS) 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** **Web: www.brammerstandard.com**
14603 Benfer Road
Houston, Texas 77069-2895 USA **Fax: (281) 440-4432** **Email: contact@brammerstandard.com**

The scopes of accreditation and ISO certificates are listed on the website : www.brammerstandard.com

References:

Versions used were those available at the time of testing and characterization

E826 Standard Practice for Testing Homogeneity of a Metal Lot or Batch in Solid Form by Spark Atomic Emission Spectrometry

E1019 Standard Test Methods for Determination of Carbon, Sulfur, Nitrogen, and Oxygen in Steel, Iron, Nickel, and Cobalt Alloys by Various Combustion and Fusion Techniques

E1806 Standard Practice for Sampling Steel and Iron for Determination of Chemical Composition

ISO Standard 17025:2017 General requirements for the competence of testing and calibration laboratories

ISO Standard 9001:2015 Quality Management Systems - Requirements

ISO Guide 30:2015 Terms and definitions used in connection with reference materials + 2008 amendment

ISO Guide 31:2015 Reference materials - Contents of certificates and labels

ISO Guide 33:2015 Uses of certified reference materials

ISO Standard 17034:2016 General requirements for the competence of reference material producers

ISO Guide 35:2017 Reference Materials - General and statistical principles for certification

ASTM documents available from ASTM, 100 Barr Harbor Dr., West Conshohocken, PA 19428.

*ISO Guides and Standards available from Global Engineering - **www.global.ihs.com***

Other useful documents available from NIST, U.S. Department of Commerce, Gaithersburg, MD 20899.

NIST Special Publication 260-100, Handbook for SRM Users

NIST Special Publication 829, Use of NIST Standard Reference Materials for Decisions on Performance of Analytical Chemical Methods and Laboratories

Certified by: _____ on December 18, 2023.

Beau R. Brammer

President