ASME B89.3.7-2013

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Granite Surface Plates

AN AMERICAN NATIONAL STANDARD

The American Society of Mechanical Engineers

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The American Society of Mechanical Engineers

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The American Society of Mechanical Engineers
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FOREWORD

This ASME Standard is a revision of the 1973 Federal Specification GGG-P-463c which has been used extensively in American industry since its publication. Although the measurement methods for surface plates had already been in use some decades prior to the Federal Specification, it did serve to document these methods. In addition, it provided common language and terms of classification for surface plate manufacturing and commerce. While little has changed with regard to measurement methods and the flatness tolerances of the various plate grades are still relevant today, ASME B89 Division 3 decided an effort was justified to modernize the document. Most notably, a more complete glossary was added with currently accepted definitions, metric units were added where appropriate, and a new format was used that should be more familiar to current users of the Standard. This Committee also recognized the need for updates to a surface plate specification to incorporate modern concepts, such as traceability and measurement uncertainty, that have undergone considerable development since 1973. This new document under ASME B89 ownership will provide the platform for these and other updates periodically through the revision process.

This edition of B89.3.7 was approved by ANSI on April 12, 2013.

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Dimensional Metrology

(The following is the roster of the Committee at the time of approval of this Standard.)

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General. ASME Standards are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Standard may interact with the Committee by requesting interpretations, proposing revisions, and attending Committee meetings. Correspondence should be addressed to:

Secretary, B89 Standards Committee
The American Society of Mechanical Engineers
Two Park Avenue
New York, NY 10016-5990
http://go.asme.org/Inquiry

Proposing Revisions. Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

Proposing a Case. Cases may be issued for the purpose of providing alternative rules when justified, to permit early implementation of an approved revision when the need is urgent, or to provide rules not covered by existing provisions. Cases are effective immediately upon ASME approval and shall be posted on the ASME Committee Web page.

Requests for Cases shall provide a Statement of Need and Background Information. The request should identify the Standard, the paragraph, figure or table number(s), and be written as a Question and Reply in the same format as existing Cases. Requests for Cases should also indicate the applicable edition(s) of the Standard to which the proposed Case applies.

Interpretations. Upon request, the B89 Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the B89 Standards Committee.

The request for interpretation should be clear and unambiguous. It is further recommended that the inquirer submit his/her request in the following format:

Subject:	Cite the applicable paragraph number(s) and the topic of the inquiry.
Edition:	Cite the applicable edition of the Standard for which the interpretation is being requested.
Question:	Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. The inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in this format may be rewritten in the appropriate format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not "approve," "certify," "rate," or "endorse" any item, construction, proprietary device, or activity.

Attending Committee Meetings. The B89 Standards Committee regularly holds meetings that are open to the public. Persons wishing to attend any meeting should contact the Secretary of the B89 Standards Committee.

Introduction

One primary purpose of specifying values for surface plate parameters such as flatness, or for measuring these parameters, is to predict or estimate the level of accuracy that may be accomplished in measurements when the surface plate serves as a reference for those measurements, i.e., the measurement errors will tend to be smaller when a flatter (higher grade) surface plate is used as a reference, and measurement errors will generally be larger when a lower grade surface plate is used. Although, in general, it is difficult to quantitatively relate surface plate flatness to measurement errors, for specific applications, a certain flatness parameter may correlate very well with measurement errors, e.g., a measurement task involving a height stand with support spacing the same as that of a repeat reading gage may have measurement errors that are close to the repeat readings from the gage. It is safe to say, in general, the correlation will be useful but qualitative. The definitions and procedures in this Standard can also allow fair comparisons between surface plates, and they can help to identify and quantify changes in a given surface plate that occur over time, either from use or from changes in the environment.

GRANITE SURFACE PLATES

1 GENERAL

1.1 Scope

This Standard covers igneous rock (granite) plates for use in high accuracy locating, layout, and inspection work. It encompasses new certification, recertification in the field, and recertification after resurfacing. In general, the standard covers any size granite surface plate. Information for the sizes in common use is presented in tabular form.

1.2 Classification: Styles and Grades

Surface plates shall be of the following styles and grades:

(a) Styles (shapes)

- Rectangular, no ledge (see Fig. 2)
- Rectangular, 2 ledge, either direction (see Fig. 3)
- Rectangular, 4 ledge (see Fig. 4)
- Round, no ledge (see Fig. 5)

(b) Grades

- AA
- A
- B

2 DEFINITIONS

bow: the condition of a surface plate where the middle of the plate is higher or lower than the two ends.

F.I.M.: Full Indicator Movement.

flatness: the condition of a surface or derived median plane having all elements in one plane.

grade: the classification of a surface plate according to the flatness and repeat reading tolerance of the work surface. (This Standard covers three grades: AA, A, and B.)

inserts: typically made of metal (usually stainless steel, to prevent rusting) and are "plugs," usually predrilled and tapped to various thread diameters and pitches, and are epoxied into a granite surface plate. They can also be furnished as a "solid" insert — no predrilling or tapping. Threaded inserts allow for hold-down capabilities and fixturing on a granite surface plate.

ledge: an undercut made along the sides or across the ends (or both) of a surface plate.

repeat reading: a measure of flatness over localized areas of a surface plate. This measure is usually obtained using a repeat reading gage (see following definition) that measures height variation of the surface plate from a reference established by the base of the repeat reading gage. The range of readings taken with a repeat reading gage represents local deviation from flatness over the area sampled.

repeat reading gage: a gage used to obtain repeat readings (see Fig. I-3). This instrument estimates the ability to reproduce a measurement of a fixed height at any place on the surface plate. The repeat reading gage is sensitive to short wavelength variations in flatness when readings are taken over small intervals of movement of its base.

twist: the condition of a surface plate where the plate takes on the shape of a surface whose ends have been turned in opposite directions (e.g., like the shape of a propeller). The four corners of plates having this condition do not lie within the same plane. The lines characterizing opposite ends of a surface plate that exhibits twist have some relative angle between them (see Fig. 1).

3 REFERENCES

3.1 Normative References

ASME B46.1, Surface Texture, Surface Roughness, Waviness and Lay

ASME B89.6.2, Temperature and Humidity Environment for Dimensional Measurement

ASME B89.7.3.1, Guidelines For Decision Rules: Considering Measurement Uncertainty in Determining Conformance to Specifications

ASME Y14.5M, Dimensioning and Tolerancing

Publisher: The American Society of Mechanical Engineers (ASME), Two Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, P.O. Box 2900, Fairfield, NJ 07007-2900 (www.asme.org)

ASTM C119-99b, Terminology Relating to Dimension Stone

ASTM C615-99, Standard Specification for Granite Dimension Stone

Publisher: American Society for Testing and Materials (ASTM International), 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959 (www.astm.org)

Research Paper 1320, Physical, Mineralogical, and Durability Studies on the Building and Monumental Granites of the United States, Journal of Research of