ASME Y14.46-2017

Draft Standard for Trial Use

Product Definition for Additive Manufacturing

Engineering Product Definition and Related Documentation Practices

This is a Draft Standard for Trial Use and comment. This Draft Standard is not an approved consensus standard of ASME nor is it an American National Standard. ASME has approved its issuance and publication as a Draft Standard only. Distribution of this Draft Standard for comment shall not continue beyond 1 year from the date of issuance. The content of this Draft Standard for Trial Use and comment was not approved through ASME's consensus process. Following the 1-year trial and comment period, this Draft Standard, along with comments received, will be submitted to a Consensus Committee or Project Team. The Consensus Committee or Project Team will review and revise this Draft Standard based, in part, upon experience during the trial term and resulting comments. A public review in accordance with established American National Standards Institute (ANSI) procedures is required at the end of the Trial-Use Period and before a Draft Standard for Trial Use is submitted to ANSI for approval as an American National Standard. Thereafter, it is expected that this Draft Standard (including any revisions thereto) will be submitted to ANSI for approval as an American National Standard. Suggestions for revision should be directed to the Secretary, Y14.46 Subcommittee using the following form: http://go.asme.org/Y14CommentForm.

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This Draft Standard for Trial Use will be revised following the conclusion of the Trial-Use Period. There will be no written interpretations of the requirements of this Draft Standard for Trial Use issued.

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FOREWORD

General. The Charter of the Y14.46 Subcommittee was approved by the Y14 Standards Committee on October 10, 2014, with the task to develop requirements in geometric dimensioning and tolerancing for additive manufacturing (AM). The goal of the Subcommittee was to create a broadly accepted standard that incorporates, expands, or refines international practices and symbology to enable AM product definition data sets to be created, interpreted, and consumed on a global basis. The Subcommittee worked quickly over the course of 2 years to generate content, collaborate with other standards development organizations to avoid overlap, and review the resulting Draft Standard thoroughly; the Y14 Standards Committee approved this ASME Y14.46 Draft Standard for Trial Use on June 19, 2017. With that said, it is understood that there are many opportunities to continue to improve this Draft Standard, and many of these are currently identified as "forward work" as described in the next paragraph. AM is a large space where industry is thirsty for experienced product definition guidance. The Y14.46 Subcommittee has brought together subject matter experts (SMEs) who have generously volunteered a significant amount of time and resources to this effort over the last 2 years. The Subcommittee believes it prudent to release the Draft Standard as quickly as possible to test the proposed concepts for AM product definition. The Subcommittee welcomes comments and/or proposals for revisions to this Draft Standard; the required method of submittal is under "Submitting Comments and Proposing Revisions" below.

Forward Work Sections. Some subsections are introduced in this Draft Standard because the Subcommittee is aware of the need to address these topics. Work to enhance these sections is ongoing, and feedback from the public is welcome (see "Submitting Comments and Proposing Revisions" below). The following sections and subsections are identified as "forward work":

4.2.3 Complex Geometry
4.2.4 Design for Assembly
Nonmandatory Appendix C Reference Documents to Test for Conformance

Submitting Comments and Proposing Revisions. Comments and proposals for revision should be directed to the Secretary, Y14.46 Subcommittee using the following form: http://go.asme.org/Y14CommentForm. Any proposals for revision 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.

The comment form contains instructions on how to submit comments.

Attending Committee Meetings. The Y14 Standards Committee regularly holds meetings and/or telephone conferences that are open to the public. Persons wishing to attend any meeting and/or telephone conference should contact the Secretary of the Y14 Standards Committee. Future Committee meeting dates and locations can be found on the Committee Page at http://go.asme.org/Y14Committee.

ASME Y14 COMMITTEE
Engineering Product Definition and Related Documentation Practices

(The following is the roster of the Committee at the time of approval of this Draft Standard for Trial Use.)

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PRODUCT DEFINITION FOR ADDITIVE MANUFACTURING DRAFT STANDARD FOR TRIAL USE

1 GENERAL

1.1 Scope

This Draft Standard, hereafter referred to as "Standard," covers definitions of terms and features unique to additive manufacturing (AM) technologies with recommendations for their uniform specification in product definition data sets and in related documents. Unless otherwise specified, any reference to features, parts, or processes shall be interpreted as applying to parts or assemblies manufactured using an AM process. Additively manufactured parts or assemblies are referred to as "parts" throughout the Standard. The Standard extends to capturing relevant AM detail from design, manufacturing, and quality engineering.

1.2 ASME Y14 Series Conventions

The conventions in paras. 1.2.1 through 1.2.9 are used in this and other ASME Y14 standards.

1.2.1 Mandatory, Recommended, Guidance, and Optional Words

(a) The word "shall" establishes a requirement.
(b) The word "will" establishes a declaration of purpose on the part of the design activity.
(c) The word "should" establishes a recommended practice.
(d) The word "may" establishes an allowed practice.
(e) The words "typical," "example," and "for reference" and the Latin abbreviation "e.g." indicate suggestions given for guidance only.
(f) The word "or" used in conjunction with a requirement or a recommended practice indicates that there are two or more options for complying with the stated requirement or practice.
(g) The phrase "unless otherwise specified" (UOS) shall be used to indicate a default requirement. The phrase is used when the default is a generally applied requirement and an exception may be provided by another document or requirement.

1.2.2 Cross-Reference of Standards. Cross-reference of standards in text with or without a date following the standard designator shall be interpreted as follows:
(a) Reference to other ASME Y14 standards in the text without a date following the standard designator indicates that the issue of the standard identified in the References section (para. 1.5) shall be used to meet the requirement.
(b) Reference to other ASME Y14 standards in the text with a date following the standard designator indicates that only that edition of the standard shall be used to meet the requirement.

1.2.3 Invocation of Referenced Standards. The following examples define the invocation of a standard when specified in the References section (para. 1.5) and referenced in the text of this Standard:
(a) When a referenced standard is cited in the text with no limitations to a specific subject or paragraph(s) of the standard, the entire standard is invoked. For example, "Dimensioning and tolerancing shall be in accordance with ASME Y14.5" is invoking the complete standard because the subject of the standard is dimensioning and tolerancing and no specific subject or paragraph(s) within the standard are invoked.
(b) When a referenced standard is cited in the text with limitations to a specific subject or paragraph(s) of the standard, only the paragraph(s) on that subject are invoked. For example, "Assign part or identifying numbers in accordance with ASME Y14.100" is invoking only the paragraph(s) on part or identifying numbers because the subject of the standard is engineering drawing practices and part or identifying numbers is a specific subject within the standard.
(c) When a referenced standard is cited in the text without an invoking statement such as "in accordance with," the standard is for guidance only. For example, "For gaging principles, see ASME Y14.43" is only for guidance and no portion of the standard is invoked.

1.2.4 Parentheses Following a Definition. When a definition is followed by a standard referenced in parentheses, the standard referenced in parentheses is the source for the definition.

1.2.5 Notes. Notes depicted in this Standard in ALL UPPERCASE letters are intended to reflect actual product definition data. Notes depicted in initial uppercase or in lowercase letters are to be considered supporting data to the contents of this Standard and are not intended for literal entry into product definition data. A statement requiring the addition of a note with the qualifier "such as" is a requirement to add a note, and the content of the note is allowed to vary to suit the application.

1.2.6 Acronyms and Abbreviations. Acronyms and abbreviations are spelled out the first time they are used in this Standard, followed by the acronym or abbreviation in parentheses. The acronym is used thereafter throughout the text.

1.2.7 Units. The International System of Units (SI) is featured in this Standard. It should be understood that U.S. Customary units could equally have been used without prejudice to the principles established.

1.2.8 Figures. The figures in this Standard are intended only as illustrations to aid the user in understanding the practices described in the text. In some cases, figures show a level of detail as needed for emphasis. In other cases, figures are incomplete by intent so as to illustrate a concept or facet thereof. The absence of figure(s) has no bearing on the applicability of the stated requirements or practice. To comply with the requirements of this Standard, actual data sets shall meet the content requirements set forth in the text. To assist the user of this Standard, a list of the paragraph(s) that refer to an illustration appears in the lower right-hand corner of each figure. This list may not be inclusive. The absence of a list is not a reason to assume inapplicability. Some figures are illustrations of models in a three-dimensional (3D) environment. The absence of dimensioning and tolerancing annotations in a view may indicate that the product definition is defined in three dimensions. Dimensions that locate or orient and are not shown are considered basic and shall be queried to determine the intended requirement. When the letter "h" is used in figures for letter heights or for symbol proportions, select the applicable letter height in accordance with ASME Y14.2. Multiview drawings contained within figures are third angle projection.

1.2.9 Precedence of Standards. The following are ASME Y14 standards that are basic engineering drawing standards:

ASME Y14.1, Decimal Inch Drawing Sheet Size and Format
ASME Y14.1M, Metric Drawing Sheet Size and Format
ASME Y14.2, Line Conventions and Lettering
ASME Y14.3, Orthographic and Pictorial Views
ASME Y14.5, Dimensioning and Tolerancing
ASME Y14.24, Types and Applications of Engineering Drawings
ASME Y14.34, Associated Lists
ASME Y14.35M, Revision of Engineering Drawings and Associated Documents
ASME Y14.36M, Surface Texture Symbols
ASME Y14.38, Abbreviations and Acronyms for Use on Drawings and Related Documents
ASME Y14.41, Digital Product Definition Data Practices
ASME Y14.100, Engineering Drawing Practices

All other ASME Y14 standards are considered specialty types of standards and contain additional requirements or make exceptions to the basic standards as required to support a process or type of drawing.

1.3 Dimensioning and Tolerancing

The methods of dimensioning and tolerancing shall be in accordance with ASME Y14.5, ASME Y14.41, and this Standard.

1.4 Examples

Where examples are provided, such lists are not exhaustive and other examples could be equally applicable.

1.5 References

The following editions of national and international standards and practices form a part of this Standard to the extent specified herein. A more recent revision may be used, provided there is no conflict with the text of this Standard. In the event of a conflict between the text of this Standard and the references cited herein, the text of this Standard shall take precedence.

ASME B46.1-2009, Surface Texture (Surface Roughness, Waviness, and Lay)