A Brief Overview of ASME Digital Product Definition Standards Enabling MBE and MBD

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In 1957 the first edition of Y14.5 American Drafting Standards Manual, Section 5, Dimensioning and Notes, was published; A revision of Z14.1-1946 sections 5, 6 and 7.

In the 1970’s the committee worked to prepare voluntary consensus standards to replace military standards where government practices were found to be common with the industry at large. Some examples are:

- Chapter 700 of military standard, MIL-STD-100, was used as the basis for the Y14.34 standard; Chapter 200 of MIL-STD-100 was used as the basis for the Y14.24 standard; and Chapter 600 of the MIL-STD-100 was used as the basis for the Y14.35 standard.

The Y14 committee continues to work closely with the Department of Defense (DoD) to ensure that the needs of the federal agency and industry are fulfilled through the voluntary consensus process.
ASME Y14 Engineering Product Definition and Related Documentation Practices

Charter:

The development and maintenance of national standards for defining and documenting a product throughout its life cycle and related certification activities. This shall be accomplished by:

1) recognizing the continuing need for existing standards regardless of the source medium (e.g., paper, film, and digital) or method of preparation (e.g., manual or computer generated);

2) providing standardization where a variety of practices exist within industry and government;

3) providing standards for new concepts and technologies; and

4) supporting and coordinating development and harmonizing of standards with responsible standardization bodies, including ANSI, ISO, and government agencies.
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**Y14.5 – Dimensioning and Tolerancing**

- Considered the authoritative guideline for the design language of Geometric Dimensioning and Tolerancing GD&T.
- **Essential for communicating design intent** – Ensure parts from technical documents have the desired form, fit, function and interchangeability.
- **Establishes uniform practices** – stating and interpreting GD&T and related requirements.
- Provides numerous examples.

www.asme.org/shop/standards
ASME Y14.5 – 2009
Tolerance Classes

- SIZE
- FORM
- ORIENTATION
- LOCATION
- RUNOUT
- PROFILE

Straightness, Flatness, Circularity, Cylindricity
Parallelism, Perpendicularity, Angularity
Position, Concentricity, Symmetry
Circular, Total, Line, Surface

Tolerance type symbol
Datum Identifier symbol
Feature Control Frame

Tolerance value: 0.05 A
Establishes the definition as well as exceptions and additional requirements of composite parts.

- Composite parts are inseparable assemblies of composite materials that may include noncomposite material(s).

Currently under revision

- Document restructure for better flow and alignment with Y14.41.
- Adding digital 3D requirements, not just drawing requirements.
- Incorporating requirements for Digital Product Definition for composites.
- Establishing Ply requirements regarding definition, stackup schematic, tables, etc…
Moving composite product definition into the digital age: From 2D drawings to 3D Models and Beyond
Beyond Wireframes
Y14.41 – Digital Product Definition Data Practices

- Establishes requirements, defines exceptions, and references documents applicable to the preparation and revision of digital product definition data, referred to as data sets or drawings in digital format.
  - Product definition data denotes the totality of data elements required to completely define a product. This includes geometry, topology, relationships, tolerances, attributes, and features necessary to completely define a component part or an assembly of parts for the purpose of design, analysis, manufacture, test, and inspection. (See ASME Y14.100).

- Currently under revision
  - Revising figures for weld and surface finish symbology to coordinated properly with text and align with Y14.36 Surface Texture Symbols.
  - Reviewing Non-Uniform Profile tolerance distribution in 3D.
ASME Y14 Engineering Product Definition and Related Documentation Practices

Y14.41.1 – DRAFT 3D Model Organization Schema

- This standard establishes a schema for organizing the data within a 3D model contained in a digital product definition data set.
  - The schema defines a common practice to improve design productivity and to deliver consistent data content and structure to consumers of the data. An alternate method of data organization may be used as long as a cross-reference is provided to the schema.
- Shall replace Appendix B of MIL-STD-31000A used to define a 3D technical data package (TDP) for the DoD.
- Will standardize the exchange of 3D model data used to define an item for manufacturing and procurement.
ASME Y14.41.1 – 20XX
Topics Covered

• Glossary of Terms
• Data Set Completeness State
• Organizational Framework Requirements:
  – Naming Conventions
  – Associated Groups
  – Saved Views
  – Presentation States
  – Annotation Orientation
  – Model Notes
  – Meta Data
Y14.46 – DRAFT GD&T for Additive Manufacturing

- The standard will establish methods to describe complex parts, internal geometric features (e.g., matrices, engineered voids, curving channels), build orientation, fill patterns, local toolpath orientations, integrated components manufactured at the same time, and specifying the geometric placement of the material and material gradients.
  - Consideration shall be given to the development of practices that can be effectively used for CAD/CAM systems application.
- This Standard will cover GD&T methods, symbology, geometric tolerance controls, the control of free state variation, and the establishment of datums related to additive manufacturing technologies for their uniform specification on engineering drawings and related documents.
ASME Y14.46 – 20XX
Committee Structure

• Data Package Requirements
  – Identification of Data Products
  – Model Schema and Organization

• Part Definition
  – Distinguishing Intermittent Stages of AM Processing
  – Geometry Characteristics Specific to Additive Manufacturing
  – Material Definition
  – Datum Referencing
  – Notes

• Process Specific Definition
  – Planning and Pre-processing
  – In Process
  – Post-processing

• Verification and Conformance to Specifications
  – Functional Requirements
  – Inspection
ASME Y14 Engineering Product Definition and Related Documentation Practices

For additional information, including future meetings and document updates. Go to:

go.asme.org/Y14committee
ASME Model-Based Enterprise (MBE)

- **Brand new committee establishment**
  - Tasked with developing standards providing rules, guidance, and examples for the creation and use of model-based datasets, data models, and related topics within a MBE.

- **Charter under development**
  - Areas of concentration: types of models and their intended uses; rules for representing requirements and constraints; types of features and data elements for model-based datasets; schemas for datasets; creating, managing and using product definition and process definition data; managing links between product definition and process definition; rules governing data quality; managing discrepancies

- **Initial efforts**
  - Develop Lexicon and Strategic Roadmap
QUESTIONS??

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