ASME Activities
Enabling a Model Based Enterprise

By Fredric Constantino
Overview of ASME Standardization

- History
- Vision, Mission, and Strategic Focus
- Organization
- Enabling MBE Activities
WHAT IS A STANDARD?
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Standard – A set of technical definitions, instructions, rules, guidelines, or characteristics set forth to provide consistent and comparable results, including:

- Items manufactured uniformly, providing for interchangeability
- Tests and analyses conducted reliably, minimizing the uncertainty of the results
- Facilities designed and constructed for safe operation
• Industrial revolution: fueled by novel applications of steam power

• Between 1898 and 1903 alone, over 1200 people were killed in the U.S. in ~1900 separate boiler explosions

• Key problem: Lack of understanding, consistency, and safety features in boiler design and operation
Timeline of Early ASME Standardization Milestones

1880
ASME founded to address issues with industrialization and mechanization

1884
Issues first standard, Code for the Conduct of Trials of Steam Boilers

1905
Standard for Proportions of Machine Screw Sizes

1914
First edition of the Boiler and Pressure Vessel Code

1916
Safety Code for Cranes

1918
Founding member of American Engineering Standards Committee (later known as ANSI)

1921
Safety Code for Elevators

NUMBER OF EXPLOSIONS

YEAR
<table>
<thead>
<tr>
<th>Vision Statements</th>
<th>Mission Statements</th>
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<tbody>
<tr>
<td>To be the essential resource for mechanical engineers and other technical professionals throughout the world for solutions that benefit humankind</td>
<td>To serve diverse global communities by advancing, disseminating and applying engineering knowledge for improving the quality of life; and communicating the excitement of engineering</td>
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<tr>
<td>To be the world leader in mechanical and multidisciplinary engineering codes, standards, conformity assessment programs, and related products and services</td>
<td>To develop the best, most applicable codes, standards, conformity assessment programs, and related products and services in the world for the benefit of humanity</td>
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**Board**

Provides procedural oversight for all activities

**Standards Committees**

Establishes consensus on all technical matters

**Subcommittees**

Provides recommendations on technical matters to the standards committee in a given subject area – e.g., Dimensioning and Tolerancing

**Subgroups**

Develops proposal in a given specialty – e.g., Edges Treatment

**WGs, TGs, PTs**

Develops detailed proposals in a specific field – e.g., Valve Design
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.
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**.

[www.asme.org/shop/standards](http://www.asme.org/shop/standards)
Y14.46 – Product Definition for Additive MFG

- Establishes 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.

- Covers 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.

- Published as a Draft Standard for Trial Use December 2017
  - One year request for commenting:
  - http://go.asme.org/Y14CommentForm
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 Y14.46 – 2017
Table of Content

1. General
2. Definitions
3. Supplemental Geometry
4. Product and Process Definition Requirements
5. Product Data Packages (PDP)

Nonmandatory Appendices
A. Example AM Notes
B. Defining Transition Regions
C. Reference Documents to Test for Conformance
Y14.47 – 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.
Glossary of Terms
Data Set Completeness State
Organizational Framework Requirements:
- Naming Conventions
- Associated Groups
- Saved Views
- Presentation States
- Annotation Orientation
- Model Notes
- Meta Data
ASME Model-Based Enterprise (MBE)

• **Charter**
  - Developing standards providing rules, guidance, and examples for the creation and use of model-based datasets, data models, and related topics within a MBE.

• **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.
Open to all NIST MBE Summit Attendees

Draft Agenda:

- 13:00 to 13:10, Welcome (Fred and Tom)
- 13:10 to 13:30, MBE committee logistics update (Fred)
- 13:30 to 14:15, Near-term (2-3 yr) Use Case Identification
  - Each attendee provides top 3 use cases the committee should tackle immediately
- 14:15 to 14:25, Break
- 14:25 to 15:10, Long-term (5-10 yr) Use Case Identification
  - Each attendee provides top 3 use cases the committee should tackle eventually
- 15:10 to 15:30, Solicit input on liaisonships
  - Other organizations we should engage (e.g., IEEE, INCOSE, SME, ASTM)
- 15:30 to 15:45, Getting involved
- 15:45 to 16:15, Question and Answer
- 16:15 to 16:20, Next steps and summary
QUESTIONS??

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