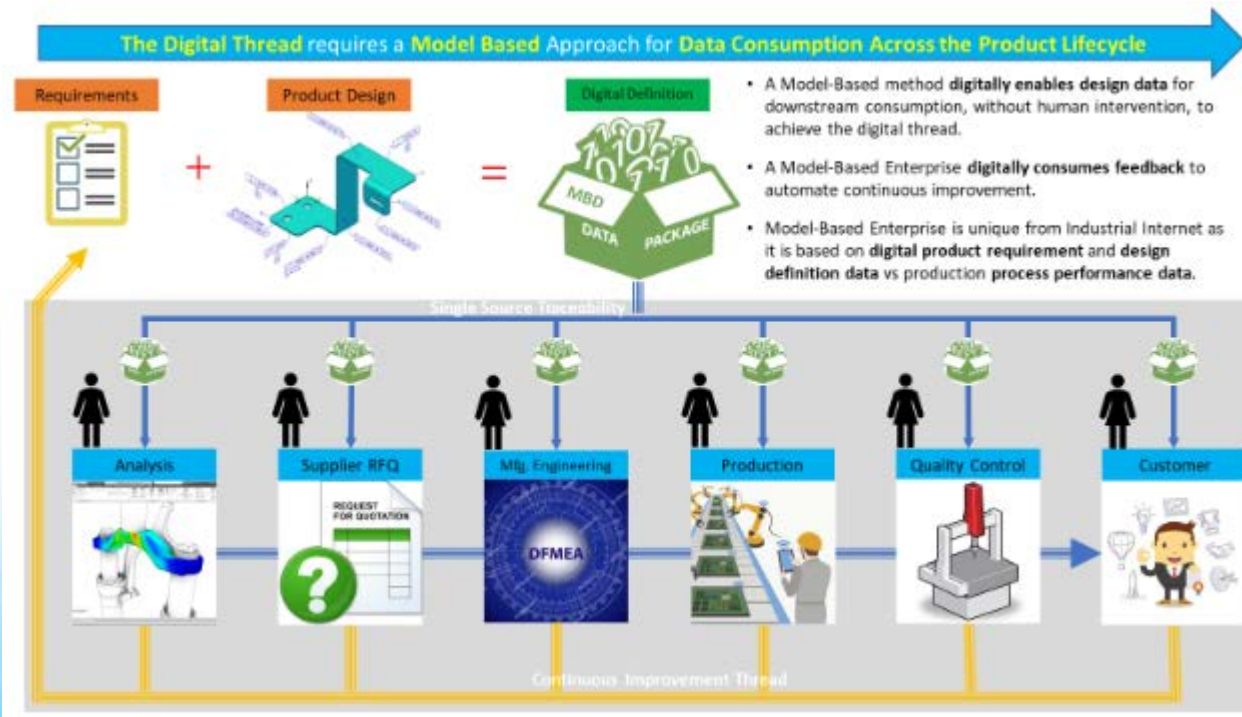


ASME

Enabling a Model-Based Enterprise



MBE Summit 2019

Overview of ASME + Standardization

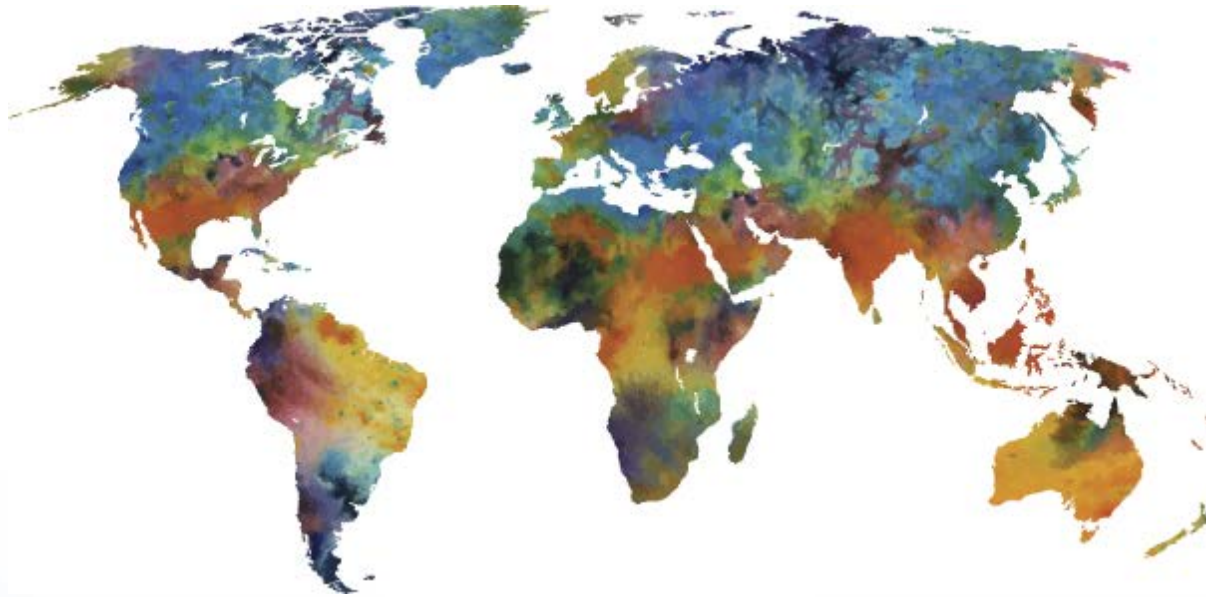
About ASME

History of ASME Standards

Standards Development Organization

Activities Enabling MBE

What is ASME?



- Standards
- Certification
- Conformity Assessment
- Courses
- Conferences
- Publications
- ASME.org
- Education
- Membership

ASME helps the global engineering community develop solutions to real-world challenges

Vision & Mission

VISION STATEMENTS

MISSION STATEMENTS

ASME

To be the essential resource for mechanical engineers and other technical professionals throughout the world for solutions that benefit humankind

To serve diverse global communities by advancing, disseminating and applying engineering knowledge for improving the quality of life; and communicating the excitement of engineering

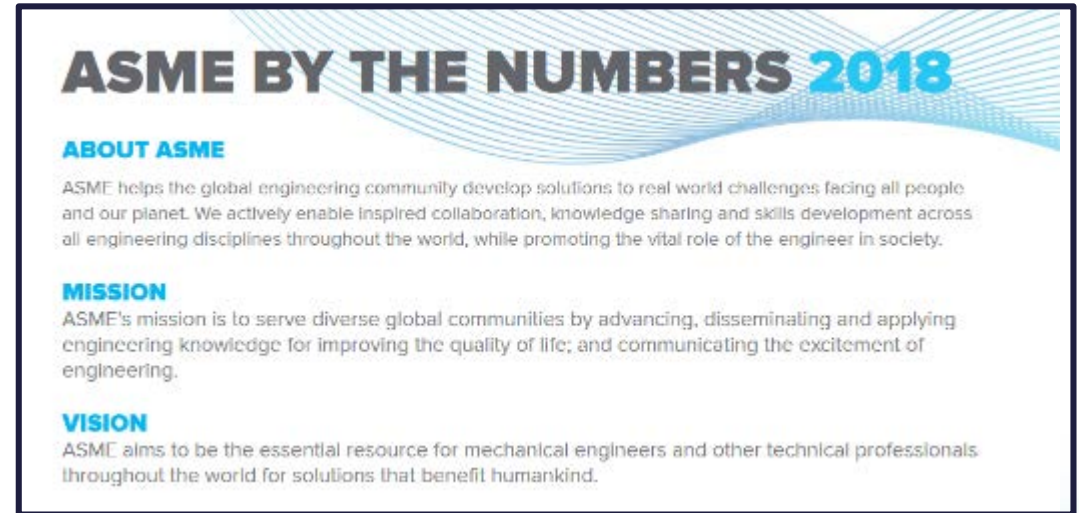
ASME STANDARDS &
CERTIFICATION
(S&C)

To be the world leader in mechanical and multidisciplinary engineering codes, standards, conformity assessment programs, and related products and services

To develop the best, most applicable codes, standards, conformity assessment programs, and related products and services in the world for the benefit of humanity

ASME at-a-Glance

- **130,000+ members in 100+ countries**
 - Includes 30,000+ students
- **500+ standards in 100+ countries**
- **Offices: US – Europe – Asia**
 - HQ: New York City
 - Little Falls (NJ); Houston (TX); Washington DC
 - Brussels (EU); Beijing (China); New Delhi (India)
- **Digital Library with journals, proceedings & ASME Press e-books, including:**
 - 220,000 technical papers (~1.7 million pages)
 - ~25 conference proceedings published annually (70-100 volumes, 7,000-10,000 papers, 70,000-100,000 pages)



ASME BY THE NUMBERS 2018

ABOUT ASME
ASME helps the global engineering community develop solutions to real world challenges facing all people and our planet. We actively enable inspired collaboration, knowledge sharing and skills development across all engineering disciplines throughout the world, while promoting the vital role of the engineer in society.

MISSION
ASME's mission is to serve diverse global communities by advancing, disseminating and applying engineering knowledge for improving the quality of life; and communicating the excitement of engineering.

VISION
ASME aims to be the essential resource for mechanical engineers and other technical professionals throughout the world for solutions that benefit humankind.

- **ASME.org: ASME's worldwide social network:**
 - Participant groups tailored to professional interest
 - ASME contacts & networking, online activities, purchases
 - Personal dashboard provides optimizable user gateway to online experience

History

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

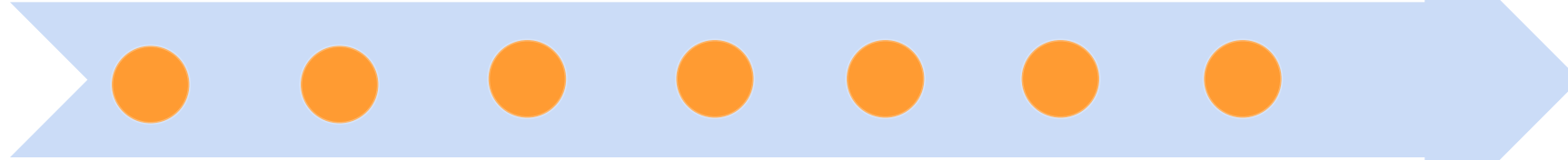
Key problem: Lack of understanding, consistency, and safety features in boiler design and operation

Grover Shoe Factory
Brockton, MA 1905

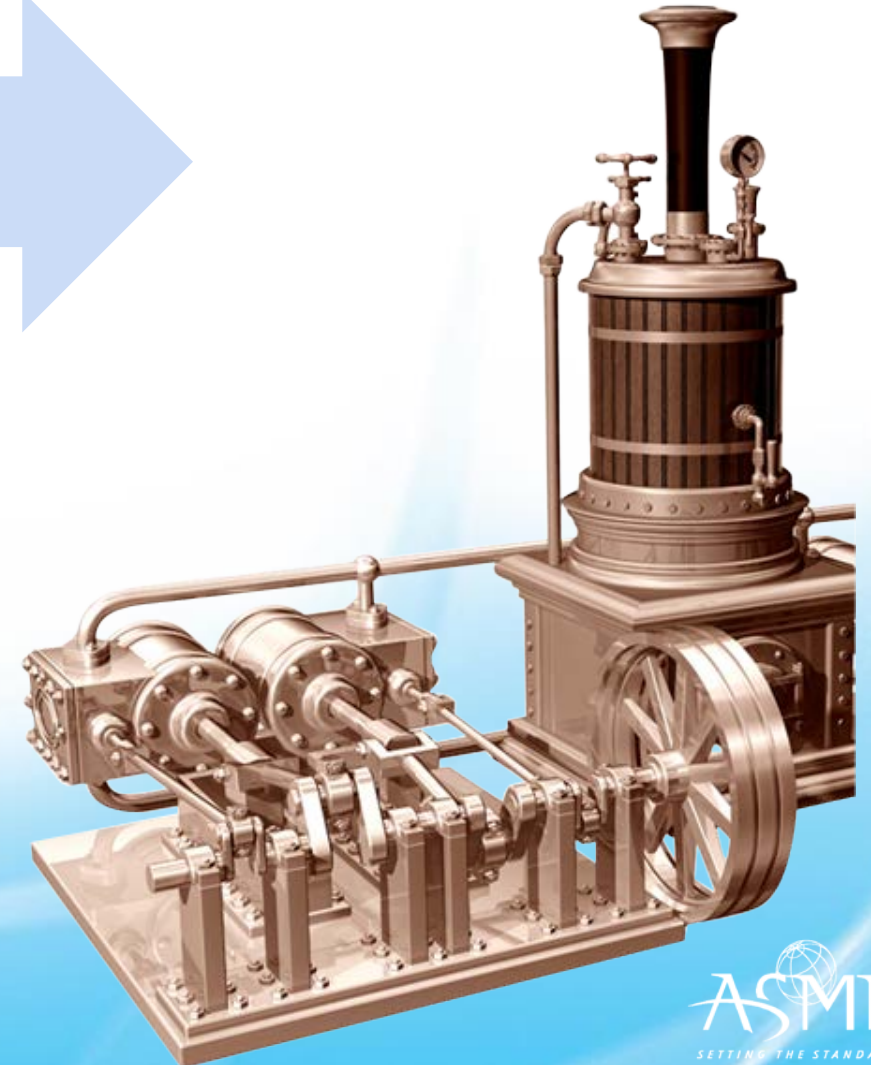
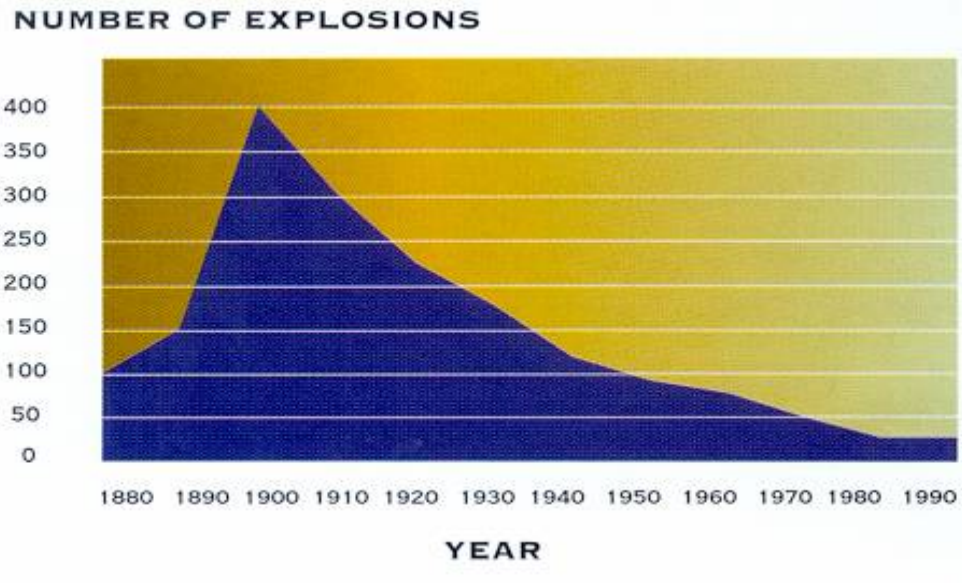


Milestones

Timeline of Early ASME Standardization



- 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



Consensus-Based Standard

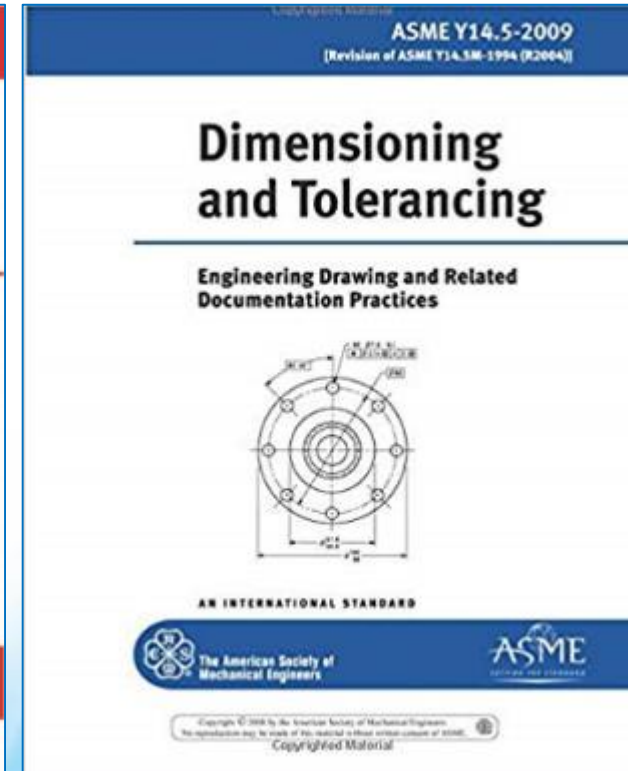
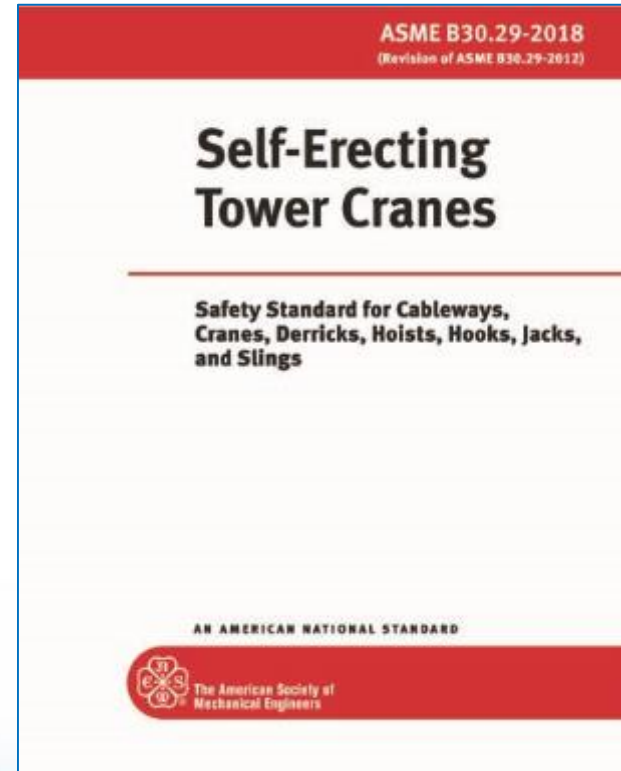
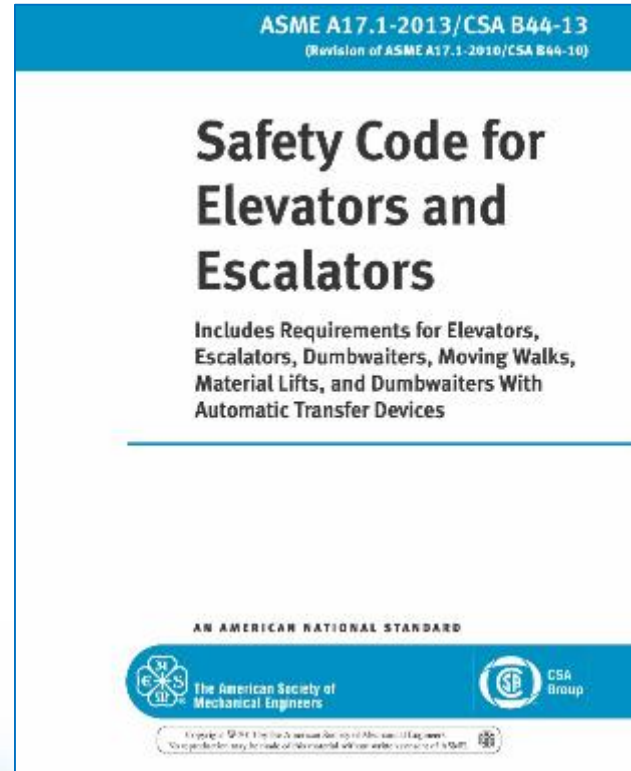
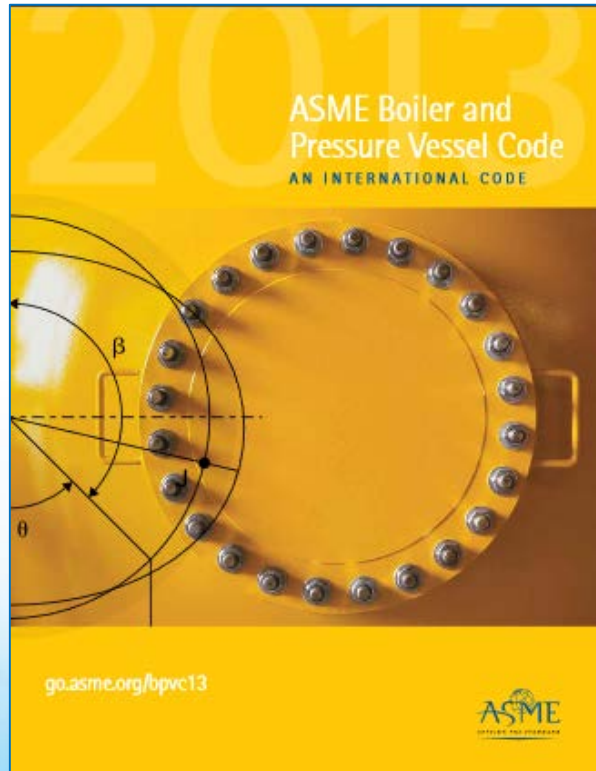
Standard

A set of technical definitions, instructions, rules, guidelines, or characteristics set forth to provide consistent and comparable results, including:

Benefits

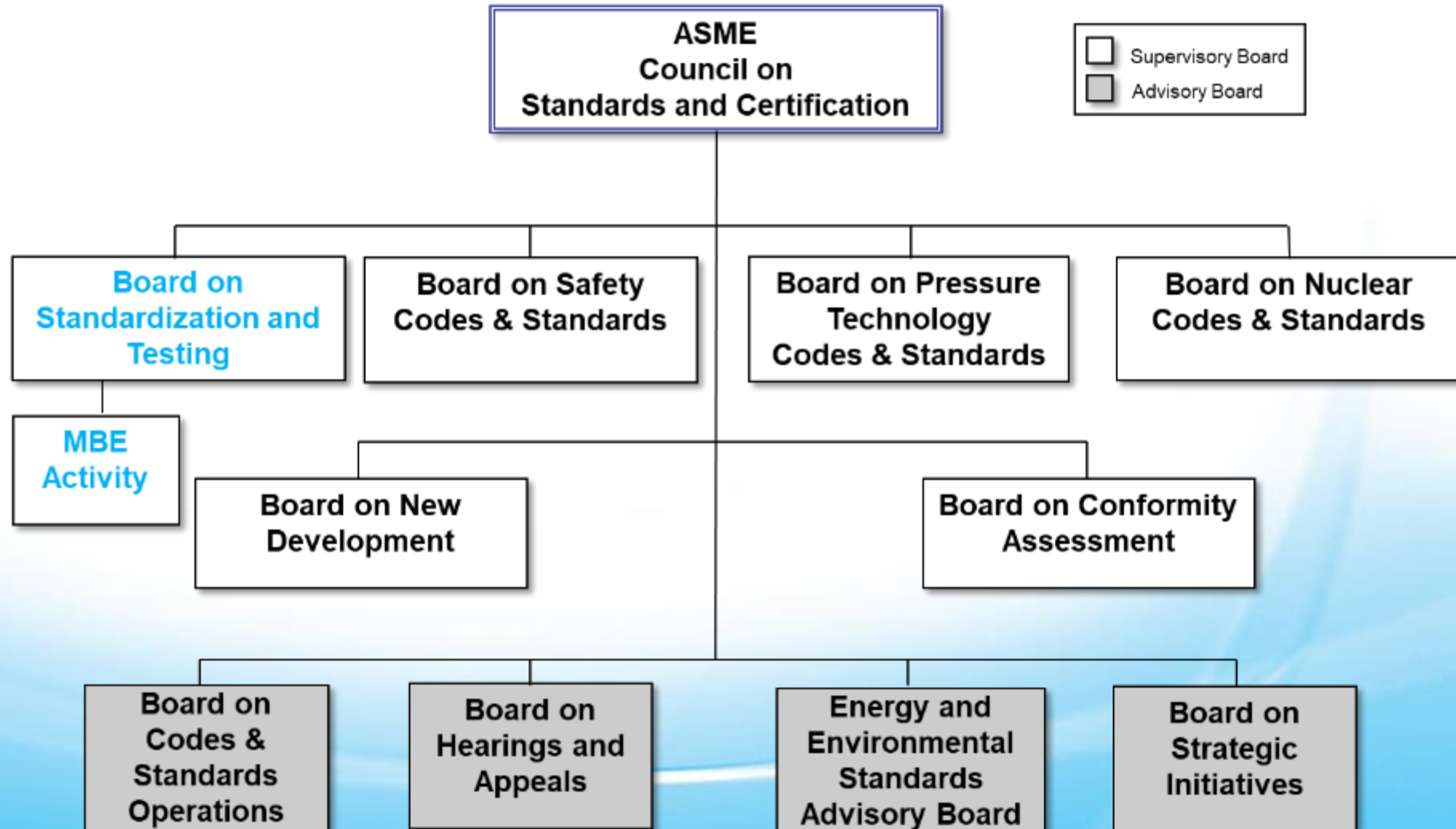
- Items manufactured uniformly, providing for interchangeability
- Tests and analyses conducted reliably, minimizing the uncertainty of the results
- Facilities designed and constructed for safe operation

Highly Recognized Standards



ASME Standards Enhance Quality of Life & Safety
500+ standards: asme.org/about-asme/standards

ASME S&C Organization



ASME S&C Organization Roles

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

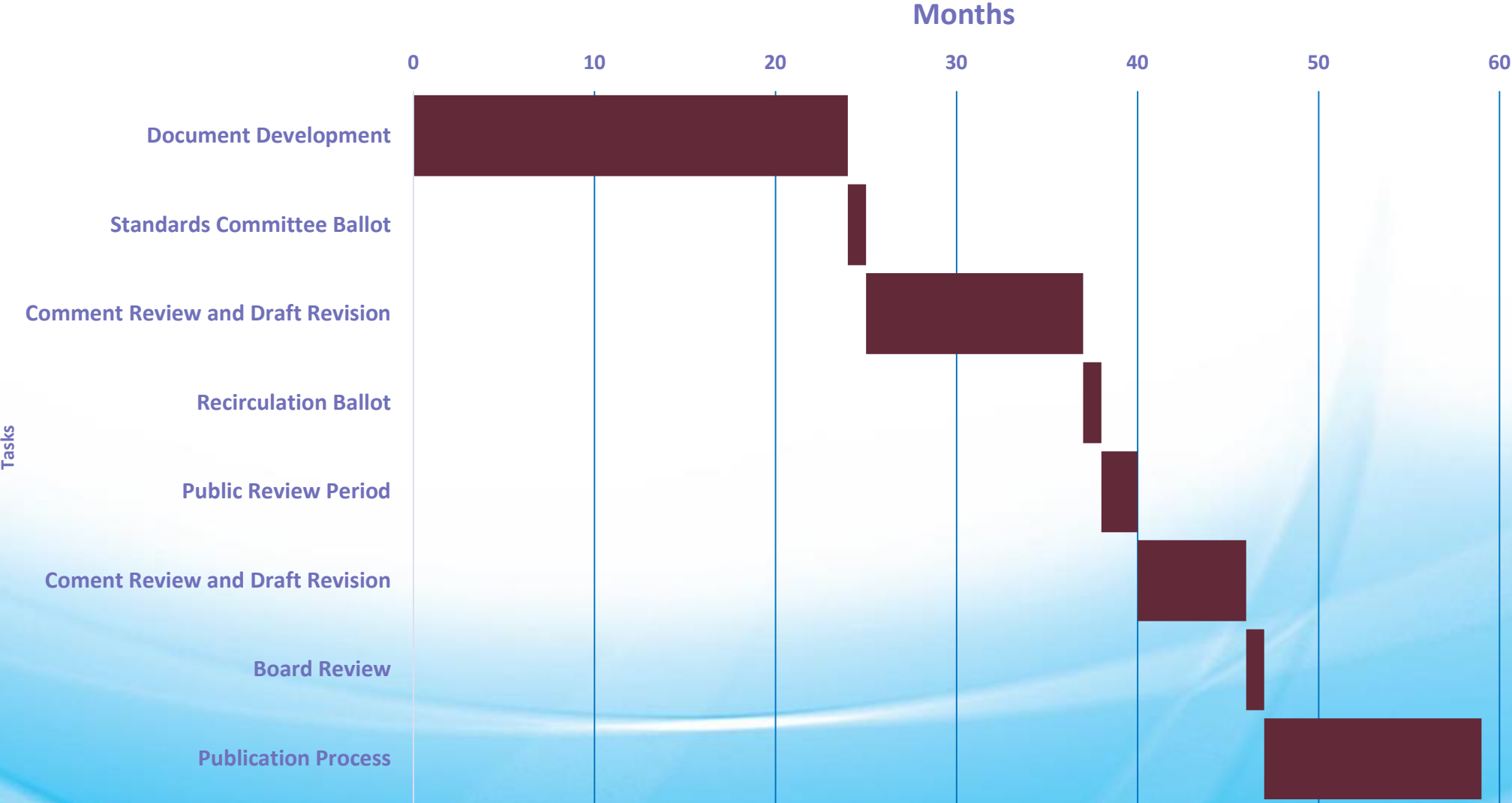
Subgroups

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

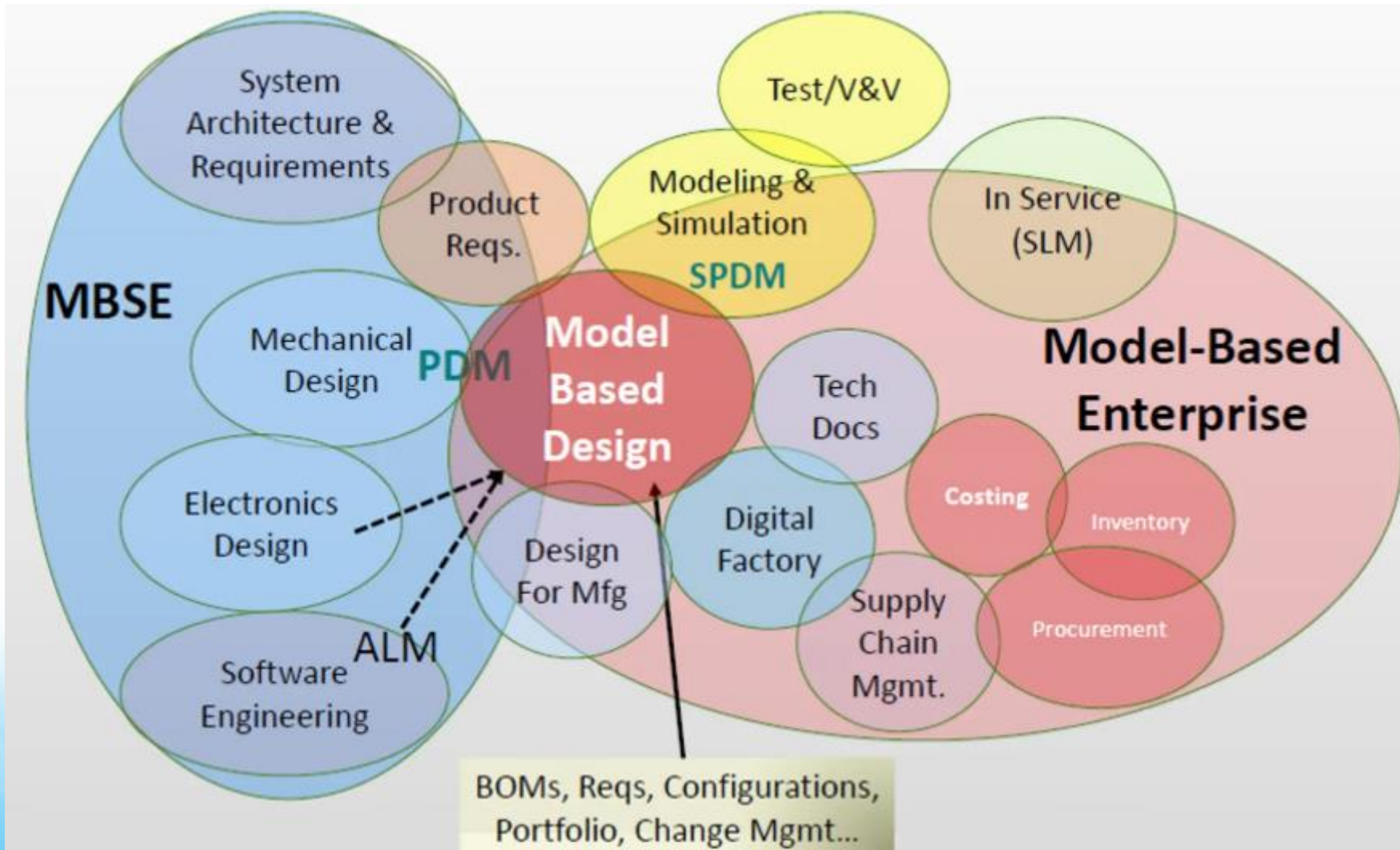
WGs, TGs, PTs

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

'Traditional' Standards Development Sequence



MBE & MBSE Relationship



Source: CIMdata

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
4. Supporting and coordinating development and harmonizing of standards with responsible standardization bodies, including ANSI, ISO, and government agencies

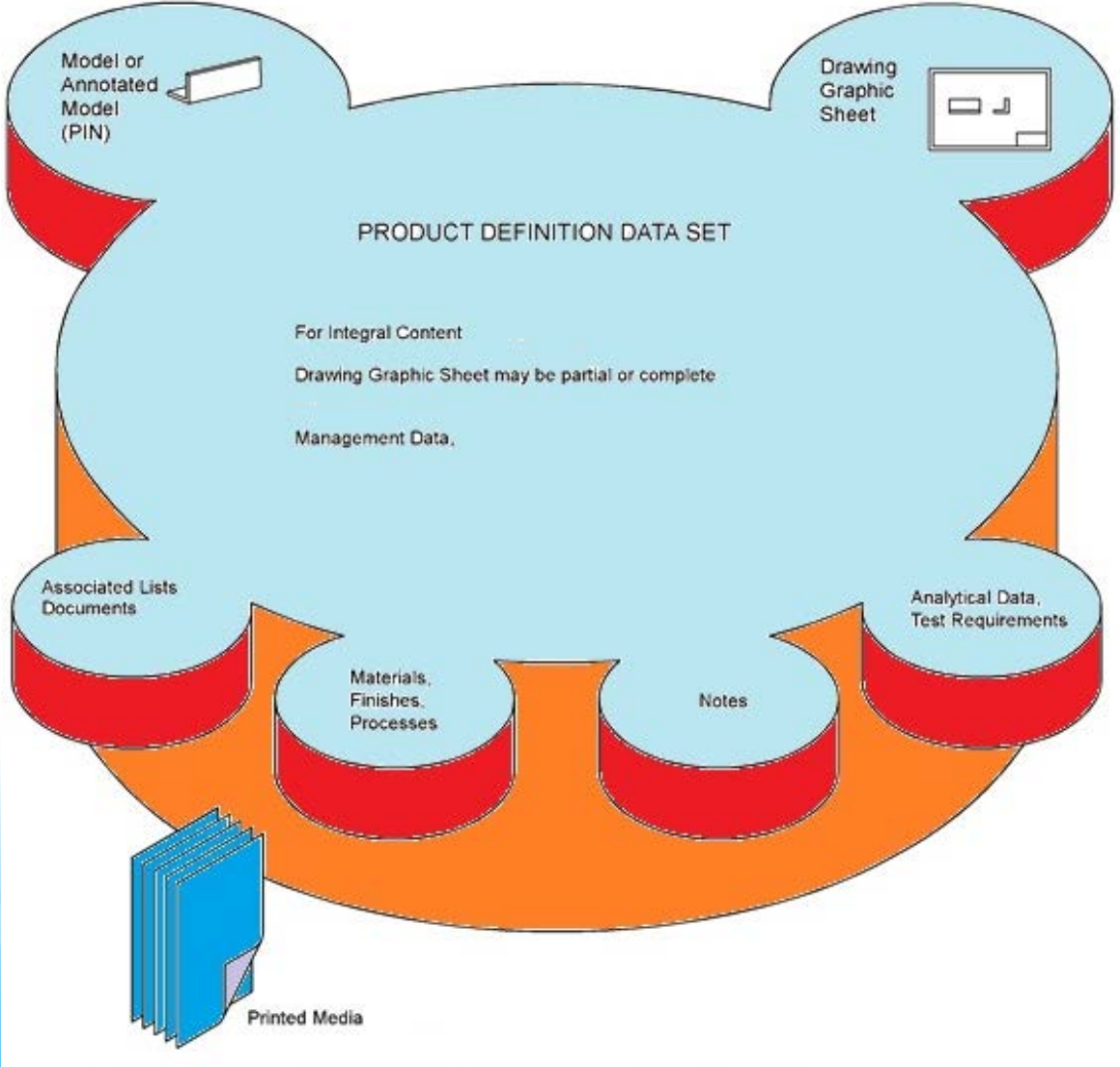
ASME Y14.41 – Digital Product Definition Data Practices

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 coordinate properly with text and align of **Y14.36-2018 Surface Texture Symbols**.
 - Reviewing **Non-Uniform Profile tolerance distribution in 3D**.



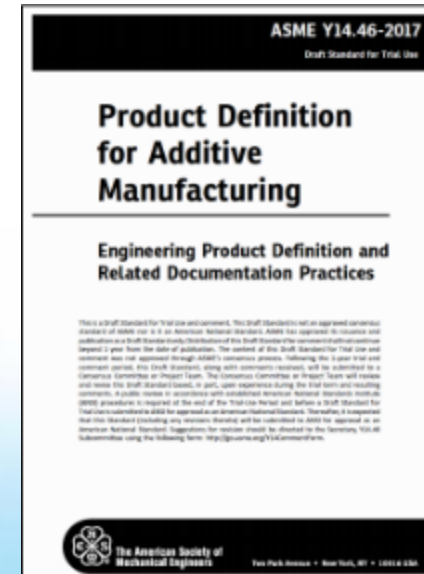
ASME Y14.41 – Digital Product Definition Data Practices



ASME Y14.46 – Product Definition for Additive MFG

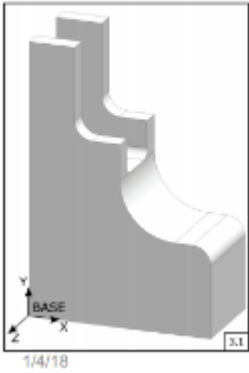
Establishes methods to describe complex parts, internal geometric features (e.g., matrices, engineered voids, curving channels), build orientation, fill patterns, local toolpath orientations, integrated components manufactured at the same time, and specifying the geometric placement of the material and 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.
- **Published** Draft Standard for Trial Use: December 2017
 - Request for commenting: go.asme.org/Y14CommentForm

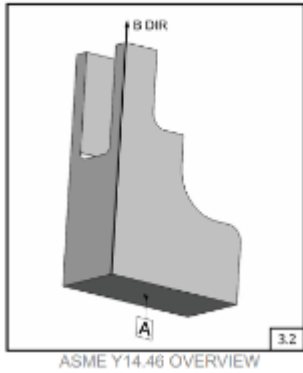


ASME Y14.46 – Product Definition for Additive MFG Structure

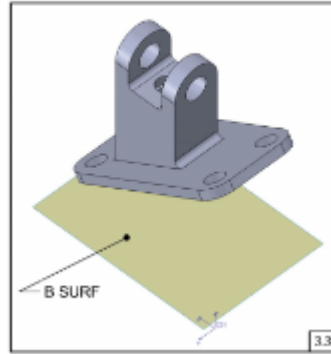
Coordinate System Identification



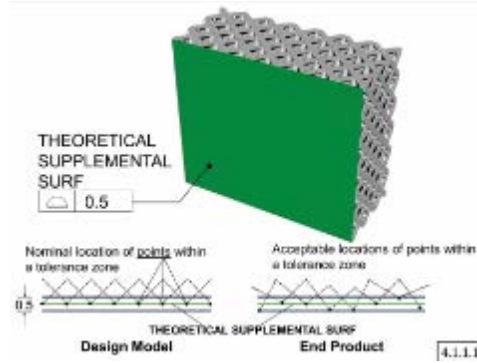
Unit Vector Identification



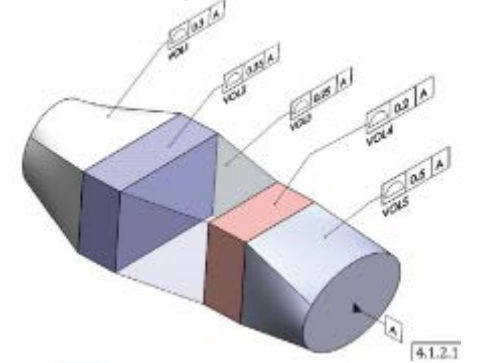
Surface Identification



Surface Tolerance



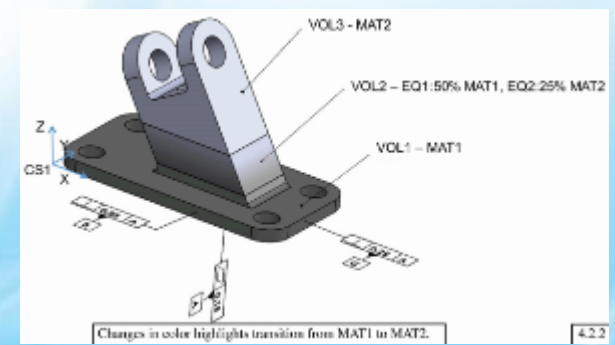
Bounded Regions and Tolerances



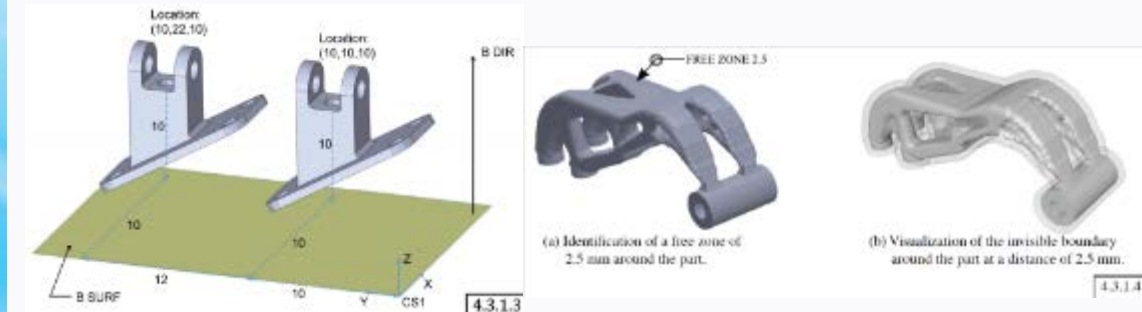
Lattice Structures



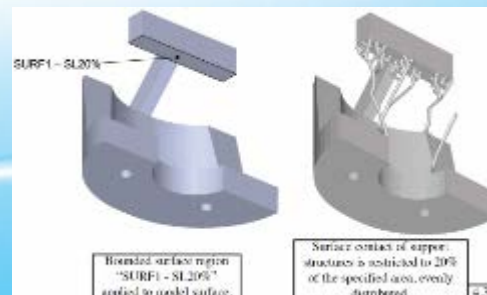
Gradient Control



Part Location & Orientation



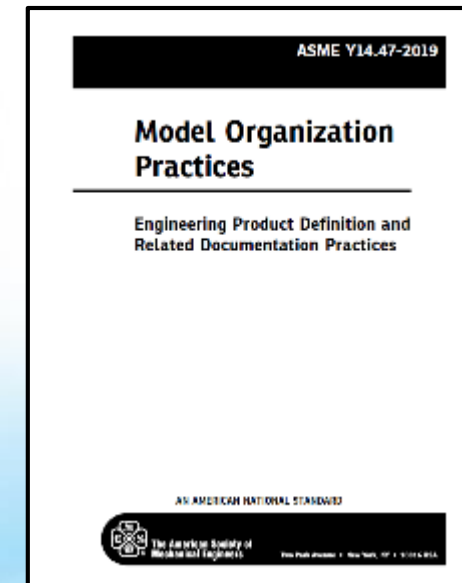
Support Structures



ASME Y14.47 – Model Organization Practices

This standard establishes a schema for organizing a three dimensional (3D) model and other associated information within the context of a digital product definition data set that enables a Model-based Enterprise (MBE).

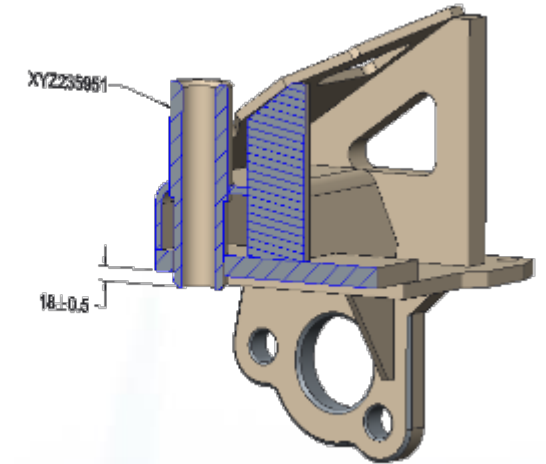
- Outlines model organization practices to support model-based definition (MBD).
- Provides requirements and guidelines for the computer-aided design (CAD) user.
- Intended as a foundation for design development efforts in a MBE.
- Formed from **MIL-STD-31000A Appendix B** to define a 3D technical data package (TDP)
- Standardizes the exchange of 3D model data used to define an item for manufacturing and procurement
- Includes 3D PDF enabled figure



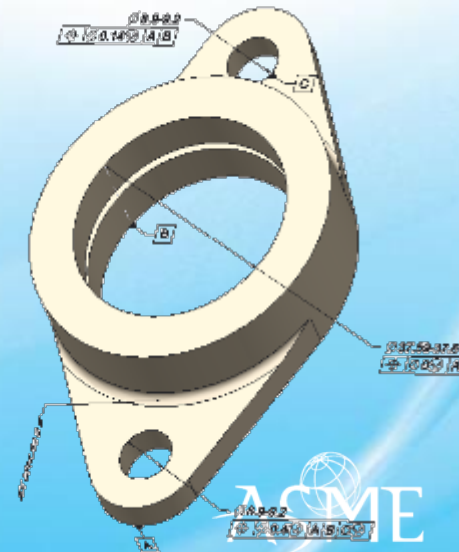
ASME Y14.47 – 2018 Table of Contents

- General
- Terms and Definitions
- Data Set Completeness States
- Organizational Framework Requirements:
 - Associated Groups
 - Naming Conventions
 - Presentation States
 - Product Definition Elements
 - Metadata
- Application Examples of Data Set Completeness States

Default
Front View
Top View
Right Side View
Left Side View
Back View
Bottom View
Section A
Model Only
Management Data
Properties
Characteristics
Notes
Datums



MBD0_Default_Notices
MBD1_Management_Data
MBD2_Model_Only
MBD3_Site_Map
MBD4_Titles
MBD5_Properties
MBD6_General_Notes
MBD7_Set_Datums
MBD8_Key_Characteristics
MBD9_Assembly
MBD10_Machining
MBD11_Weld
D1_Section_A-A
D2_Detail_B
D3_Face_View



ASME Model-Based Enterprise (MBE) Standard

Charter

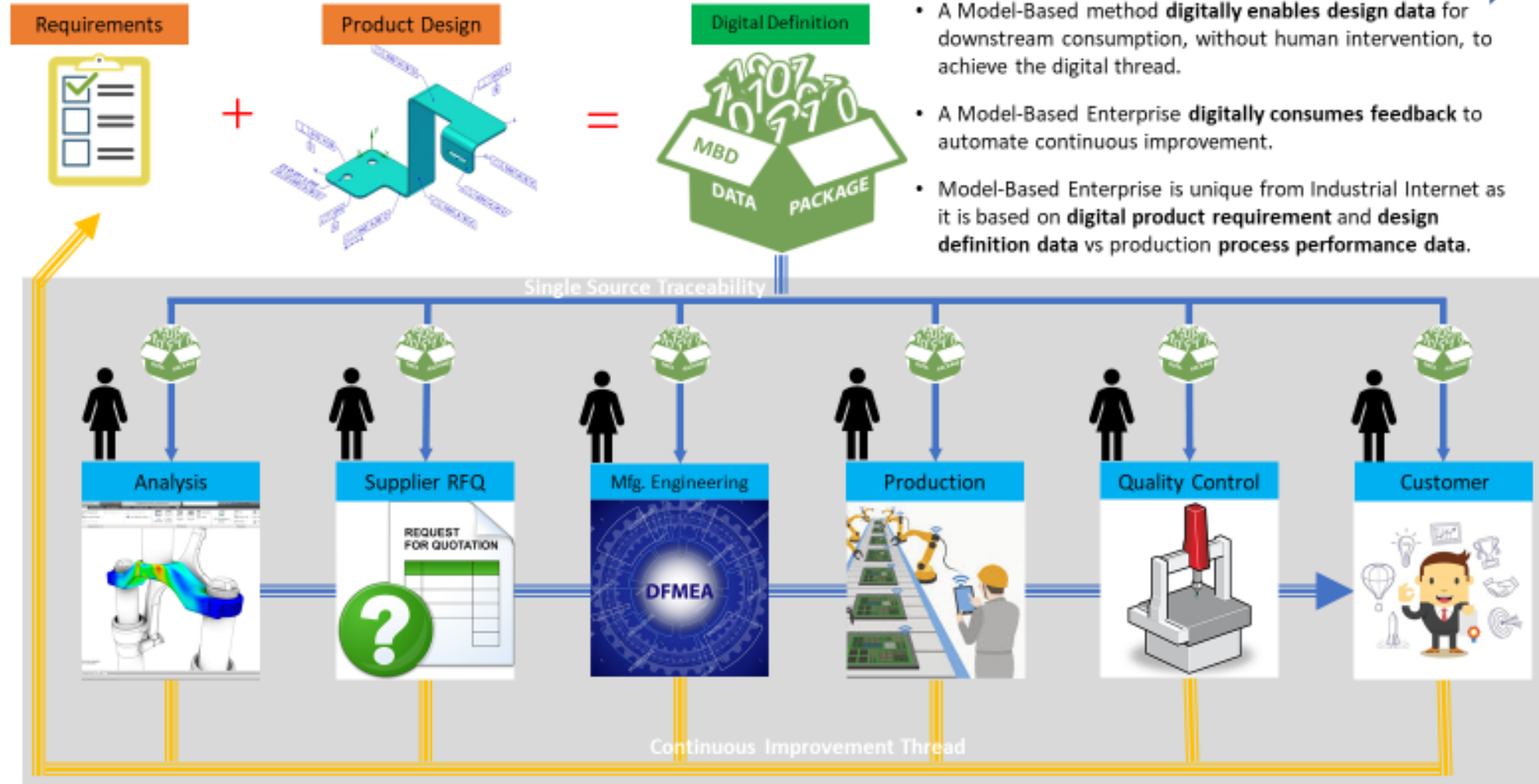
Develop standards providing rules, guidance, and examples for the creation and use of model-based datasets, data models, and related topics within a MBE.

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

Goal: Enable the True Digital Thread

The Digital Thread requires a **Model Based** Approach for **Data Consumption Across the Product Lifecycle**



ASME MBE Standard Recommendation Report

Starting point for the ASME MBE
January 1st 2019.

Intent

- Provide direction, activities, priorities of the ASME MBE Standards Committee (SC) and its members
- Provide methodology for developing standards using a model-based approach.
- Provide a marketing and adoption strategy
- Provide a MBE standards roadmap

HOME
Meetings
■ MBE Future Meetings
This Committee
Please LOGIN to Reveal Members-Only Features
■ BST Reports & Balanced Scorecard
Codes & Standards Resources
■ Participation
■ Volunteer Recruiting Toolbox
■ ASME C&S Policies, Procedures, and Guidelines
■ Board on Standardization & Testing Interpretation Policy
■ Standardization & Testing Department Procedures
■ S&C Successful Practices for ASME Standards Development Committees
■ S&C Training Modules
■ S&C Vision and Mission Statement
■ Standardization & Testing Awards & Medals
■ Committee Handbook
■ Model Based Enterprise ASME Report

Process. Released

of the ASME MBE

-based approach.



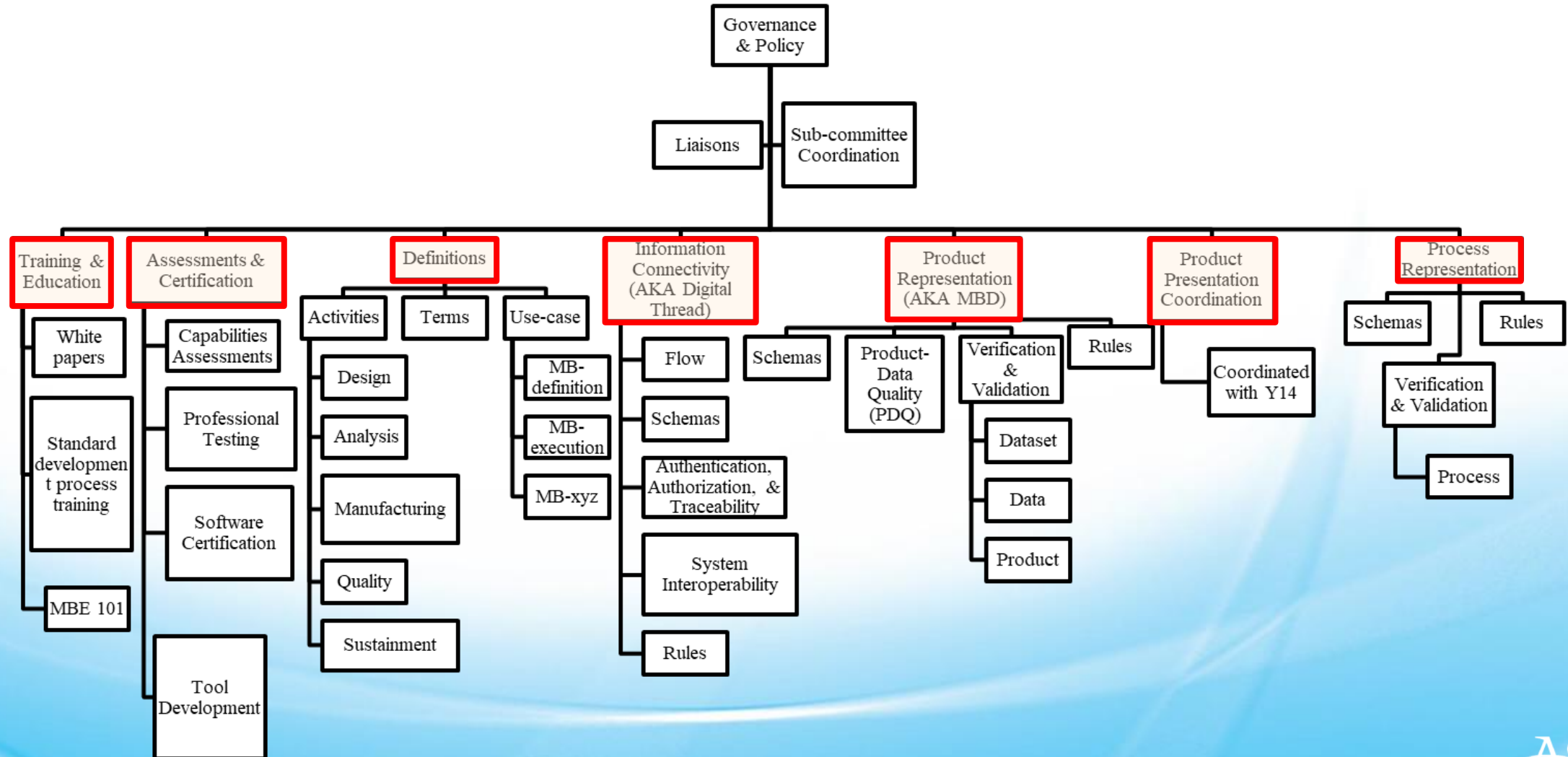
Download: go.asme.org/mbereport

ASME MBE Standard Initial Subcommittees

- Assessment and Certification
- Information Connectivity
- Process Representation
- Product Representation
- Terms and Definitions
- Training and Education
- Use Cases, Concepts, and Context Working Group



ASME MBE Proposed Standard Topical Structure



Related Efforts: ASME V&V 50 – Verification and Validation of Computational Modeling for Advanced Manufacturing

Provide procedures for verification, validation, and uncertainty quantification (VVUQ) in modeling and computational simulation for advanced manufacturing.

- **V&V 50 Subgroups**

- Terminology, Concepts, Relationships and Taxonomy
- Interactions with the Model Life Cycle
- Applications in Process Technology
- Challenges and Methods in Systems of Models
- Methods in Data-driven and Hybrid Models

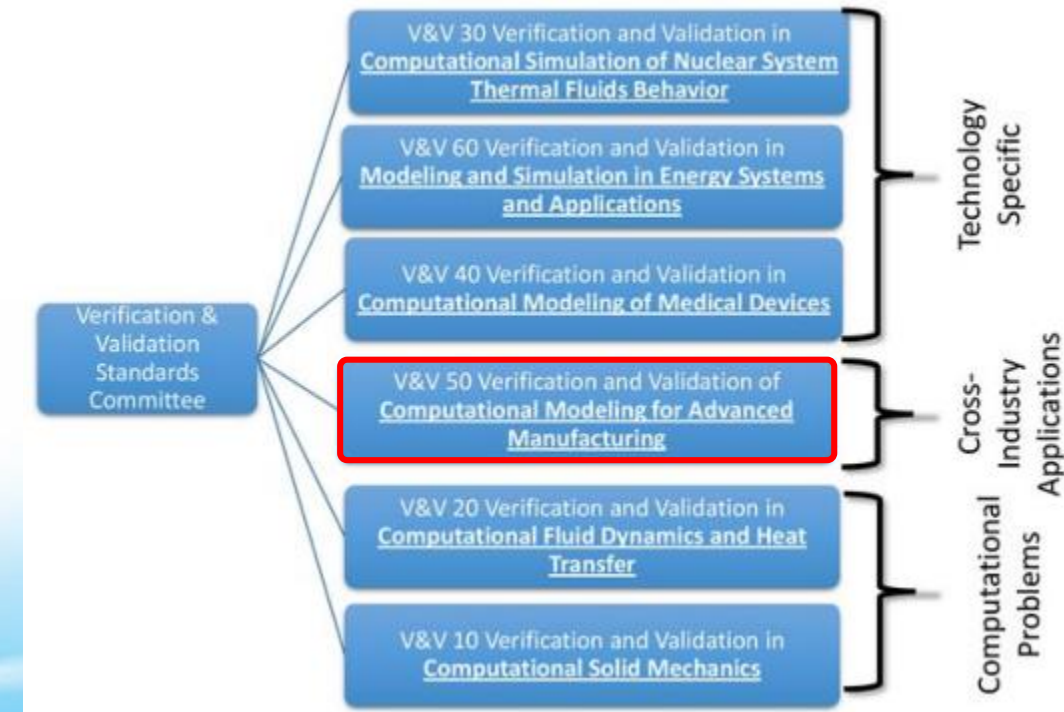
- **V&V Verification and Validation Symposium**

Westgate Resorts, Las Vegas , Nevada

Conference: May 15 – 17, 2019

Training & Committee Meetings: May 13 – 14, 2019

Additional Info: event.asme.org/V-V



Related Efforts: Additional MBE Solutions

- Technical Reports/White Papers
- Capability Index Revision
- Support DoD's Digital Engineering Strategy
- Supply Chain Readiness
- ASME MBE Standard Meeting (05 April 2019*)

ASME Meeting: 05 Apr 2019 8:00AM–12:00PM

Free and open to all summit attendees

Draft Agenda:

08:30 to 08:45, Welcome (Fred and Tom)

08:45 to 09:00, MBE committee logistics update (Fred)

09:00 to 09:45, Roadmap outline and discussion

09:45 to 10:00, Break

10:00 to 11:00, Subcommittee development discussion

11:00 to 11:20, Solicit input on liaisons (e.g., IEEE, INCOSE, SME, ASTM)

11:20 to 11:30, Getting involved

11:30 to 11:45, Question and Answer

11:45 to 11:55, Next steps and summary

We Welcome You to Join ASME's Model-Based Journey!

(membership not required-but nice-to-have!)

QUESTIONS?

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Kabirl@asme.org

Fredric Constantino
S&C Project Engineering Advisor
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constantinoF@asme.org