PLM Road Map™ & PDT North America 2026

AI in PLM: A Disruptive Opportunity and Challenge

Turning AI disruption into enterprise value:
Strategic insights for the PLM professional

6-7 May 2026

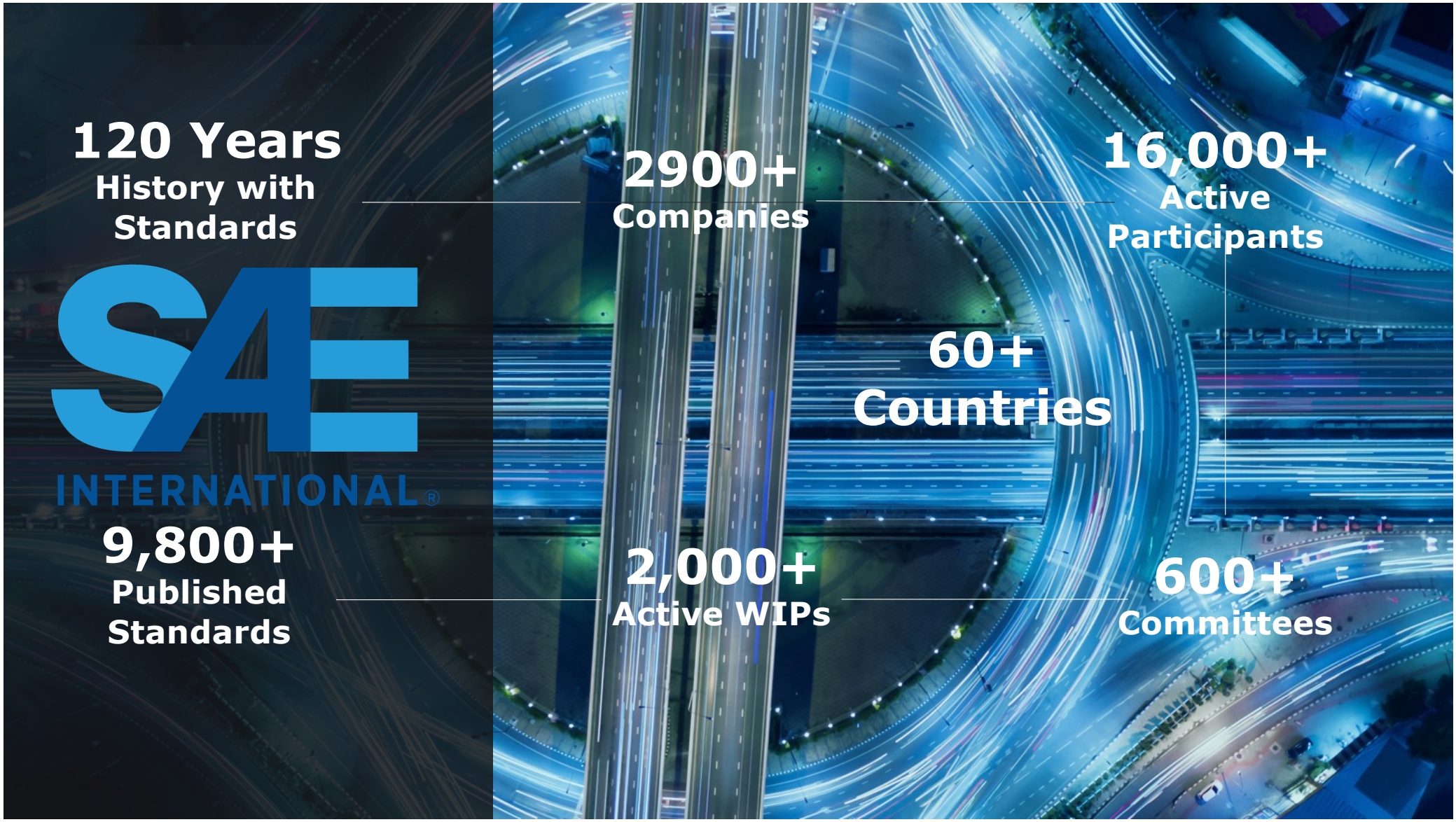
CIMdata

www.CIMdata.com

Supporting the Digital Transformation of the Mobility Industry

March 2026

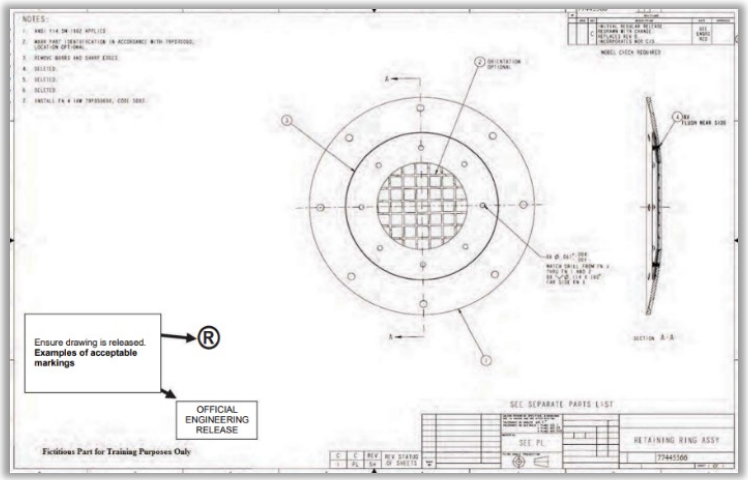
Leslie McKay, Director of Digital Standard Development
and Vice-Chair of Digital Standards Alliance

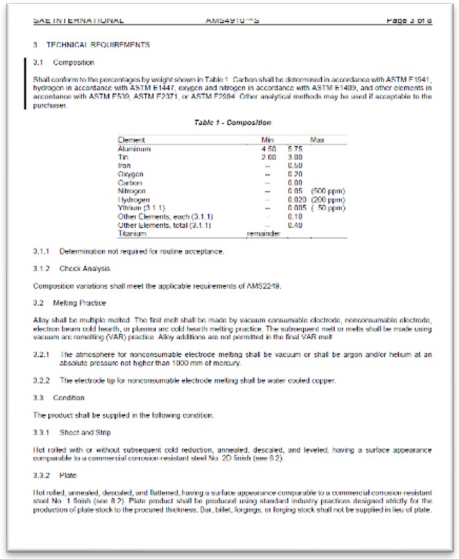

120 Years
History with
Standards
SAE
INTERNATIONAL®
9,800+
Published
Standards
2900+
Companies
2,000+
Active WIPs
60+
Countries
16,000+
Active
Participants
600+
Committees

The Vision

***Model-Based Enterprise (MBE) is the** vision of an organization that has achieved **process efficiencies, lower costs,** and **faster time-to-market** by extending model-based definition **beyond engineering** into **manufacturing,** the **internal and external supply chain,** and beyond. MBE enables the creation of **digital twins** and **digital threads** through a model-based approach.*

But in order to get THERE…





SAE INTERNATIONAL AMS4911™ Page 2 of 6

3 TECHNICAL REQUIREMENTS

3.1 Composition

Shall conform to the percentages by weight shown in Table 1. Carbon shall be determined in accordance with ASTM E1941, hydrogen in accordance with ASTM E1447, oxygen and nitrogen in accordance with ASTM E1409, and other elements in accordance with ASTM E539, ASTM E2371, or ASTM E2594. Other analytical methods may be used if acceptable to the purchaser.

Table 1 - Composition

Element	Min	Max
Aluminum	4.60	5.75
Tin	2.60	3.00
Iron	--	0.50
Oxygen	--	0.20
Carbon	--	0.08
Nitrogen	--	0.05 (500 ppm)
Hydrogen	--	0.020 (200 ppm)
Yttrium (3.1.1)	--	0.005 (50 ppm)
Other Elements, each (3.1.1)	--	0.10
Other Elements, total (3.1.1)	--	0.40
Titanium	remainder	

3.1.1 Determination not required for routine acceptance.

3.1.2 Check Analysis

Composition variations shall meet the applicable requirements of AMS2249.

3.2 Melting Practice

Alloy shall be multiple melted. The first melt shall be made by vacuum consumable electrode, nonconsumable electrode, electron beam cold hearth, or plasma arc cold hearth melting practice. The subsequent melt or melts shall be made using vacuum arc remelting (VAR) practice. Alloy additions are not permitted in the final VAR melt

3.2.1 The atmosphere for nonconsumable electrode melting shall be vacuum or shall be argon and/or helium at an absolute pressure not higher than 1000 mm of mercury.

3.2.2 The electrode tip for nonconsumable electrode melting shall be water cooled copper.

3.3 Condition

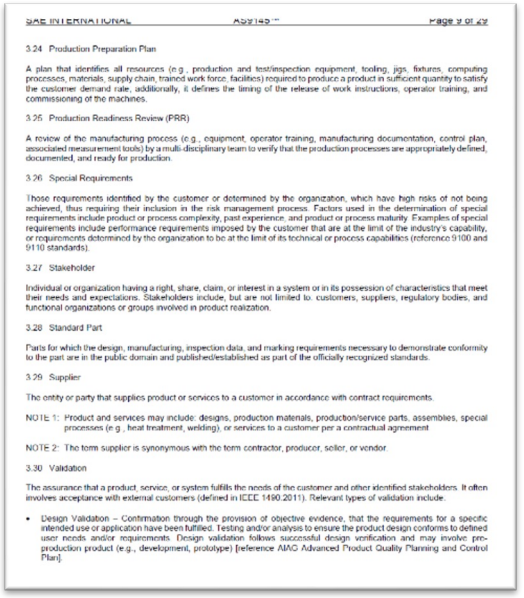
The product shall be supplied in the following condition:

3.3.1 Sheet and Strip

Hot rolled with or without subsequent cold reduction, annealed, descaled, and leveled, having a surface appearance comparable to a commercial corrosion-resistant steel No. 2D finish (see 8.2).

3.3.2 Plate

Hot rolled, annealed, descaled, and flattened, having a surface appearance comparable to a commercial corrosion-resistant steel No. 1 finish (see 8.2). Plate product shall be produced using standard industry practices designed strictly for the production of plate stock to the procured thickness. Bar, billet, forgings, or forging stock shall not be supplied in lieu of plate.



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3.24 Production Preparation Plan

A plan that identifies all resources (e.g., production and test/inspection equipment, tooling, jigs, fixtures, computing processes, materials, supply chain, trained work force, facilities) required to produce a product in sufficient quantity to satisfy the customer demand rate, additionally, it defines the timing of the release of work instructions, operator training, and commissioning of the machines.

3.25 Production Readiness Review (PRR)

A review of the manufacturing process (e.g., equipment, operator training, manufacturing documentation, control plan, associated measurement tools) by a multi-disciplinary team to verify that the production processes are appropriately defined, documented, and ready for production.

3.26 Special Requirements

Those requirements identified by the customer or determined by the organization, which have high risks of not being achieved, thus requiring their inclusion in the risk management process. Factors used in the determination of special requirements include product or process complexity, past experience, and product or process maturity. Examples of special requirements include performance requirements imposed by the customer that are at the limit of the industry's capability, or requirements determined by the organization to be at the limit of its technical or process capabilities (reference 9100 and 9110 standards).

3.27 Stakeholder

Individual or organization having a right, share, claim, or interest in a system or in its possession of characteristics that meet their needs and expectations. Stakeholders include, but are not limited to: customers, suppliers, regulatory bodies, and functional organizations or groups involved in product realization.

3.28 Standard Part

Parts for which the design, manufacturing, inspection data, and marking requirements necessary to demonstrate conformity to the part are in the public domain and published/established as part of the officially recognized standards.

3.29 Supplier

The entity or party that supplies product or services to a customer in accordance with contract requirements.

NOTE 1: Product and services may include: designs, production materials, production/service parts, assemblies, special processes (e.g., heat treatment, welding), or services to a customer per a contractual agreement

NOTE 2: The term supplier is synonymous with the term contractor, producer, seller, or vendor.

3.30 Validation

The assurance that a product, service, or system fulfills the needs of the customer and other identified stakeholders. It often involves acceptance with external customers (defined in ICEE 1490.2011). Relevant types of validation include:

- Design Validation – Confirmation through the provision of objective evidence, that the requirements for a specific intended use or application have been fulfilled. Testing and/or analysis to ensure the product design conforms to defined user needs and/or requirements. Design validation follows successful design verification and may involve pre-production product (e.g., development, prototype) [reference AIAG Advanced Product Quality Planning and Control Plan].

…We have to start HERE….

You may not think of standards often, but they are everywhere

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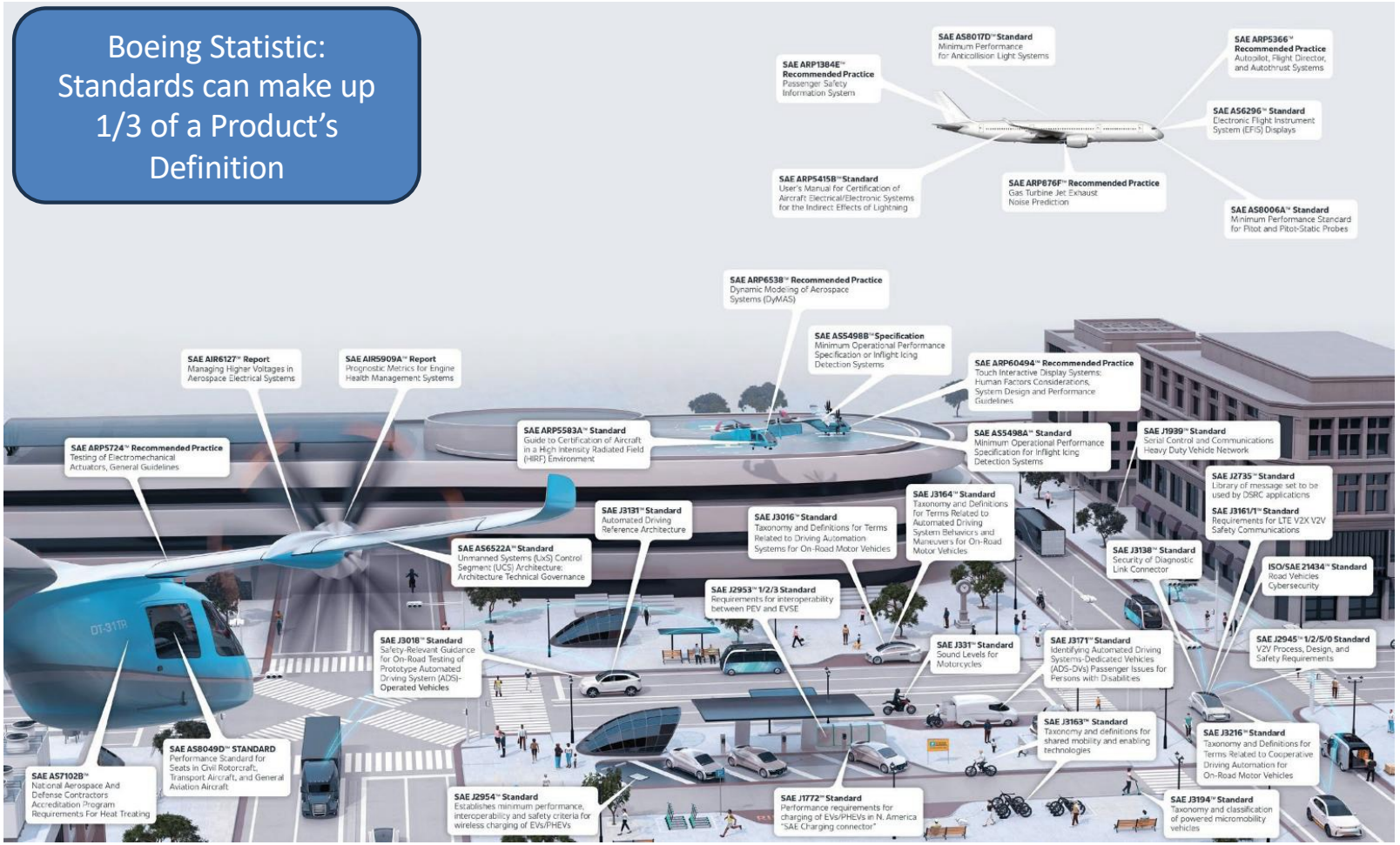
Boeing Statistic:
Standards can make up 1/3 of a Product's Definition




A Short History Lesson
SAE International

SAE Digital Standards System Vision: OnQue

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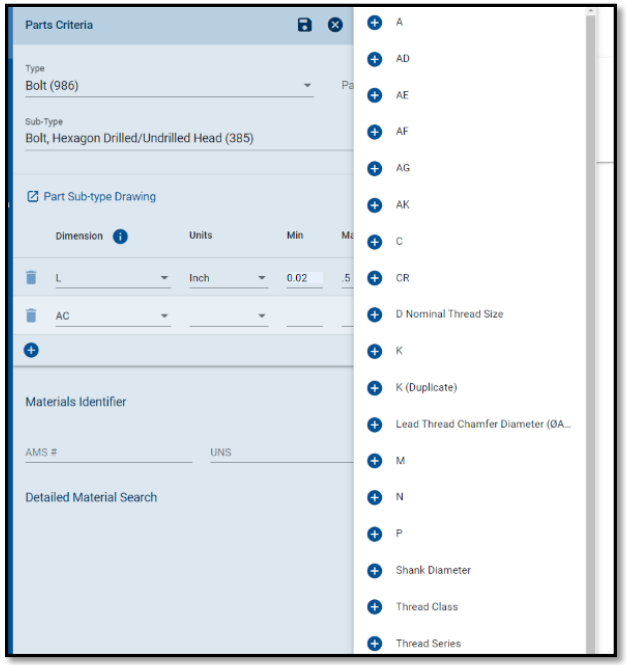
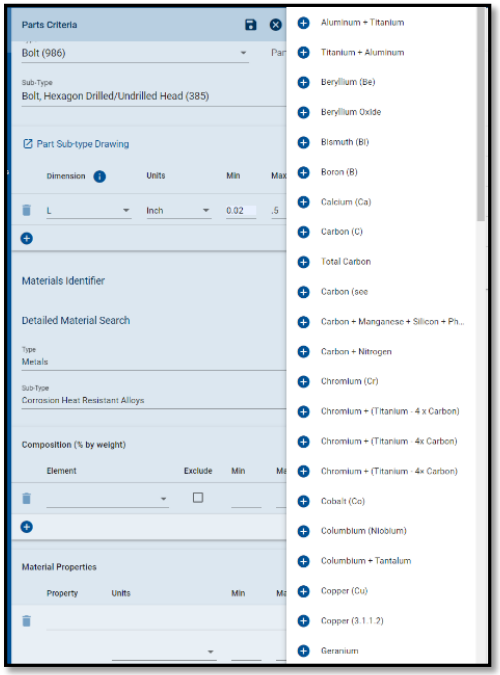
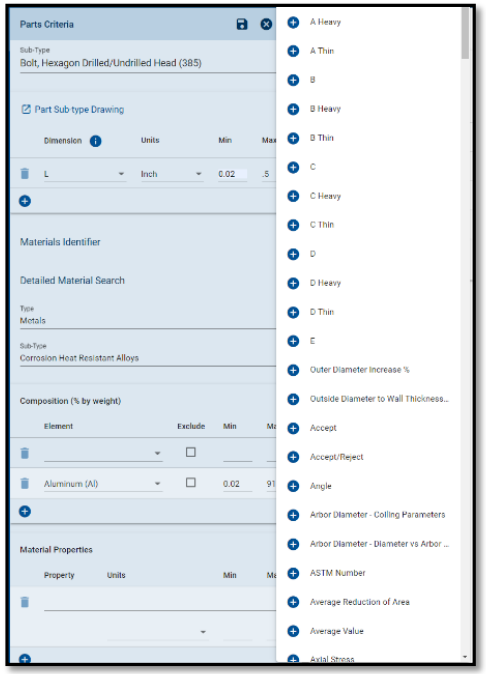
Dimensions



Composition

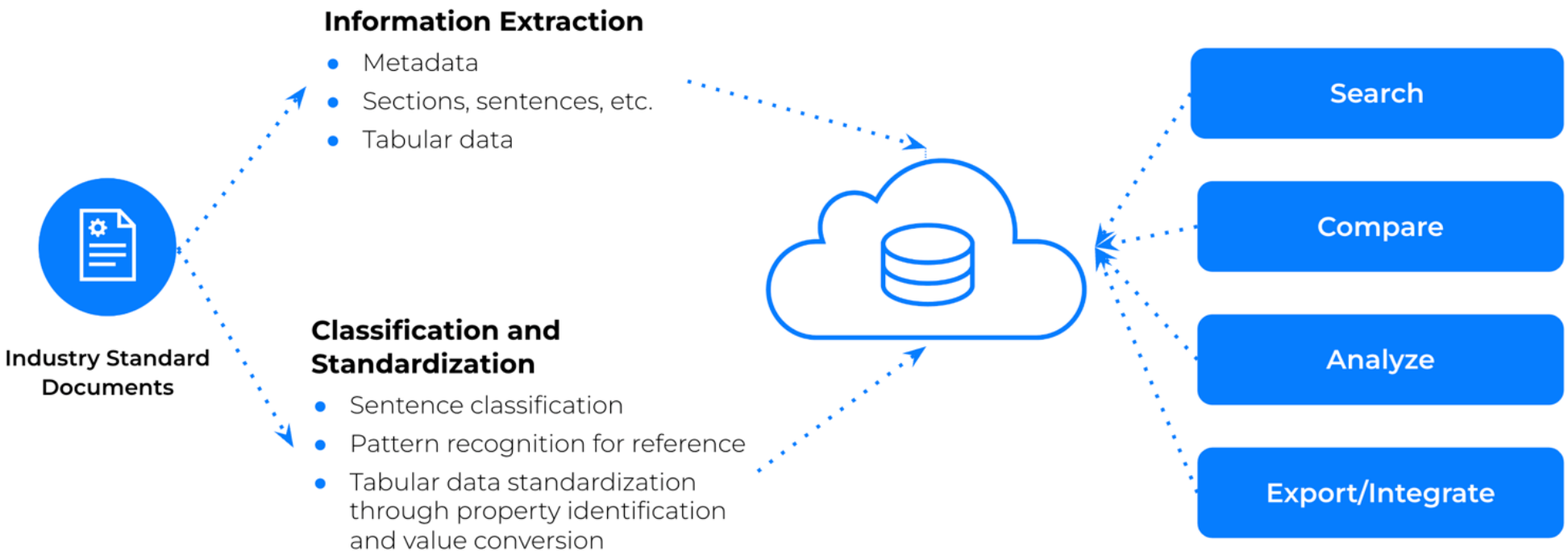


Materials Properties



- **Eliminate Transcription Errors**
- **Support Systems Integration**
- **Maximize Re-Use**
- **Lower Costs**
- **Minimize Change Management**
- **Digitally Track Requirements**

SAE’s Digitization Approach



Guess What We Learned?

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- Standards are not written to be “read” by machines
- AI technologies can help us, but will not perform miracles
  - Too much ambiguity
  - Difficult to classify information types
  - Too many conflicting statements
- Collaboration is essential across SDOs and Industry
- Current XML schemas for standards are document-focused rather than data-focused
- POCs and agile approach is needed
- Standards need to be consumable by PLMs, ERPs, and more


Thoughts from Our Customers
Driving SAE Digital Initiatives
SAE International

VOC Efforts

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Standards as PLM Libraries

Government Feedback

Standards as Digital Models

Benefits:

Efficiency Gains	Increased Quality	Cost Reduction	Faster TTM	Competitive Advantage
Reusability	Automated Compliance	Interoperability	Authoritative Source	Traceability

Gaps:

Modularity	Ontology	Machine Readable	Digital Licensing	Relationships	Interoperability

SAE's Digitalization Strategy

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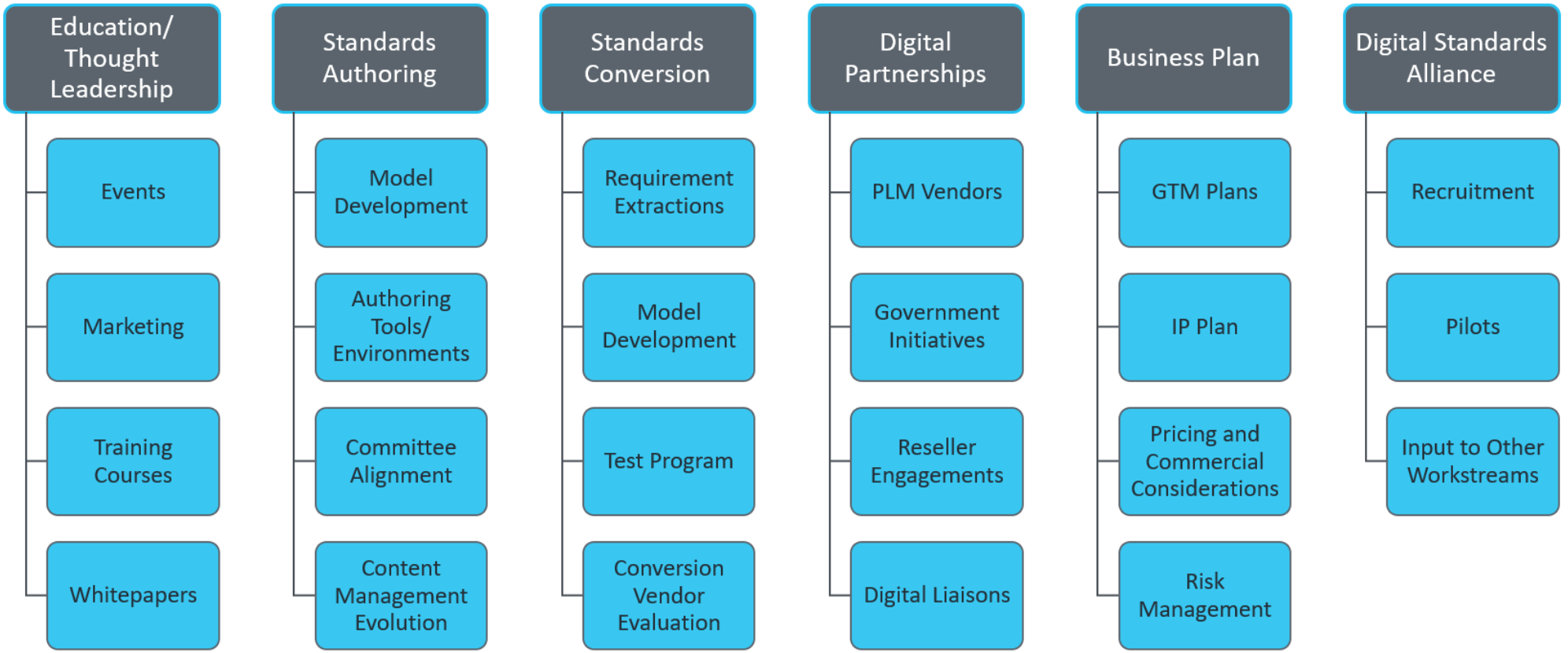
Digital Data from Standards Integrated into Digital Ecosystems



Education and Thought Leadership

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Table 2 - Hardness and minimum tensile properties

Condition	Tensile Strength ksi (MPa)	Yield Strength at 0.2% Offset ksi (MPa)	Elongation in 4D %	Reduction of Area %	Hardness (1) HB	Hardness (1) HRC	Temperature/ Time °F (°C)/Hours
H900	190 (1310)	170 (1172)	10	40 (2)	388-444	40-47	900 (482)/1 (3)
H925	170 (1172)	155 (1069)	10	44 (2)	375-429	38-45	925 (496)/4 (4)
H1025	155 (1069)	145 (1000)	12	45	331-401	34-42	1025 (552)/4 (4)
H1075	145 (1000)	125 (862)	13	45	311-375	31-38	1075 (579)/4 (4)
H1100	140 (965)	115 (793)	14	45	302-363	30-37	1100 (593)/4 (4)
H1150	135 (931)	105 (724)	16	50	277-352	28-37	1150 (621)/4 (4)
Solution Heat Treated					363 (5)	39 (5)	1900 (1038) (5)

NOTES:
1. Hardness shall not be the basis for rejection if tensile properties are acceptable, determined on specimens taken from the same sample as that with nonconforming hardness or from another sample with similar nonconforming hardness.
2. For sizes over 3 inches (76 mm), 35% for H900 condition and 38% for H925 condition.
3. Temperature tolerance ±10 °F (±6 °C); time tolerance ±0.1 hour (±5 minutes); cool in air.
4. Temperature tolerance ±10 °F (±6 °C); time tolerance ±0.3 hour (±15 minutes); cool in air.
5. Maximum; alternate for wire, 175 ksi (1207 MPa) or equivalent hardness (see 6.2).
6. Temperature tolerance ±25 °F (±14 °C); time commensurate with thickness, heating equipment, and procedure used, and cooling as required to below 90 °F (32 °C).

Table Structure
- Keep tables simple
- One data element/cell
- Managing blank cells
- Row/column design

3.3.2 Average Grain Size

Shall be no larger than 20 microns (20 µm), determined in accordance with ASTM E112, using the intercept method at 500X magnification.

3.4 Quality

The product, as received by purchaser, shall be uniform in quality and condition, sound, and free from foreign materials and from imperfections detrimental to usage of the product.

3.4.1 Density

Shall be at least 99.0% of theoretical density, determined by the water displacement method. The accuracy of density determination shall be to the second decimal, or better.

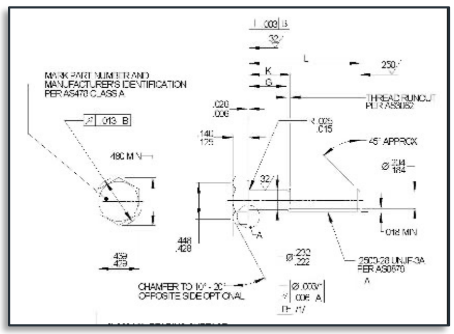
3.4.1.1 The theoretical density shall be calculated using Equation 1:

$$\text{Theoretical Density (gm/cm}^3) = \frac{100}{\dfrac{100-\%\text{BeO}}{1.8477\ \text{gm/cm}^3} + \dfrac{\%\text{BeO}}{3.009\ \text{gm/cm}^3}} \quad \text{(Eq. 1)}$$

3.4.1.2 Thermally Induced Porosity (TIP) Resistance

3.4.1.2.1 Sample product shall be subjected to a TIP test consisting of a heat treatment in inert atmosphere or under vacuum at 1450 °F (788 °C) for 1 hour.

Content
- Consistency, consistency, consistency
- Avoid calculations in tables
- Avoid using fractions or scientific notations



Drawings and Variables
- Standard variable names
- Data extraction

Nickel Alloy, Brazing Filler Metal
73Ni - 0.75C - 4.5Si - 14Cr - 3.1B - 4.5Fe
1790 °F (977 °C) Solidus to 1970 °F (1077 °C) Liquidus
(Composition similar to UNS N99600)

RATIONALE

AMS4775K incorporates industry standard requirements of AWS A5.8, revises Title, Burn off of Binder (3.3.1.1, 3.3.2.2), Powder mesh designations (3.5.1.1), Sampling and Testing (4.3.2.1), and Reports (4.4), prohibits unauthorized exceptions (3.8), and is a Five-Year Review and update of this specification.

1. SCOPE

1.1 Form

This specification covers a nickel alloy in the form of wire, rod, strip, foil, and powder and a viscous mixture (paste) of the powder in a suitable binder.

1.2 Application

This filler metal has been used typically for joining corrosion and heat-resistant steels and alloys requiring corrosion and oxidation resistant parts with good strength at elevated temperatures, but usage is not limited to such applications. Also may be used as a corrosion and oxidation resistant hard coating.

2. APPLICABLE DOCUMENTS

The issue of the following documents in effect on the date of the purchase order forms a part of this specification to the extent specified herein. The supplier may work to a subsequent revision of a document unless a specific document issue is specified. When the referenced document has been cancelled and no superseding document has been specified, the last published issue of that document shall apply.

Document Structure
- Use complete sentences
- Requirements handling
- Table or figure references

How to Write a Digital-Ready Standard

Standards Authoring

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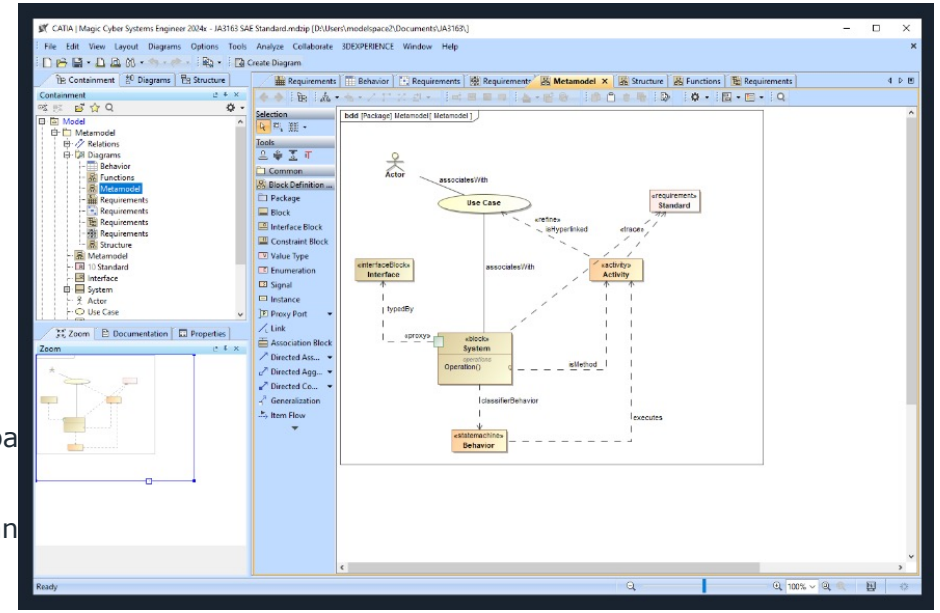
First SAE MBSE-Compatible Standard Published

- AS7140: Data Model for Rotorcraft Health and Maintenance Info



Introducing SAE MBSE Environment

- Virtual environment set up on SAE network in Sept
- Accessible by SAE committees to write standards in a digital format
- First step to providing digital authoring capabilities

New Digital Engineering Committee: S-19

- Unify model-based engineering across SAE standards
- Promotes digital model development, interoperability, and simulation-ba certification
- Develop standards for digital standards and help digitize traditional stan
- Join today!

MBSE Training

- MBSE professional development curriculum
- New: Foundations of Model-Based Definition (MBD) & Model-Based Enterprise (MBE)

Digital Standards Alliance

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Establishing best practices for the authoring and use of digital standards in the entire product development lifecycle (R&D, design, simulation/testing, verification/validation, certification, procurement, manufacturing, operation, & MRO)

Interoperability

Identify families of standards that share similarities and develop a standard ontology for each family

Education

Rules for authoring digital-ready standards and education about efficiency gains, ROI

Licensing & Business

Establish guidelines around licensing, pricing, and other

BOEING

LOCKHEED MARTIN

AIA AEROSPACE INDUSTRIES ASSOCIATION

SAE INTERNATIONAL

RTX

Raytheon UK

ASTM INTERNATIONAL

Collins Aerospace An RTX Business

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DEPARTMENT OF DEFENSE

DIN Solutions

UL Standards & Engagement

bsi

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digitalstandardsalliance@sae-itc.org

DSA in Action: Pilot on Manufacturing Process

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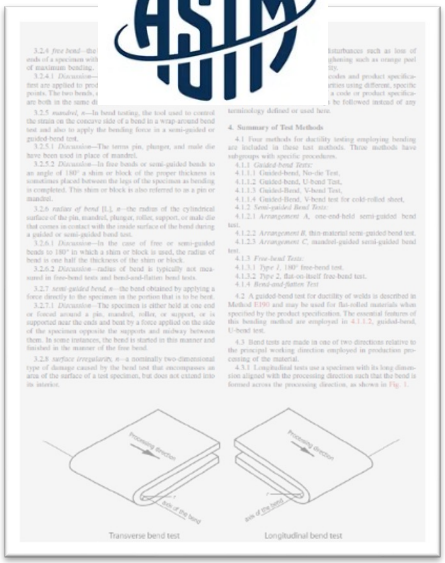
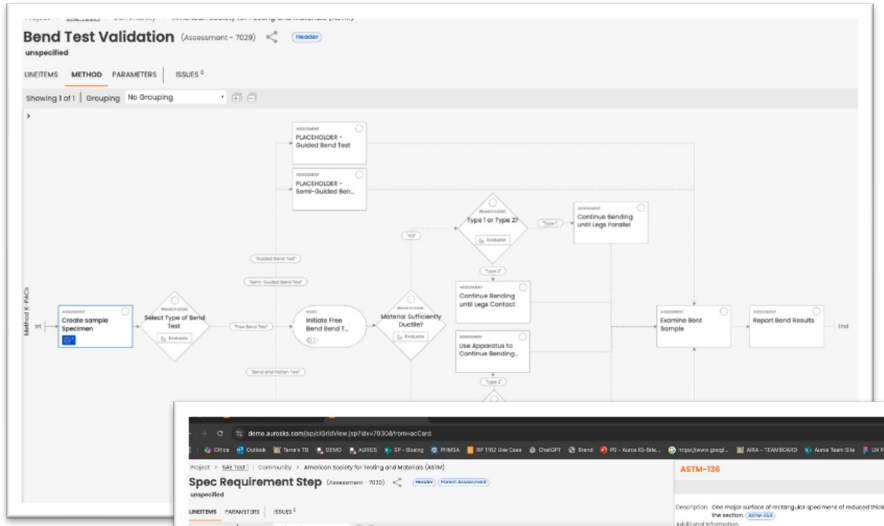
3.4.1.3 Bending

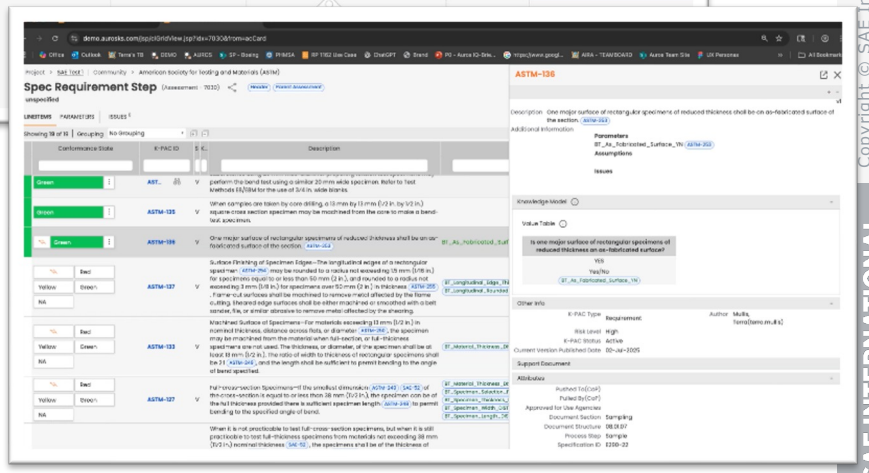
Product 0.275 inch (6.98 mm) and under in nominal thickness shall be tested in accordance with ASTM E290 using a sample prepared nominally 0.75 inch (19.0 mm) in width with its axis of bending parallel to the direction of rolling and shall withstand without cracking when bending at room temperature through the angle and bend diameter shown in Table 3. In case of dispute, the results of tests using the guided bend test of ASTM E290 shall govern.

Table 3 - Bending requirements

Nominal Thickness Inch	Nominal Thickness Millimeters	Type of Bend	Angle Deg. Min	Bend Factor
Up to 0.1874, incl	Up to 4.760, incl	Free Bend	180	1
Over 0.1874 to 0.275, incl	Over 4.760 to 6.98, incl	Free Bend	180	3







Help us with validation! We need materials engineers or manufacturing engineers!

DSA in Action: Pilot on Standard Parts

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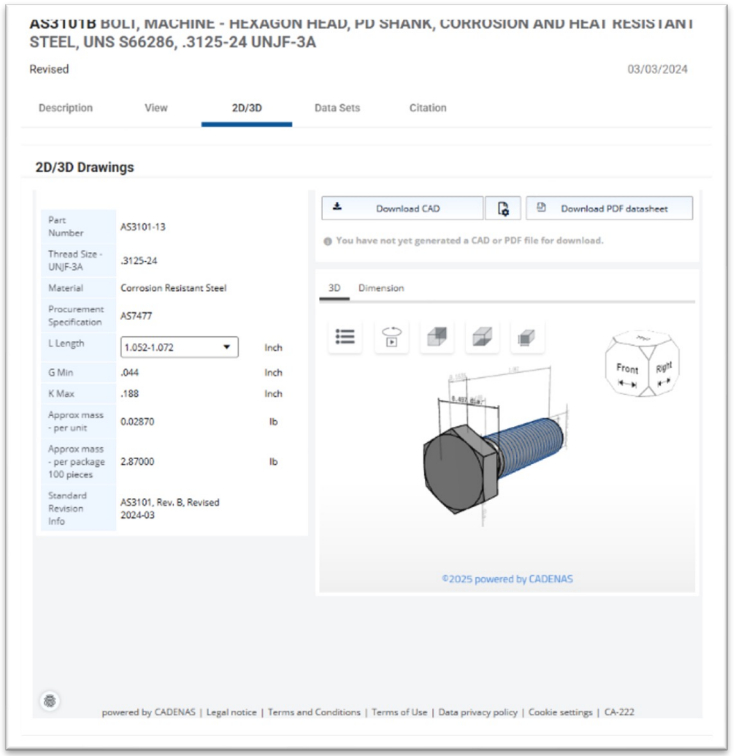
How Does This:



Compare to These Data Models:

OEM-Developed Data Models

2026 DSA Pilot: Standards Schemas

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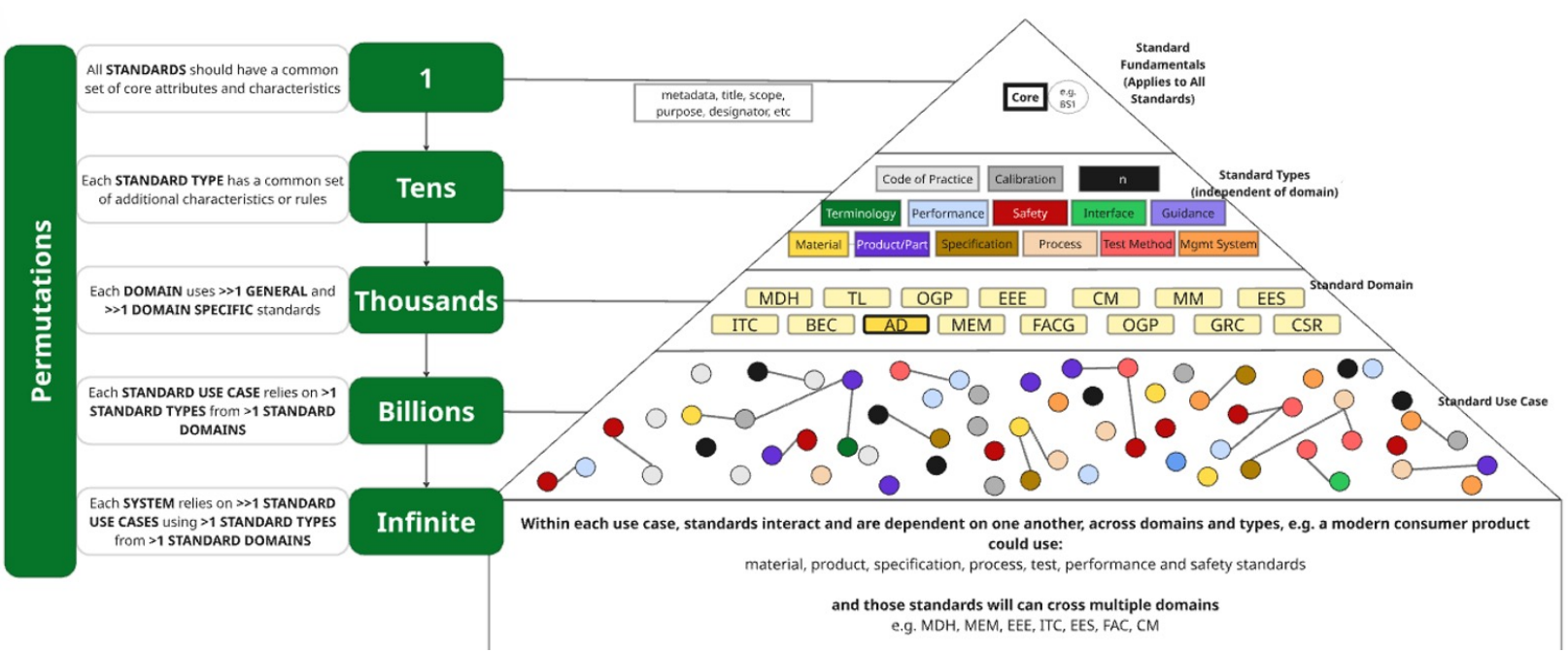
Evolving from Documents to Data



Examples of Varying Standards Schemas

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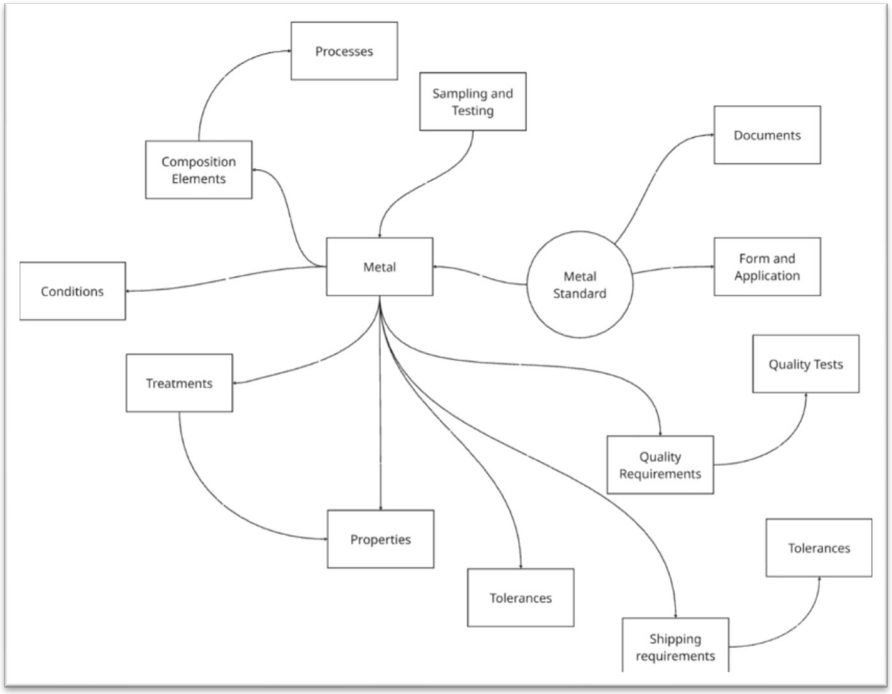
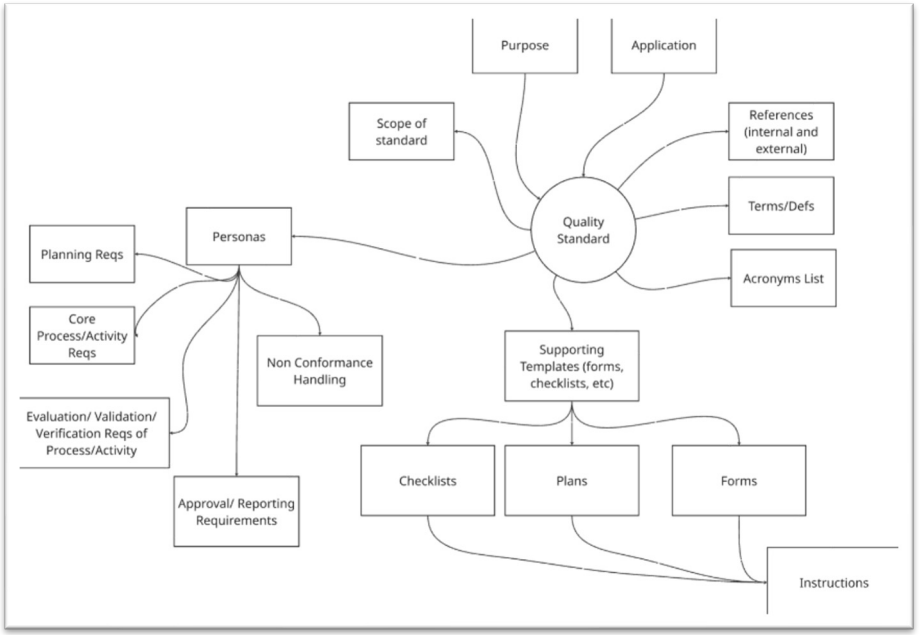
Metal Standard



Quality Standard



2026 DSA Pilot: Persistent Identifiers

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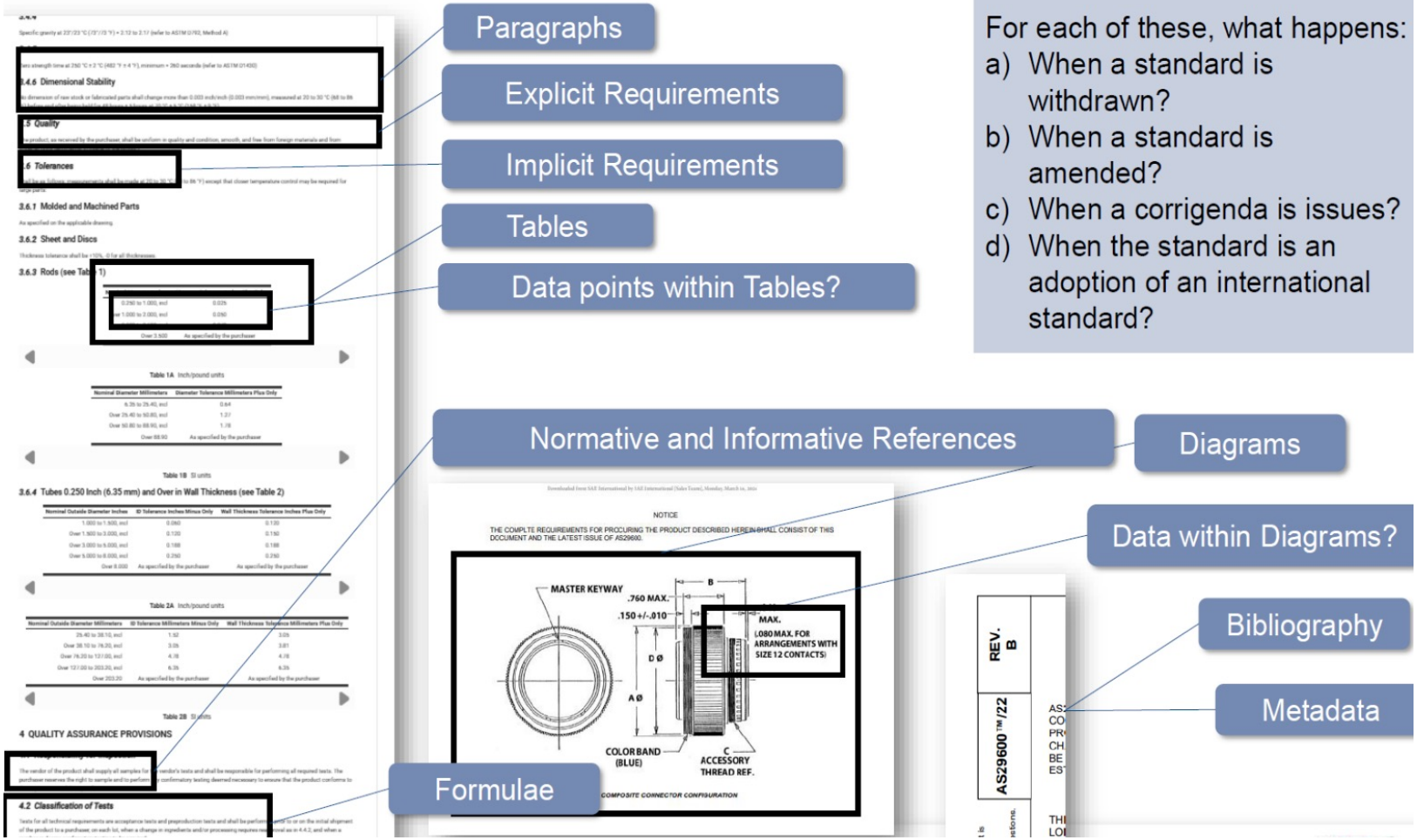

Paragraphs

Explicit Requirements

Implicit Requirements

Tables

Data points within Tables?

For each of these, what happens:

a) When a standard is withdrawn?
b) When a standard is amended?
c) When a corrigenda is issues?
d) When the standard is an adoption of an international standard?

Normative and Informative References

Diagrams

Data within Diagrams?

Bibliography

Metadata

Formulae

Join Us on Our Digital Journey!

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Leslie McKay

Director, Digital Standards Development at SAE International

Vice-Chair of the Digital Standards Alliance

Professional experience

- Over 20 years' experience leading software and hardware product development projects.
- Over 10 years' developing solutions that leverage artificial intelligence and machine learning.
- Dedicated to establishing best practices for authoring and use of digital standards.

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Contact

+1.412.897.5388
leslie.mckay@sae.org
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Contact the DSA Directly: digitalstandardsalliance@fullsight.org