Recent Progress on ASTM Research & Standardization Efforts

Mohsen Seifi, Ph.D.
Director of Global Additive Manufacturing Programs
ASTM International, Washington, DC, USA
ASM Handbook Vol. 24

• ASM Handbook, Volume 24:
  • Additive Manufacturing Processes (475 pages and 40+ chapters)

• Editors
  • Dr. David L. Bourell
  • Dr. William Frazier
  • Dr. Howard Kuhn
  • Dr. Mohsen Seifi
### Background

- Overview of AM R&D portfolio and their impact on AM standards portfolio
- New program development in workforce development
- Expansion of in-person workshops attracting over 300 AM professionals in Paris, Virginia and Texas
- AM CoE's COVID-19 response
- And more...
# AM CoE R&D Projects (Rounds 1 & 2)

## R&D Projects

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Post Processing (Surface finishing and Characterization)</td>
<td>Standardization of Data Pedigree</td>
</tr>
<tr>
<td>Feedstock (Powder quality guide)</td>
<td>Design Guide for Post-Processing</td>
</tr>
<tr>
<td>Mechanical Testing of Metal AM</td>
<td>Powder Spreadability</td>
</tr>
<tr>
<td>LB-PBF Process Qualification</td>
<td>LB-PBF Process Qualification – Phase II</td>
</tr>
<tr>
<td>Polymer AM Test Specimen Design</td>
<td>Polymer AM Design Value Tests</td>
</tr>
<tr>
<td>Design Guides for AM Processes</td>
<td>Dynamic Testing of Polymer AM</td>
</tr>
</tbody>
</table>

**LAUNCHED 14** Total Research Projects

**ADDRESSING 25** Total Standards

**IMPACTING 53** Total Standards

[https://www.amcoe.org/projects](https://www.amcoe.org/projects)

---

**ASTM International Information – Distribution limited – Please do not share without prior written approval**
# Research to Standardization

<table>
<thead>
<tr>
<th>Status</th>
<th>1. Work item scoping and registration</th>
<th>2. Draft under development</th>
<th>3. Editorial support and pre-ballot</th>
<th>4. Undergoing balloting and final approval of a standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>TBD</td>
<td>WK62867 WK65929 WK66682 WK71391 WK73340 WK74390</td>
<td>WK66030 WK71393 WK71395</td>
<td>WK49229* WK65937* WK66029 WK72172 WK73444</td>
<td>Approved: ASTM F3413 – 19</td>
</tr>
</tbody>
</table>

* Existing Work Items

<table>
<thead>
<tr>
<th>PARTNER</th>
<th>FUNDING YEAR</th>
<th>PROJECT DESCRIPTION</th>
<th>STANDARD WORK ITEM</th>
<th>STATUS</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>2018</td>
<td>1801: Metal AM Testing</td>
<td>WK49229</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2019</td>
<td>1901: Rapid Quality Inspection Specimen</td>
<td>WK71395</td>
<td></td>
</tr>
<tr>
<td>EWI</td>
<td>2018</td>
<td>1802: AM Post Processing</td>
<td>WK66682</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2019</td>
<td>1902: Data Pedigree</td>
<td>WK72172</td>
<td></td>
</tr>
<tr>
<td>EWI</td>
<td>2018</td>
<td>1803: AM Feedstock Evaluation</td>
<td>WK66030</td>
<td></td>
</tr>
<tr>
<td>mtc</td>
<td>2019</td>
<td>1903: AM Powder Spreadability</td>
<td>WK71393</td>
<td></td>
</tr>
<tr>
<td>mtc</td>
<td>2019</td>
<td>1904: Design for Post Processing</td>
<td>WK73444</td>
<td></td>
</tr>
<tr>
<td>mtc</td>
<td>2019</td>
<td>1905: Design Guides for AM Processes</td>
<td>WK62867 F3413-19 (WK62946)</td>
<td></td>
</tr>
<tr>
<td>NAMIC</td>
<td>2019</td>
<td>1906: In-process Monitoring</td>
<td>WK74390</td>
<td></td>
</tr>
<tr>
<td>NIAR</td>
<td>2018</td>
<td>1805: Polymer AM Testing</td>
<td>WK66029</td>
<td></td>
</tr>
<tr>
<td>NIAR</td>
<td>2018</td>
<td>1805: Polymer AM Testing</td>
<td>WK71391</td>
<td></td>
</tr>
<tr>
<td>NIAR</td>
<td>2019</td>
<td>1908: Polymer AM Design Value Tests</td>
<td>TBD</td>
<td></td>
</tr>
<tr>
<td>NIAR</td>
<td>2019</td>
<td>1909: Dynamic Testing of Polymer AM</td>
<td>WK73340</td>
<td></td>
</tr>
</tbody>
</table>

**Status Key:**
1. Work item scoping and registration
2. Draft under development
3. Editorial Support and Pre-Ballot
4. Undergoing Balloting and Final approval as a standard

**Approved:** ASTM F3413 – 19

---

*Please do not share without prior written approval*
3rd Round of Projects

2020 Request for Ideas

- The idea solicitation process was expanded to all ASTM members as a membership benefit
  - Over 60 ideas were received during the survey
- Submissions addressed a wide range of challenges in AM that members face, including:
  - Design, Data, and Modeling
  - Feedstock
  - Processes and Post processing
  - AM Testing
  - Inspection and Qualification
- Project selection process
  - Ideas were evaluated by the F42.90.05 team
  - AM CoE Partners are developing SOWs
  - Projects will start in October 2020
### 3rd round of R&D Projects

<table>
<thead>
<tr>
<th>Lead</th>
<th>Project Title</th>
<th>Material</th>
<th>Topic</th>
</tr>
</thead>
<tbody>
<tr>
<td>EWI</td>
<td>Specimen Design for Compression Testing of Metallic Lattice Structures</td>
<td>🔴</td>
<td>🔴</td>
</tr>
<tr>
<td>mtc</td>
<td>Common Data Exchange Format (CDEF) for Powder Characterization</td>
<td>🔴</td>
<td>🔴</td>
</tr>
<tr>
<td>mtc</td>
<td>Metal Powder Feedstock Recycling and Sampling Strategies</td>
<td>🔴</td>
<td>🔴</td>
</tr>
<tr>
<td>mtc</td>
<td>Recycling and Re-Use of Polymer Powders</td>
<td>🔵</td>
<td>🔵</td>
</tr>
<tr>
<td>NAMIC</td>
<td>Miniature Tensile Specimens for Additive Manufacturing</td>
<td>🔴</td>
<td>🔴</td>
</tr>
<tr>
<td>NAMIC</td>
<td>Volume-Traceability (VT) Development in Porosity Characterization with XCT for Integrity and Quality Assurance of AM Parts</td>
<td>🔴</td>
<td>🔴</td>
</tr>
<tr>
<td>NAMIC</td>
<td>Development of Specification for Maraging Steel</td>
<td>🔴</td>
<td>🔴</td>
</tr>
<tr>
<td>NASA</td>
<td>Thermal Tolerance Test for LB-PBF Process Parameters</td>
<td>🔴</td>
<td>🔴</td>
</tr>
<tr>
<td>NIAR</td>
<td>Continuation of AM Polymer Projects (Design Value and Dynamic Testing)*</td>
<td>🔵</td>
<td>🔵</td>
</tr>
</tbody>
</table>

* Continuation of projects initiated in 2019

ASTM International Information – Distribution limited – Please do not share without prior written approval
New Project Call Mechanism

New Call for Projects (CFP) mechanism allowing non-AM CoE partners to receive support to conduct targeted R&D projects

- Objectives
  - Allow the AM community to participate in Research to Standardization initiative
  - Evaluate the possibility of bringing on additional partners to the AM CoE team, to further accelerate standard development in AM

<table>
<thead>
<tr>
<th>PROPOSAL DUE</th>
<th>NOVEMBER 24, 2020</th>
</tr>
</thead>
<tbody>
<tr>
<td>SELECTION ANNOUNCEMENT</td>
<td>JANUARY 2021</td>
</tr>
<tr>
<td>ANTICIPATED START DATE</td>
<td>MARCH 2021</td>
</tr>
</tbody>
</table>

2020 Call for Projects
Submit Your Proposal!
Funding Opportunities for Research Organizations
Informational Webinar: November 2, 2020
Proposal Deadline: November 24, 2020
# Update: Snapshot of ISO/ASTM Standards

**Terminology**

- ISO/ASTM 52903: Standard practice for part positioning, coordinates & orientation

**Methods, process & materials**

- ISO 17296-3: Overview of process categories and feedstock
- ISO/ASTM F2963-1: Material extrusion based AM of plastic materials: Feedstock materials
- ISO/ASTM CD 52903-1: Material extrusion based AM of plastic materials: Process/Equipment
- ISO/ASTM CD 52901-1: Technical design guidelines for PBF: PBF-LB of metals
- ISO/ASTM P2902-1: Standard practice on metal powders
- ISO/ASTM D7596: Standard practice for metal PBF process to meet critical applications
- ISO/ASTM AM 52901: Post-processing: Spec’n for QA & post processing of PBF metallic parts
- ISO/ASTM P2901: Qualification principles—conformity assessment of AM facilities
- ISO/ASTM WS 52012: General principles—Overview of data processing
- ISO/ASTM WS 52017: Process characteristics and performance - Test methods

**Test methods**

- ISO 17296-3: Main characteristics and corresponding test methods
- ISO/ASTM F2963-2: Main characteristics and corresponding test methods
- ISO/ASTM CD 52903: Material extrusion based AM of plastic materials: Parts
- ISO/ASTM P2902: Standard Test Artifacts

**Data & design**

- ISO 17296-4: Overview of data processing
- ISO/ASTM F2961: Design—Standard for design of functional AM parts
- ISO/ASTM CD 52912: Design—Standard for design of functional AM parts
- ISO/ASTM P2914: Design—Standard for design of functional AM parts
- ISO/ASTM P2915: Design—Standard for design of functional AM parts
- ISO/ASTM WS 52016: Test method of sand mold for metal casting: Physical properties

**Environmental, health & safety**

- ISO/ASTM CD 52930: Standard guidelines for use of metallic materials
- ISO/ASTM CD 52932: Determination of particle emission rates from desktop 3D printers
- ISO/ASTM CD 52933: Standard guidelines for use of metallic materials
- ISO/ASTM CD 52932: Determination of particle emission rates from desktop 3D printers

**AM in aerospace applications**

- ISO/ASTM WS 52013: Preliminary guidelines for use of metallic materials
- ISO/ASTM WS 52014: Preliminary guidelines for use of metallic materials
- ISO/ASTM WS 52015: Preliminary guidelines for use of metallic materials
- ISO/ASTM WS 52016: Preliminary guidelines for use of metallic materials
- ISO/ASTM WS 52017: Preliminary guidelines for use of metallic materials

**AM for plastics**

- ISO/ASTM P2916-1: Qualification principles—Qualification of machine operators for metallic parts production
- ISO/ASTM P2916-2: Qualification principles—Qualification of machine operators for metallic parts production
- ISO/ASTM P2916-3: Qualification principles—Qualification of machine operators for metallic parts production
- ISO/ASTM P2916-4: Qualification principles—Qualification of machine operators for metallic parts production

---

Credit: David Hardacre
### List of Published standards (As of 07/2020)

**15 Standards published by ASTM Only**

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM F2971-13</td>
<td>Standard Practice for Reporting Data for Test Specimens Prepared by Additive Manufacturing</td>
</tr>
<tr>
<td>ASTM F3049-14</td>
<td>Standard Guide for Characterizing Properties of Metal Powders Used for Additive Manufacturing Processes</td>
</tr>
<tr>
<td>ASTM F3001-14</td>
<td>Standard Specification for Additive Manufacturing Titanium-6 Aluminum-4 Vanadium ELI (Extra Low Interstitial) with Powder Bed Fusion</td>
</tr>
<tr>
<td>ASTM F3056-14e1</td>
<td>Standard Specification for Additive Manufacturing Nickel Alloy (UNS N06625) with Powder Bed Fusion</td>
</tr>
<tr>
<td>ASTM F3184-16</td>
<td>Standard Specification for Additive Manufacturing Stainless Steel Alloy (UNS S31603) with Powder Bed Fusion</td>
</tr>
<tr>
<td>ASTM F3187-16</td>
<td>Standard Guide for Directed Energy Deposition of Metals</td>
</tr>
<tr>
<td>ASTM F3301-18a</td>
<td>Standard for Additive Manufacturing — Post Processing Methods — Standard Specification for Thermal Post-Processing Metal Parts Made Via Powder Bed Fusion1, 2</td>
</tr>
</tbody>
</table>

**10 Standards published by ISO/ASTM**

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO/ASTM52900-15</td>
<td>Standard Terminology for Additive Manufacturing — General Principles — Terminology1, 2</td>
</tr>
<tr>
<td>ISO/ASTM52901-16</td>
<td>Standard Guide for Additive Manufacturing — General Principles — Requirements for Purchased AM Parts</td>
</tr>
<tr>
<td>ISO/ASTM52910-18</td>
<td>Additive manufacturing — Design — Requirements, guidelines and recommendations</td>
</tr>
<tr>
<td>ISO/ASTM52902-19</td>
<td>Additive manufacturing — Test artifacts — Geometric capability assessment of additive manufacturing systems</td>
</tr>
<tr>
<td>ISO/ASTM52907-19</td>
<td>Additive manufacturing — Feedstock materials — Methods to characterize metallic powders</td>
</tr>
</tbody>
</table>

**4 Standards published by ISO**

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO 17296-3:2014</td>
<td>Additive manufacturing — General principles — Part 3: Main characteristics and corresponding test methods</td>
</tr>
</tbody>
</table>
### List of Under Development standards (continued)

**20 Standards currently under development: ASTM**

<table>
<thead>
<tr>
<th>Standard Code</th>
<th>Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>ASTM WK66029</td>
<td>New Guide for Mechanical Testing of Polymer Additively Manufactured Materials</td>
</tr>
<tr>
<td>ASTM WK66030</td>
<td>Quality Assessment of Metal Powder Feedstock Characterization Data for Additive Manufacturing</td>
</tr>
<tr>
<td>ASTM WK67454</td>
<td>Additive manufacturing -- Feedstock materials -- Methods to characterize metallic powders</td>
</tr>
<tr>
<td>ASTM WK69371</td>
<td>Standard practice for generating mechanical performance debits</td>
</tr>
<tr>
<td>ASTM WK71391</td>
<td>Additive Manufacturing -- Static Properties for Polymer AM (Continuation)</td>
</tr>
<tr>
<td>ASTM WK71393</td>
<td>Additive manufacturing -- assessment of powder spreadability for powder bed fusion (PBF) processes</td>
</tr>
<tr>
<td>ASTM WK71395</td>
<td>Additive manufacturing -- accelerated quality inspection of build health for laser beam powder bed fusion process</td>
</tr>
<tr>
<td>ASTM WK48549</td>
<td>AMF Support for Solid Modeling: Voxel Information, Constructive Solid Geometry Representations and Solid Texturing</td>
</tr>
<tr>
<td>ASTM WK72172</td>
<td>Additive manufacturing -- General principles -- Overview of data pedigree</td>
</tr>
<tr>
<td>ASTM WK65937</td>
<td>Additive Manufacturing -- Space Application -- Flight Hardware made by Laser Beam Powder Bed Fusion Process</td>
</tr>
<tr>
<td>ASTM WK69730</td>
<td>Additive Manufacturing -- Wire for Directed Energy Deposition (DED) Processes in Additive Manufacturing</td>
</tr>
<tr>
<td>ASTM WK69732</td>
<td>Additive Manufacturing -- Wire Arc Additive Manufacturing</td>
</tr>
<tr>
<td>ASTM WK72317</td>
<td>Additive Manufacturing -- Powder Bed Fusion -- Multiple Energy Sources</td>
</tr>
<tr>
<td>ASTM WK72457</td>
<td>Additive manufacturing processes -- Laser sintering of polymer parts/laser-based powder bed fusion of polymer parts -- Qualification of materials</td>
</tr>
<tr>
<td>ASTM WK71891</td>
<td>Additive Manufacturing of Titanium-6 Aluminum-4 Vanadium ELI (Extra Low Interstitial) with Powder Bed Fusion for Medical Devices</td>
</tr>
<tr>
<td>ASTM WK66682</td>
<td>Evaluating Post-processing and Characterization Techniques for AM Part Surfaces</td>
</tr>
</tbody>
</table>
List of standards (continued)

45 Standards currently under development: ISO/ASTM

ISO/ASTM DTR 52905 Additive manufacturing — General principles — Non-destructive testing of additive manufactured products
ISO/ASTM CD TR 52906 Additive manufacturing — Non-destructive testing and evaluation — Standard guideline for intentionally seeding flaws in parts
ISO/ASTM AWI 52908 Additive manufacturing — Post-processing methods — Standard specification for quality assurance and post processing of powder bed fusion metallic parts
ISO/ASTM AWI 52909 Additive manufacturing — Finished part properties — Orientation and location dependence of mechanical properties for metal powder bed fusion
ISO/ASTM PWI 52911-3 Additive manufacturing — Technical design guideline for powder bed fusion — Part 3: Standard guideline for electron-based powder bed fusion of metals
ISO/ASTM PRF TR 52912 Additive manufacturing - Design - Functionally graded additive manufacturing
ISO/ASTM PWI 52913-1 Additive manufacturing — Test methods for characterization of powder flow properties for AM applications - Part 1: General requirements
ISO/ASTM PWI 52914 Additive manufacturing — Design — Standard guide for material extrusion processes
ISO/ASTM WD 52916 Additive manufacturing — Data formats — Standard specification for optimized medical image data
ISO/ASTM CD TR 52918 Additive manufacturing — Data formats — File format support, ecosystem and evolutions
ISO/ASTM WD 52919-1 Additive manufacturing — Test method of sand mold for metalcasting — Part 1: Mechanical properties
ISO/ASTM PWI 52920-1 Additive manufacturing — Qualification principles — Part 1: Conformity assessment for AM system in industrial use
ISO/ASTM WD 52920-2 Additive manufacturing — Qualification principles — Part 2: Requirements for industrial additive manufacturing sites
ISO/ASTM DIS 52921 Additive manufacturing — General principles — Standard practice for part positioning, coordinates and orientation
ISO/ASTM PWI 52922 Additive manufacturing — Design — Directed energy deposition
ISO/ASTM PWI 52923 Additive manufacturing — Design decision support
ISO/ASTM DIS 52924 Additive manufacturing — Qualification principles — Classification of part properties for additive manufacturing of polymer parts
ISO/ASTM DIS 52925 Additive manufacturing — Qualification principles — Qualification of polymer materials for powder bed fusion using a laser
ISO/ASTM WD 52926-1 Additive manufacturing — Qualification principles — Part 1: Qualification of machine operators for metallic parts production
ISO/ASTM WD 52926-4 Additive manufacturing — Qualification principles — Part 4: Qualification of machine operators for metallic parts production for DED-LB
ISO/ASTM WD 52926-5 Additive manufacturing — Qualification principles — Part 5: Qualification of machine operators for metallic parts production for DED-Arc
ISO/ASTM PWI 52927 Additive manufacturing — Process characteristics and performance - Test methods
ISO/ASTM PWI 52928 Additive manufacturing — Process characteristics and performance - Test methods
ISO/ASTM PWI 52929 Additive manufacturing — Process characteristics and performance - Test methods
ISO/ASTM PWI 52930 Additive manufacturing — Process characteristics and performance - Test methods
ISO/ASTM PWI 52931 Additive manufacturing — Process characteristics and performance - Test methods
ISO/ASTM PWI 52932 Additive manufacturing — Process characteristics and performance - Test methods
ISO/ASTM PWI 52933 Additive manufacturing — Process characteristics and performance - Test methods
ISO/ASTM PWI 52934 Additive manufacturing — Process characteristics and performance - Test methods
ISO/ASTM PWI 52935 Additive manufacturing — Process characteristics and performance - Test methods
ISO/ASTM PWI 52936-1 Additive manufacturing — Process characteristics and performance - Test methods
ISO/ASTM PWI 52937 Additive manufacturing — Process characteristics and performance - Test methods
ISO/ASTM DIS 52941 Additive manufacturing — System performance and reliability — Standard test method for acceptance of powder-bed fusion machines for metallic materials for aerospace application
ISO/ASTM DIS 52942 Additive manufacturing — System performance and reliability — Standard test method for acceptance of powder-bed fusion machines for metallic materials for aerospace application
ISO/ASTM PWI 52943-1 Additive manufacturing — System performance and reliability — Standard test method for acceptance of powder-bed fusion machines for metallic materials for aerospace application
ISO/ASTM PWI 52943-2 Additive manufacturing — System performance and reliability — Standard test method for acceptance of powder-bed fusion machines for metallic materials for aerospace application
ISO/ASTM PWI 52943-3 Additive manufacturing — System performance and reliability — Standard test method for acceptance of powder-bed fusion machines for metallic materials for aerospace application
ISO/ASTM PWI 52944 Additive manufacturing — System performance and reliability — Standard test method for acceptance of powder-bed fusion machines for metallic materials for aerospace application
ISO/ASTM DIS 52950 Additive manufacturing — General principles — Overview of data processing
ISO/ASTM PWI 52951 Additive manufacturing — Data packages for AM parts
A collaborative workshop with America Makes.

Two-day event: 20 technical talks, panel, roadmapping session.

Objective:
- Identify challenges, gaps, and pain points
- Discuss solutions
- Build a momentum
Roadmap Methodology

• **Gaps and Challenges**: Participants brainstormed gaps and challenges in small groups and voted on the highest priorities for the AM community.

• **Potential Solutions**: Participants brainstormed solutions to the priority gaps and challenges from the previous exercise and again voted on the highest priority solutions for the AM community.

• **Detailed Action Plans**: Participants worked in small groups to develop detailed action plans for the highest priority solutions by identifying major tasks, milestones, stakeholder roles, and resource requirements.
Highest Rated Gaps

Data Acquisition
• Potential for manual data entry to lead to human error

Data Management
• The need for unique, unified data identifiers (e.g., bar codes, alphanumeric tags, etc.) for AM data

Data Security
• Data traceability/integrity/provenance
• Protection of intellectual property (IP) during data sharing

Data Use
• Correlating data to part performance
• Format or presentation mode of data

Data Practices
• Minimum viable data packages
• Common terms and semantics for data definition

Number of Gaps: 37
Highest Rated Action Plans

Common Data Dictionary (Underway: WK72172)
To standardize data elements that are collected during an AM process

Common Data Exchange Format (Underway: work item to be registered next month)
A neutral and open data format that simplifies data exchange between data management systems that have built the appropriate translators.

Automated Data Acquisition
To reduce human error, and enable application of advanced analytics

Minimum Viable Datable Package
To correlate key AM variables to part performance

Public Use Cases
To understand the ROI of the AM Data Ecosystem (Qual./Cert., Supply Chain, R&D)
Strategic Guide

- Based on inputs from participants
- Summarized gaps and challenges with respect to Data in AM, and provided solutions and action plans

Download at: https://amcoe.org/rd-publications
Data Initiatives/Activities
Formation of F42.08

**Data Pedigree Project**
2nd round of R&D projects

**AM Data Subcommittee**
Recommended during the road-mapping session discussions

**CDD Work Item**
“Overview of Data Pedigree”
Post-Balloting stage

**CDEF Work Item**
“Common Data Exchange Format”
Scoping and Registration

**Formation of F42.08:**
- Based on input from the AM Data Workshop
- A dedicated forum for AM Data experts to identify gaps and develop standards
- Approved by the ASTM Committee F42 Executive Team on Feb. 2020

**F42.08 Officers**
- Chair
  Alex Kitt,
  EWI
- Vice-Chair
  Yan Lu,
  NIST
- Secretary
  Peter Coutts,
  Penn State ARL

**AM Data Workshop**
ASTM Int. & America Makes

**Strategic Guide**
based on inputs from the workshop participants

**AM CoE R&D Team update**
Addition of two AM Data Experts
Mr. Matthew Jacobsen
Mr. Chuck Browne

**Timeline:**
- Oct. 2019
- Dec. 2019
- Feb. 2020
- Jul. 2020
- Aug. 2020
- Jul. 2020
- Nov. 2020

ASTM International Information – Distribution limited – Please do not share without prior written approval
Data Initiatives/Activities

Work Items

- ASTM WK72172: New Practice for Additive manufacturing -- General principles -- Overview of data pedigree
  - The standard identifies classes of AM data (buckets), important terms for data that fit within those buckets, and relationships that exist between the buckets.
  - Balloting completed, negative comments are being addressed (Tech contact: Yan Lu, NIST)

- NEXT: Common Data Exchange Format (CDEF)
  - Facilitates data sharing among data management systems, Will be registered in Nov. 2020 (Lead org: EWI)

- ASTM WK73978: New Specification for Additive Manufacturing -- Data Registration
  - This standard practice comprises actions that users need take to register datasets and store them in a repository.
  - Tech contact: Shawn Feng, NIST

- Several other data related activities at F42 ISO/ASTM joint groups such as JG64, JG67, JG70, JG73
Data Initiatives/Activities

In-Process Monitoring Project

- Assessment of State-of-the-Art of In-Process Control and In-Situ Monitoring for Additive Manufacturing
  - Conducted literature review of available monitoring technique
  - Evaluated TRL/MRL level
  - Conducted survey (20+ experts in North America and Europe)
  - Report to be published for public before end of the year

- Data structure a primary concern
  - High spatial resolution sensor data produces very large volumes of data
  - Real time data processing is challenging and expensive
  - Parameterization reduces data volume for analysis and storage, but loses fidelity
  - Variation between companies constrains development of universal acceptance criteria
  - Standardization of data simplification will be necessary for allowance in certification/qualification
Data Initiatives/Activities
Cyber Security Training Award

- America Makes Open Project Call
  - ASTM and Auburn University: AM Cyber security training

- Need to create cyber security standards
Data Initiatives/Activities

NASA-ASTM Cooperative Agreement

- This cooperative agreement will be the basis to expand the AM CoE and NASA’s evolving partnership
  - Three-year contract
  - Formalize collaboration aimed at supporting projects identified by NASA for the AM CoE execution

- First project
  - Qualification framework for laser beam powder bed fusion (LB-PBF) AM processes
    - One of the largest impediments to the growing implementation of AM into many applications.
    - Need to standardize process qualification that ultimately contribute to robust data generation, collection and specification
Upcoming AM CoE Annual Flagship Event – ICAM 2020

- 10 panel discussions
- 220+ organizations
- 300+ presentations
- 400+ attendees
- Award ceremony
For more information contact:

Dr. Mohsen Seifi

mseifi@astm.org