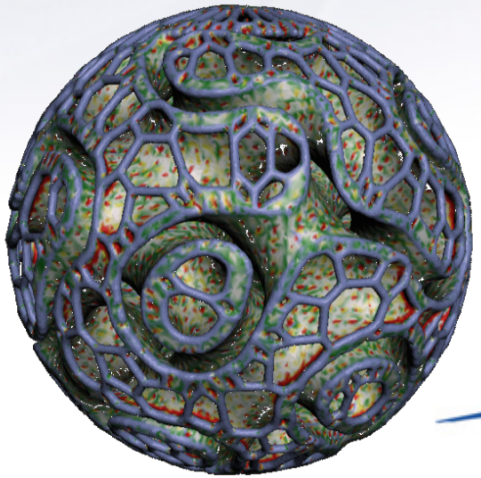


SETTING THE STANDARD

Overview of ASME Y14.46

Product Definition for Additive Manufacturing (AM)

Rev07
Last Update: Jan 4, 2017

The Case for this Standard

Oct 2014
ASME Y14 Main Committee
VOTED to create the Y14.46 subcommittee on Dimensioning and Tolerancing for Additive Manufacturing

2015-present
CAD Vendors Develop 3D Printing Software

2015-present
Strategic Software Alliance / Acquisition

2015-present
Strategic Hardware Alliance / Acquisition

2016
Gaps Identified by America Makes Standards Consortium (AMSC)

2015-present
SDOs Developing Supporting AM Standards

ASME Y14.46
1st Release November 2017

Approved
Jan 2016

Y14.46 Charter

- Develop and standardize systems and indications to promote uniform practices for **product definition** for **Additive Manufacturing (AM).**
- Create a broadly accepted standard that incorporates, expands, or refines international **practices and symbology** to enable AM product definition data sets to be created, interpreted, and consumed on a global basis.
- This standard shall ensure that component parts and component assemblies, produced from such AM product definition data sets, are subject to a **single interpretation** of engineering specifications and requirements for the purpose of conformance verification.
- This standard shall **supplement** the requirements of the Y14 series.

Work To Date

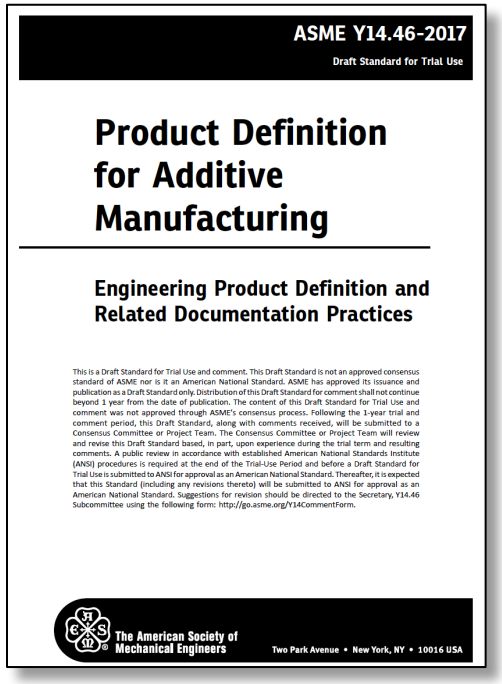
- **Brainstorming** for content generation – Started May 2015
- **Term/Definition** and Section Content generation contributed by 10-15 writers – 2015 through Spring 2016
- **Round 1** Comment Collection with over 200 comments – All comments adjudicated - Fall 2016 Dallas
- **Round 2** Comment Collection with over 200 comments – All comments adjudicated – Winter 2017, 9 telecons
- **Final** Comment Adjudication – Spring 2017 Tampa
- **First Release** (DRAFT Standard for Trial Use) – November 2017
- **Ready for Comments** – January 2018

2 YEAR Cycle
Cradle
to
1st Release

1. Draft Standard for **Trial Use**
2. Dedicated Contributors from **NIST**
3. Leveraged **existing** standards

Draft Standard for Trial Use

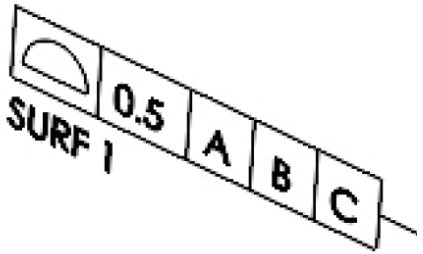
- Not a consensus standard of ASME, Nor ANSI
- Subcommittee (SC) reviews and revises based upon experience and comments after trial term ends (TBD decision from SC)
- Intended to be submitted to ANSI After Trial Use Period
- Approval Requirements
  - Majority of Consensus Committee Membership
  - Majority of Responsible Supervisory Board
- Piloted with the EA-1-2008 Standard – published as a draft standard for trial use for a 5 month period - Approved by ANSI Nov 25, 2009



Source: ASME Codes and Standards Development Committee Procedures

Adopting Existing Practices

- AM definitions from ASTM
- Re-use available GD&T symbology and methods when possible
- Only develop new GD&T symbology and methods when missing or non-existent in current standards



Members have Voting Privileges

ASME Y14.46 Leadership	
Jennifer Herron (Chair)	jennifer@action-engineering.com
Paul Witherell (Co-Chair)	paul.witherell@nist.gov
Remi Remington (Staff Secretary)	richmondrs@asme.org

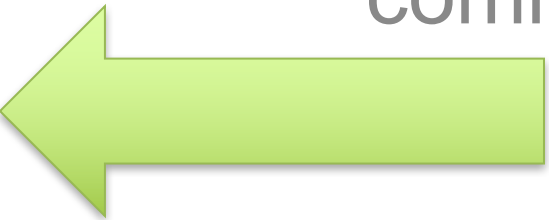
19 VOTING MEMBERS

34 SUPPORT MEMBERS

Member Organizations			
Action Engineering	IBW	Northrup Grumman	Stryker
Air Force	NSC FMT	Orbital ATK	Tech Azul
Apple	John Deere	ONR	Univ. of Hartford
Altair	JT3	Profile Services	UL
Army	Lloyd's Register	PTC	UNC-Charlotte
Boeing	Lockheed Martin	Raytheon	Univ. of Missouri
Dakota	MITRE	Rolls Royce	Woodward, Inc.
Dassault SOLIDWORKS	Mitutoyo	SAMPE	WPI
FDA	NAVAIR	Sandia National Labs	Youngstown State Univ.
GE Aviation	NIST	Siemens Energy	

Questions?

Please type questions and comments into the chat window



Content

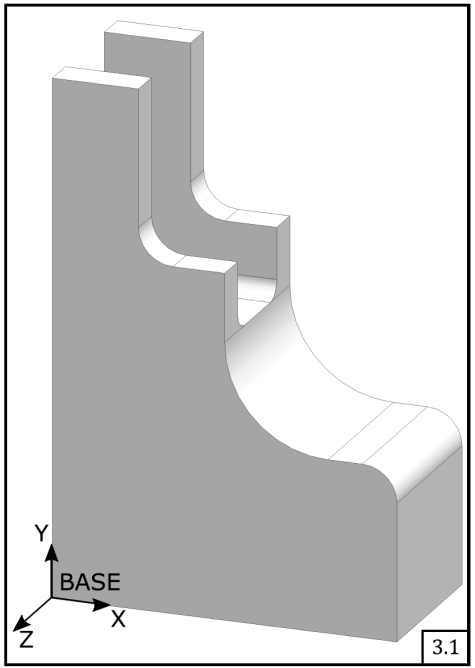
- 2 Definitions
- 3 Supplemental Geometry
- 4 Product and Process Definition Requirements
    - Geometry, Design, Process-Related Characteristics
- 5 Product Data Packages (PDP)
- Non-Mandatory Appendix A: Example Notes
- Non-Mandatory Appendix B: Defining Transition Regions
- Non-Mandatory Appendix C: Conformance to Specifications

2 Definitions

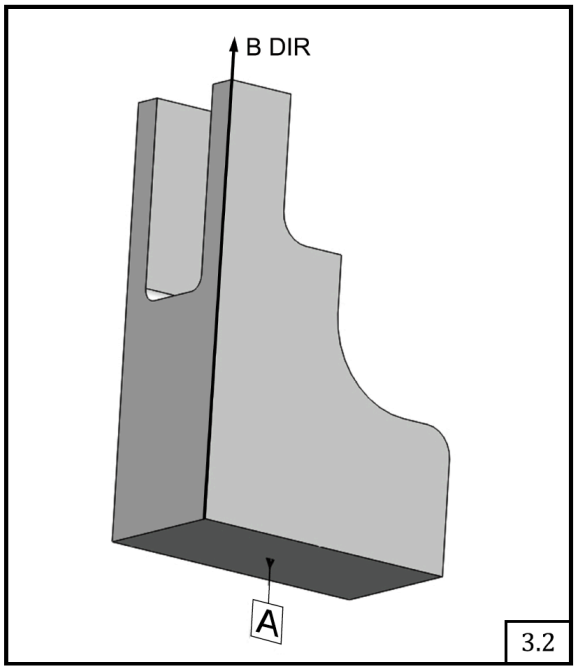
- 12 new definitions
- 20 remaining definitions are referenced from appropriate ASME Y14 and ASTM standards

3 Supplemental Geometry

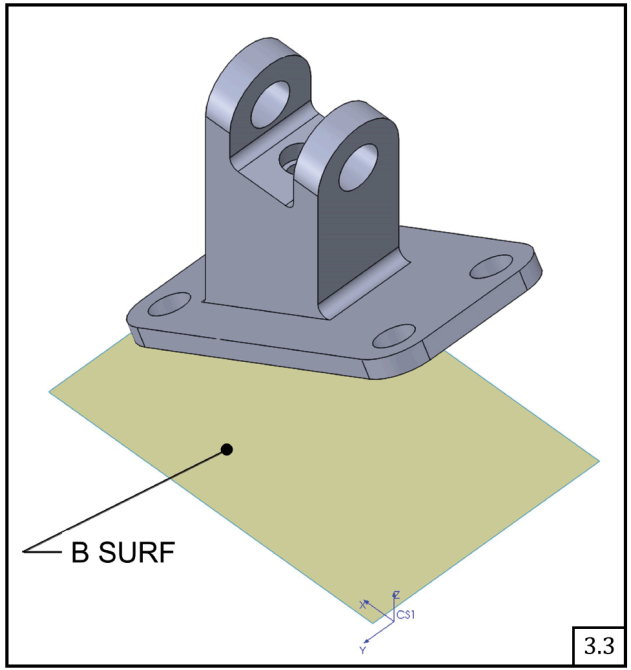
Coordinate System Identification



Unit Vector Identification



Surface Identification



Section 4

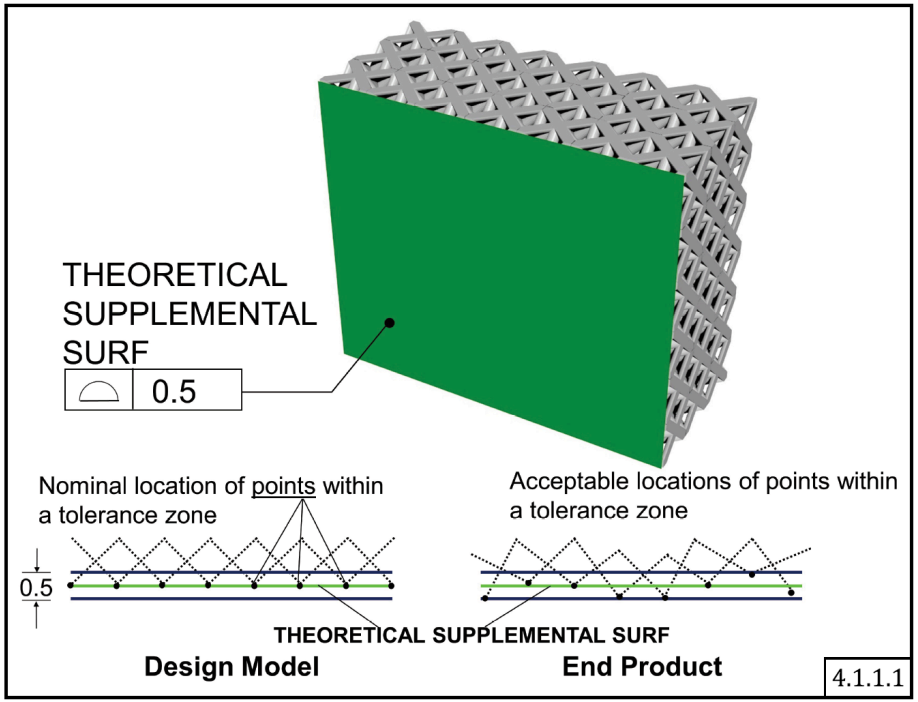
Product and Process Definition Requirements

4.1 Geometry Characteristics

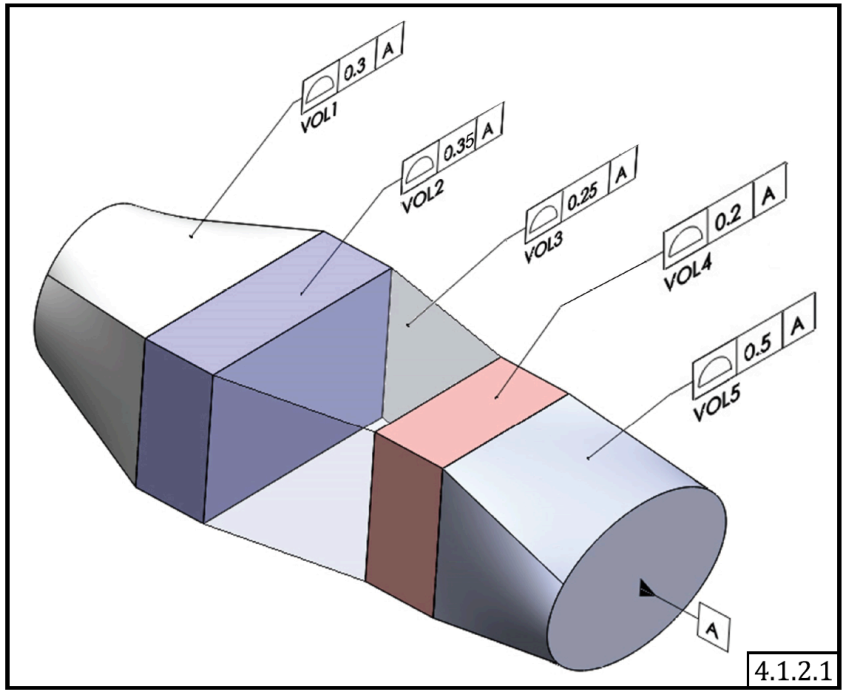
4.2 Design Characteristics

4.3 Process-Related Characteristics

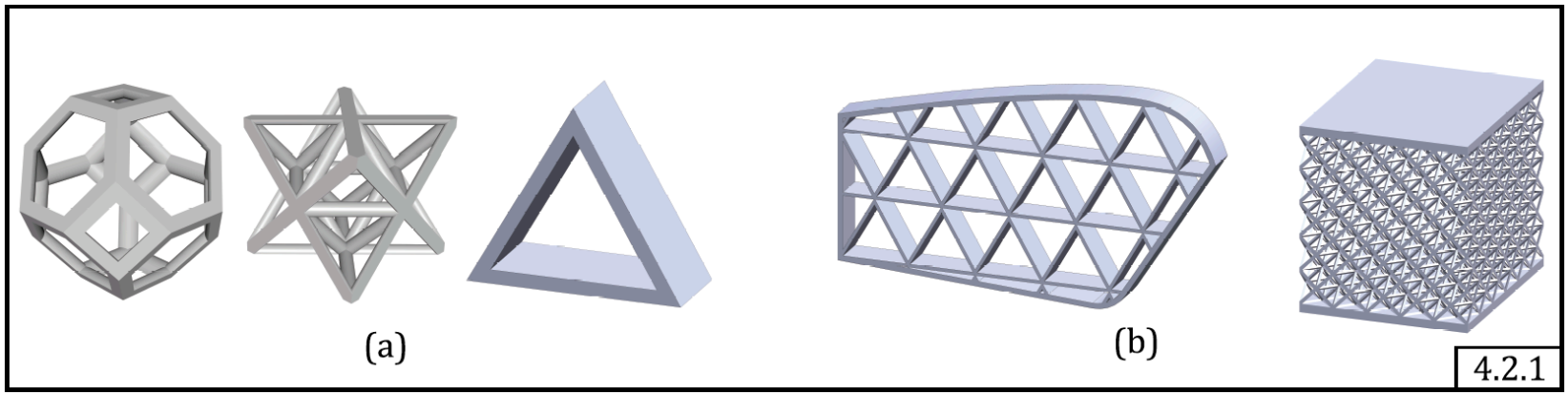
4.1.1 Geometry Characteristics: Surfaces and Tolerances



4.1.2: Bounded Regions and Tolerances

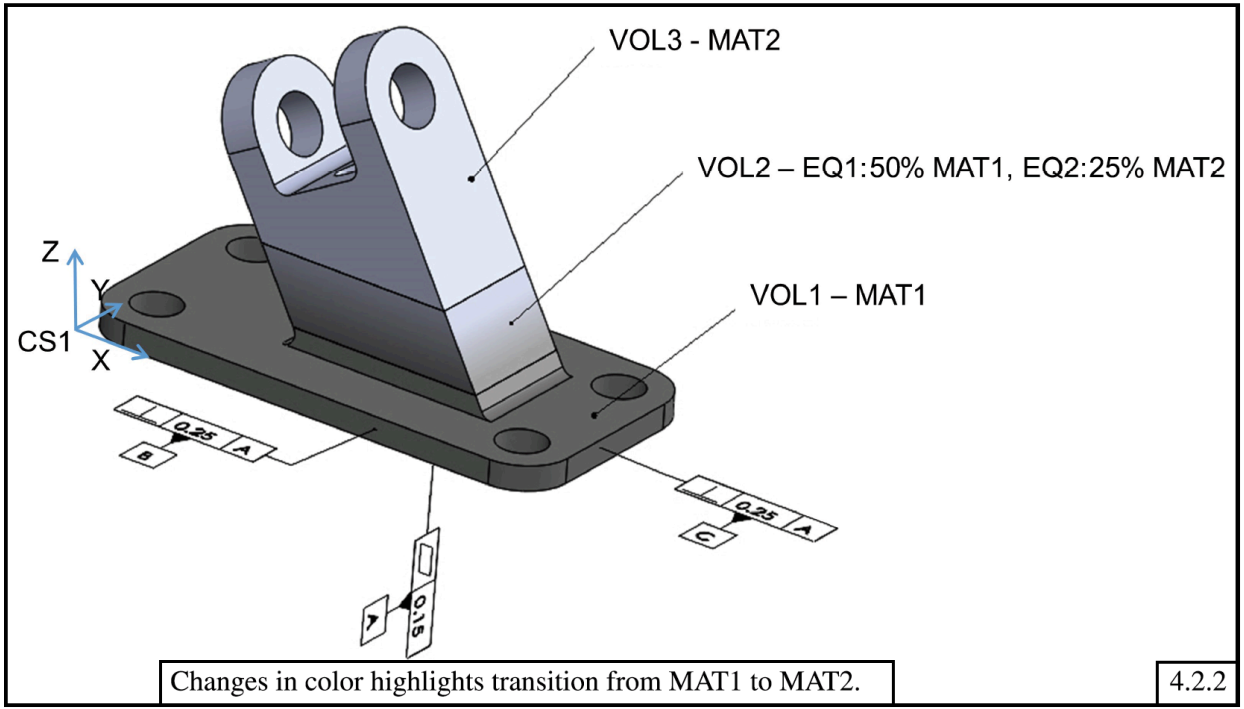


4.2.1 Lattice Structures



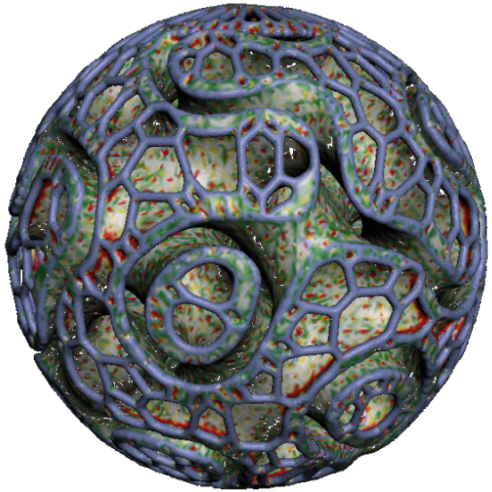
4.2 Design Characteristics

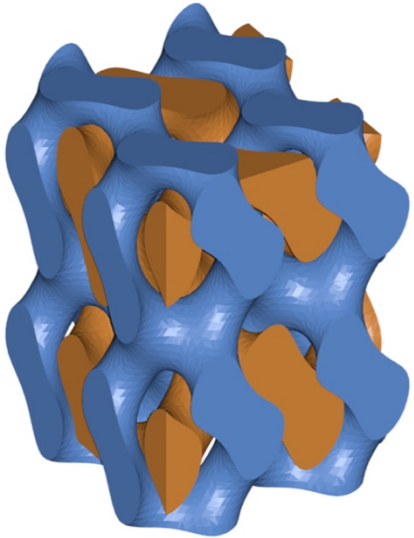
4.2.2 Gradient Control



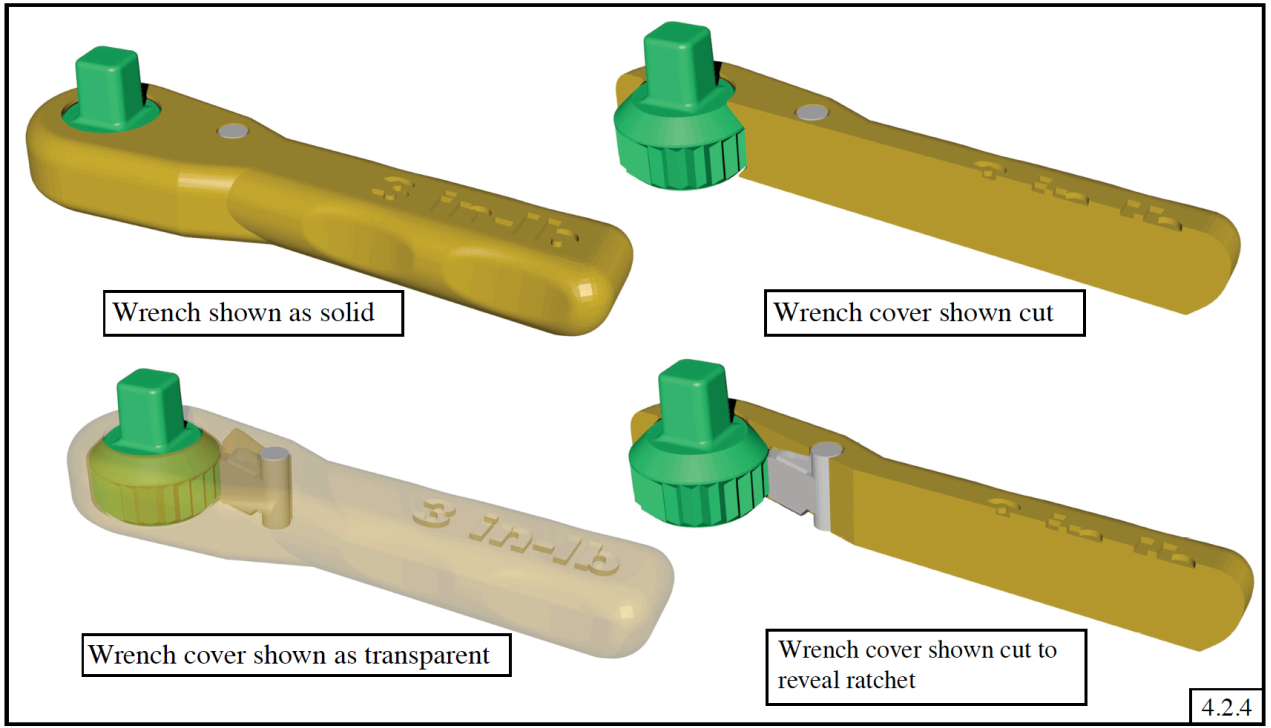
Changes in color highlights transition from MAT1 to MAT2. 4.2.2

4.2.3 Complex Geometry

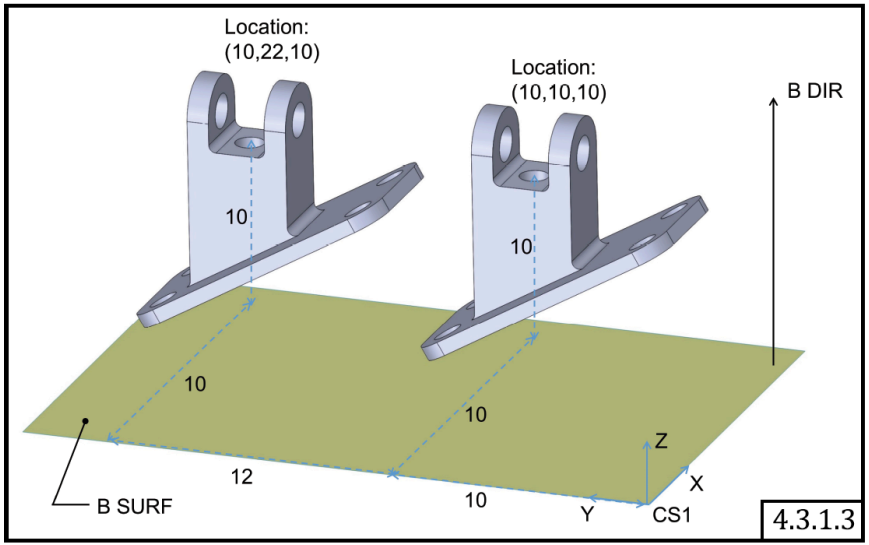


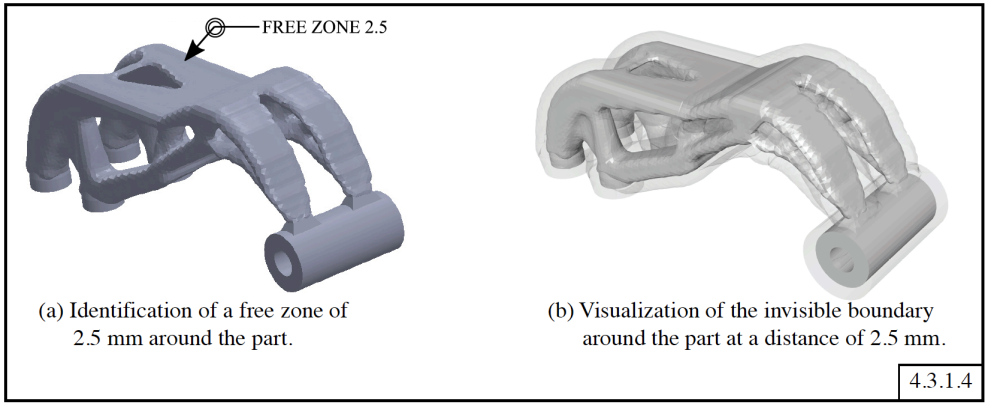


4.2.4 Design for Assembly



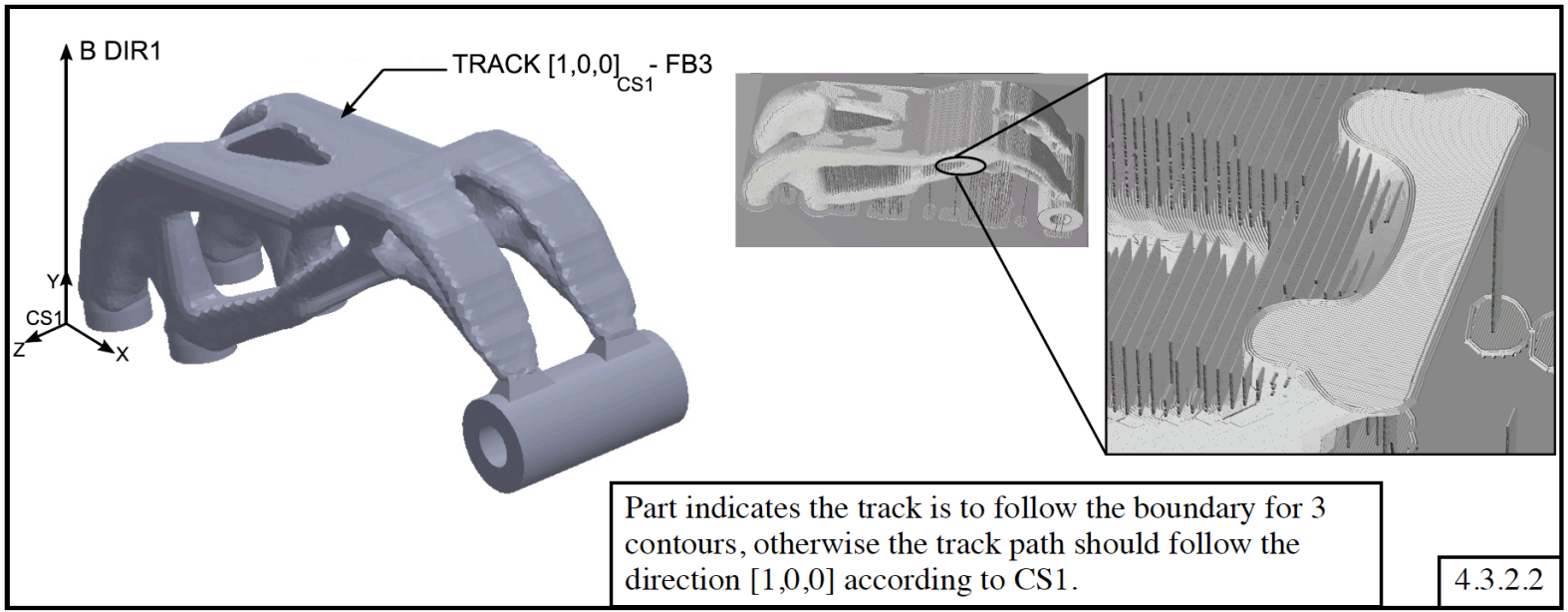
4.3.1 Part Location and Orientation



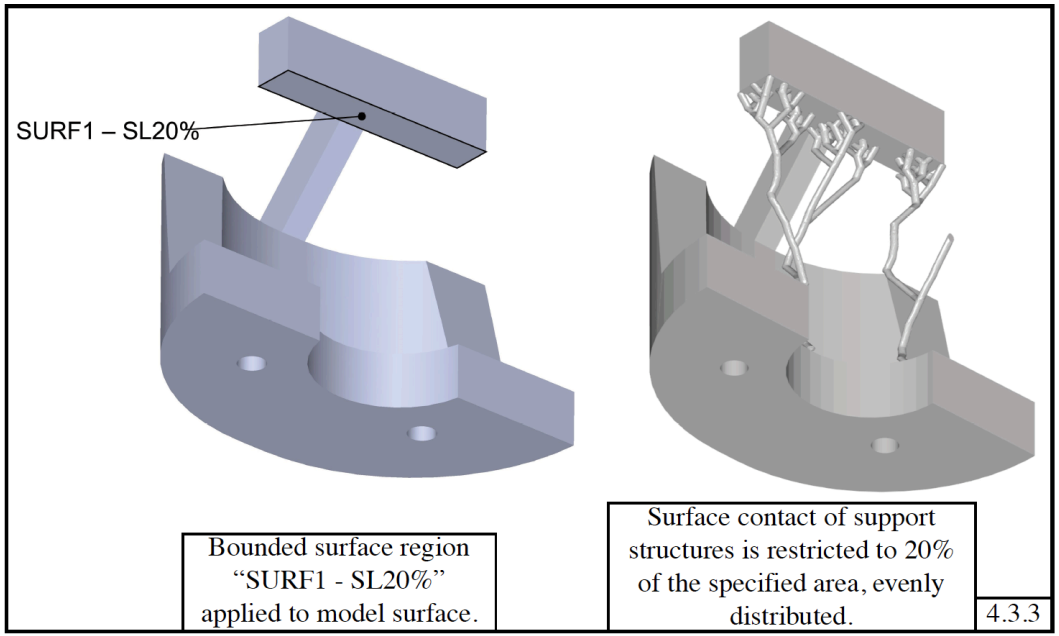


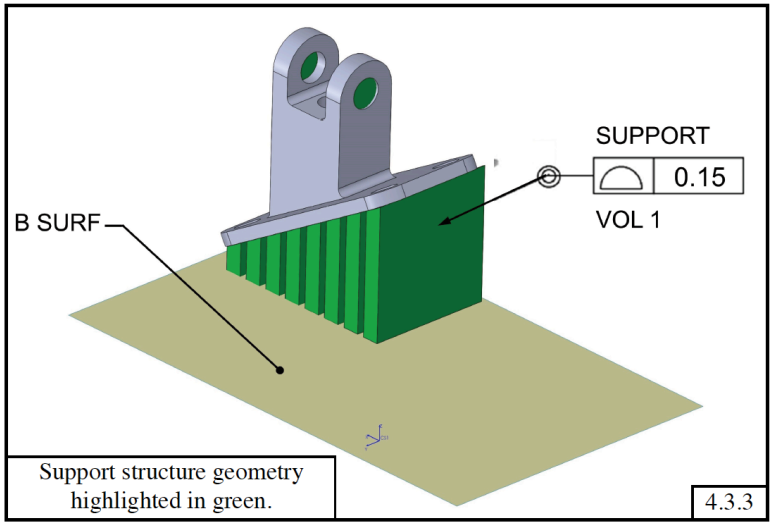
4.3 Process-Related Characteristics

4.3.2 Build Specification



4.3.3 Support Structures





5.0 Product Data Packages

Table 5-1 Required and Optional Data Packages for AM Products

PDP Type	Required/ Optional	Description
AM design	Required	Identifies all requirements for the end product and may also include supplemental geometry as defined in section 3 and geometry characteristics as defined in paras. 4.1 and 4.2.
AM build	Optional	Identifies all requirements for the printed file geometry and build environment. May also include support structures, supplemental geometry from section 3, geometry characteristics as defined in paras. 4.1 and 4.2, and process-related characteristics as defined in para. 4.3.
AM processed	Optional	Identifies all requirements for completing the part. May include all elements of AM build data package (DP) complemented by additional instructions (e.g., notes) on postprocessing (e.g., machining, coatings, heat treatment, inserts) operations.
AM end product	Optional	Includes evidence of conformance to specification. Refer to Nonmandatory Appendix C for suggestions on collecting data representing the end product.
AM postproduction	Optional	Archive of all data used in the production of the part. May be a combination of some or all of the data packages produced.

Submitting Comments and Proposing Revisions. Comments and proposals for revision should be directed to the Secretary, Y14.46 Subcommittee using the following form: http://go.asme.org/Y14CommentForm. Any proposals for revision should be as specific as possible, citing the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation.

The comment form contains instructions on how to submit comments.

Please Provide Feedback!

http://go.asme.org/Y14CommentForm

ASME Standards Committee Y14
Engineering Drawing and Related Documentation Practices

Y14.46 Product Definition for Additive Manufacturing
REVIEW/COMMENTS

Please return this form only if you wish to comment.

Do not modify the template. Sections of the template will expand as you enter text or graphics. Comments submitted become the property of ASME. Do not submit material that you want to retain copyright or ownership.

While all submissions are appreciated and will be reviewed, please recognize that not all proposals and comments can be considered at the next release, and may be addressed in future revisions.

**Required entry*

DATE COMMENT SUBMITTED*: <DATE>____LAST DATE COMMENTS ACCEPTED: 1 April 2018

Comment No*: <LASTNAME>-0#

Comment Type*: Clarification Request ☐ Essential ☐ Suggested ☐ New Content ☐

Page*:	**Para*:**	**Table*:**	**Figure*:**

Comment*:

Recommended Change* or New Content*: (~~strike through~~ - existing text to be DELETED & underline - text to be INSERTED, attach supporting documentation as needed)

***Technical Justification*:** (REQUIRED for all ESSENTIAL comments)

Print Name*:
Email address*:
Telephone *:

Do Not Write Below This Line

Ref No: ***ACTION TAKEN BY COMMITTEE***

☐ **Accepted**	☐ **Accepted in Principle**	☐ **Overcome by Events**	☐ **Declined** (Non-Germain, Non-Persuasive)	☐ **Deferred** Follow-up Date _____

Committee Response:

Contact and More Info…

- Jennifer Herron (Chair)

  jennifer@action-engineering.com
- Gaurav Ameta

  gaurav.ameta@nist.gov
- Remi Remington (ASME Staff Rep)

  richmondrs@asme.org

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