SAND2017-3878PE

Use of a Support Model (i.e. 9925016) for Acceptance

E. A. "Tony" Bryce (SNL/NM)

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Question?

- How many of you are familiar with or have perhaps heard of the document titled “Identification, Support Model (SH) 3D CAD Part”?
- Purpose of this presentation is to provide possible impact scenario's this document may have on acceptance practices?

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R. DeVilbiss 832 KC
G. Whited 833 KC
T. Henderson 2981 SA
T. Christie 2982 SA
D. Vortolomei 2982 SA
C. Wong 8233 SL
R. Van Cleave 8234 SL

(U) IDENTIFICATION, SUPPORT MODEL (SH), 3D CAD PART

CHANGE HISTORY

CONTROL NUMBER	ISSUE	RELEASE/CHANGE NO.	DATE
9925016-00	A	AER 20133089SA	10/11/13
9925016-01	B	FCO 20133560SA	5/30/14
9925016-01		IER 20141720SA	5/30/14
9925016-02	C	FCO 20143858SA	10/20/14
9925016-03	D	FCO 20162451SA	10/11/16

Callout for part defining drawings and support model:

SUPPORT MODEL REPRESENTS (1) GEOMETRY PER 9925016.

(1) Insert "NOMINAL" or "MEAN" to represent the support model's state of geometry.

Note: The nominal support model is considered the primary support model for 9925016. Refer to Section 3.3 for additional information.

Support Model (SH) 3D CAD Part

1.2 Purpose

The purpose of this
- configuration ma
three dimensior
- authorize the ST
- identify and callc

1.3.14 STEP D

A STEP file is a **STan**
CAD file. Acceptable

AP 203 – Configuration Controlled 3D Design of Mechanical Parts and Assemblies

Final Acceptance Based on Drawing

3.6 Support Model Authorization and Release at Issue A

Specific use(s) of a Support Model identified in product definition is at the discretion of the PRT or design owner and shall be captured by the Engineering Authorization (AER or CER) released to IMS. A DER may be used to release a development Support Model. Support Models may be used, for example, in manufacturing, inspection, or analysis processes.

The Support Model and associated graphic drawing issues (AY or IPL) shall be in accordance with T039. Refer to Section 6.1 for additional information.

Final acceptance of product is based on the drawing. However, this does not preclude the use of Support Models in conjunction with the drawing in situations where it provides clarity or other advantage during the final acceptance process. In cases regarding interpretation of the intent of the Support Model versus the intent of the drawing, it is the responsibility of the Support Model user to contact the design owner of the 3D CAD supported product drawing for resolution.

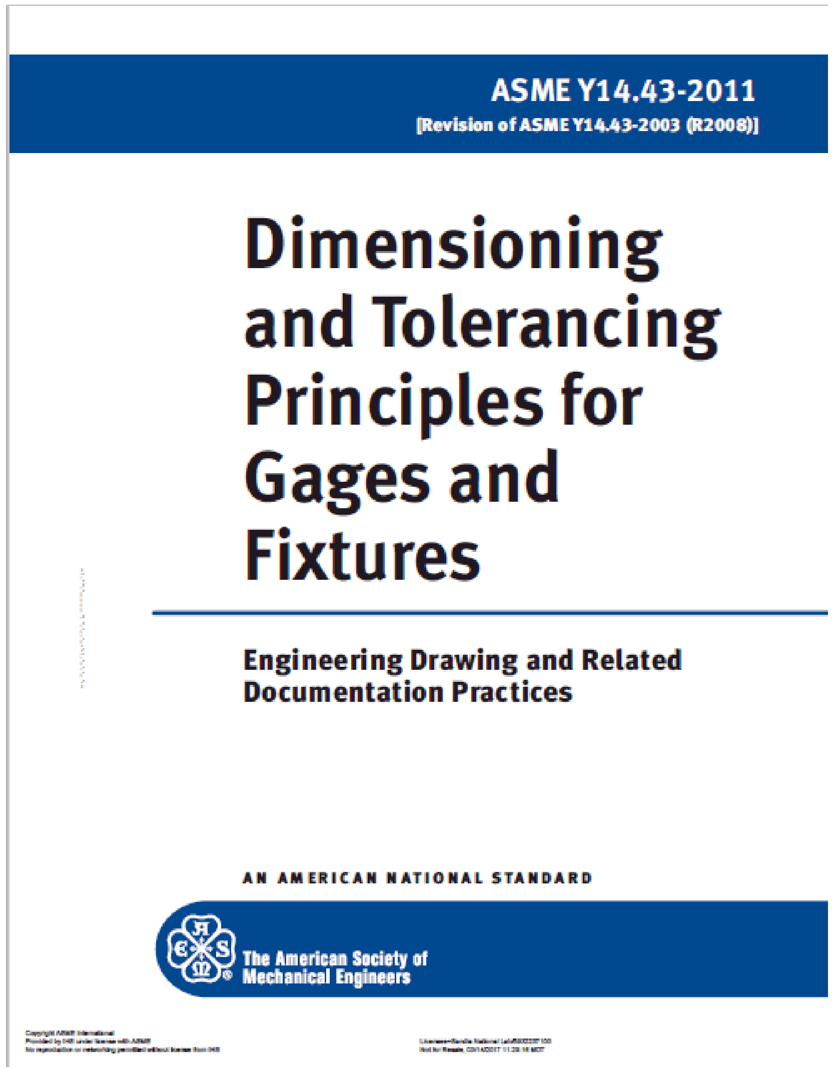
Support Model Callout in Product Definition

NOTES:
1. SUPPORT MODEL REPRESENTS NOMINAL GEOMETRY PER 9925016.

IPL callout:

AR	SH5A6789-000	SUPPORT MODEL, WIDGET	1		
ARS	1234567-00	BULK MATERIAL			
NA	9925016	IDENTIFICATION, SUPPORT MODEL, 3D CAD PART			
NA	9919100	MARKING, GENERAL METHODS			
NA	9900000	GENERAL REQUIREMENTS			
NO REQD	PART / CONTROL NUMBER	DESCRIPTION / MATERIAL	NOTE	SHEET ZONE	ITEM

What does this mean for product acceptance?


ASME Y14.43-2011
[Revision of ASME Y14.43-2003 (R2008)]

Dimensioning and Tolerancing Principles for Gages and Fixtures

Engineering Drawing and Related Documentation Practices

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4.12 Economics

When a GO or functional gage is not economically feasible, suitable simulations may be constructed using other inspection tools. For example, a computer-controlled coordinate measurement machine may be used to acquire a digital data set. The points may then be used to model actual values and compare these with a worst-case computer design model of the feature under test to determine violations of the boundaries normally inspected with a hard (physical) GO or functional gage. These computer-generated GO and functional gages simulate the function of hard gages. The simulated soft gage will verify or reject only the points probed, which are not necessarily representative of all points on the workpiece being gaged. Also, it is recommended for features being gaged for interrelationships to datums that these workpieces be fixtured whenever possible to give a better simulation of the high-point planes and axes than may be possible through the use of probes directly on the datum features. Fixtures shall be produced at a sufficient level of accuracy to ensure acceptable uncertainty.

Soft Gaging

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B-2 SOFT GAGING

Soft gaging is the term used when a set of coordinate measurement data, such as data generated by a coordinate measuring machine (CMM), is compared with a design model for purposes of part acceptance/rejection. In general terms, the soft gaging process works as follows:

Step 1: A part's nominal geometry is modeled with CAD software.

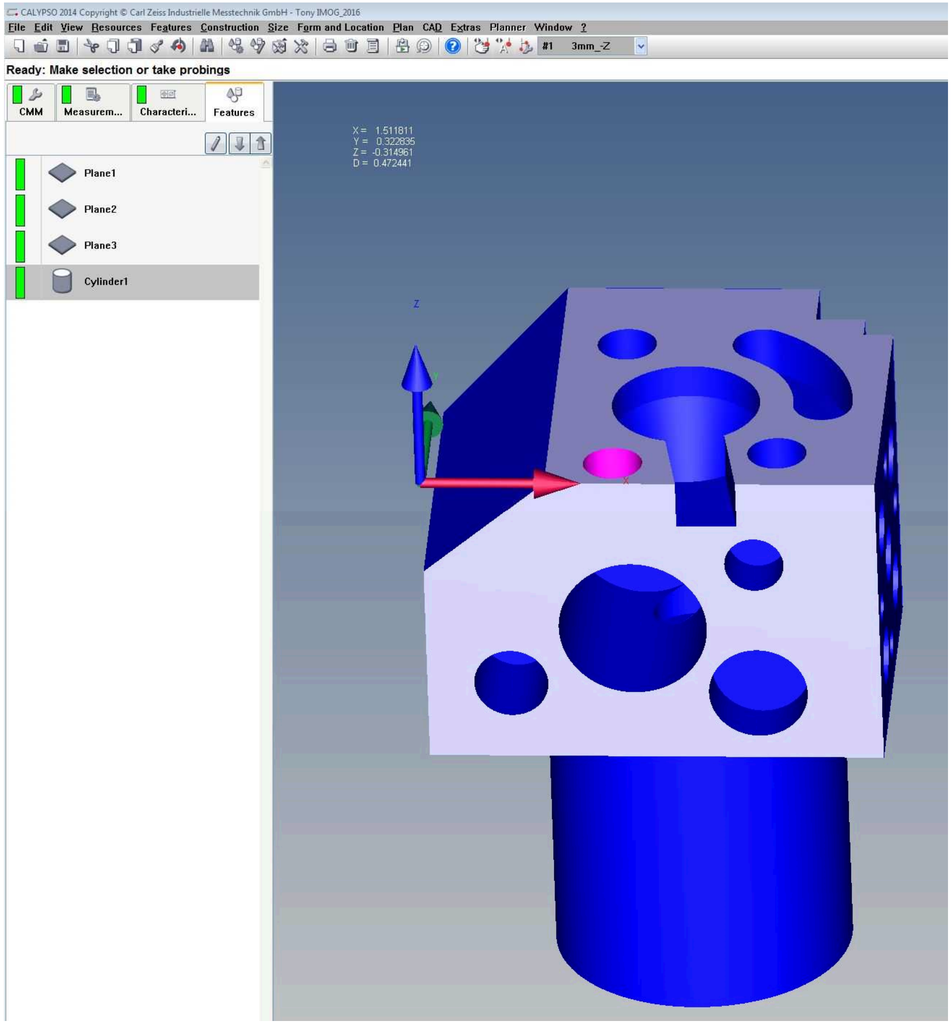
Step 2: The design model is imported into the soft gaging software where tolerance attributes are attached to part features. (Some CAD systems perform this step internally.)

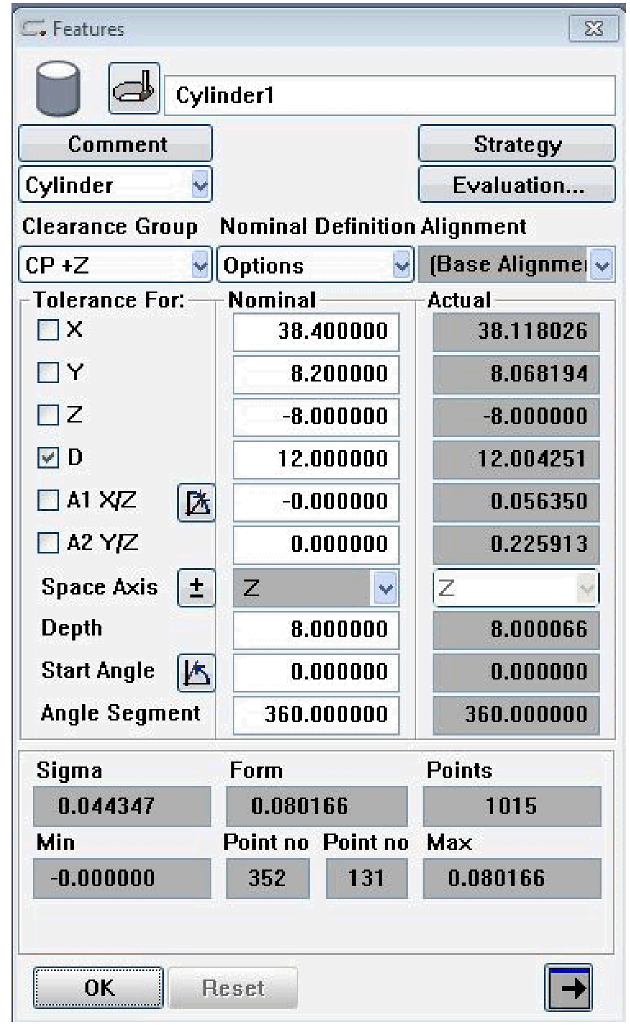
Step 3: The soft gaging software is used to generate a worst-case model based on the nominal CAD geometry varying by the amount allowed by the tolerances. This worst-case model is called a soft gage.

Step 4: A part is measured on a CMM, generating a cloud of coordinate data points.

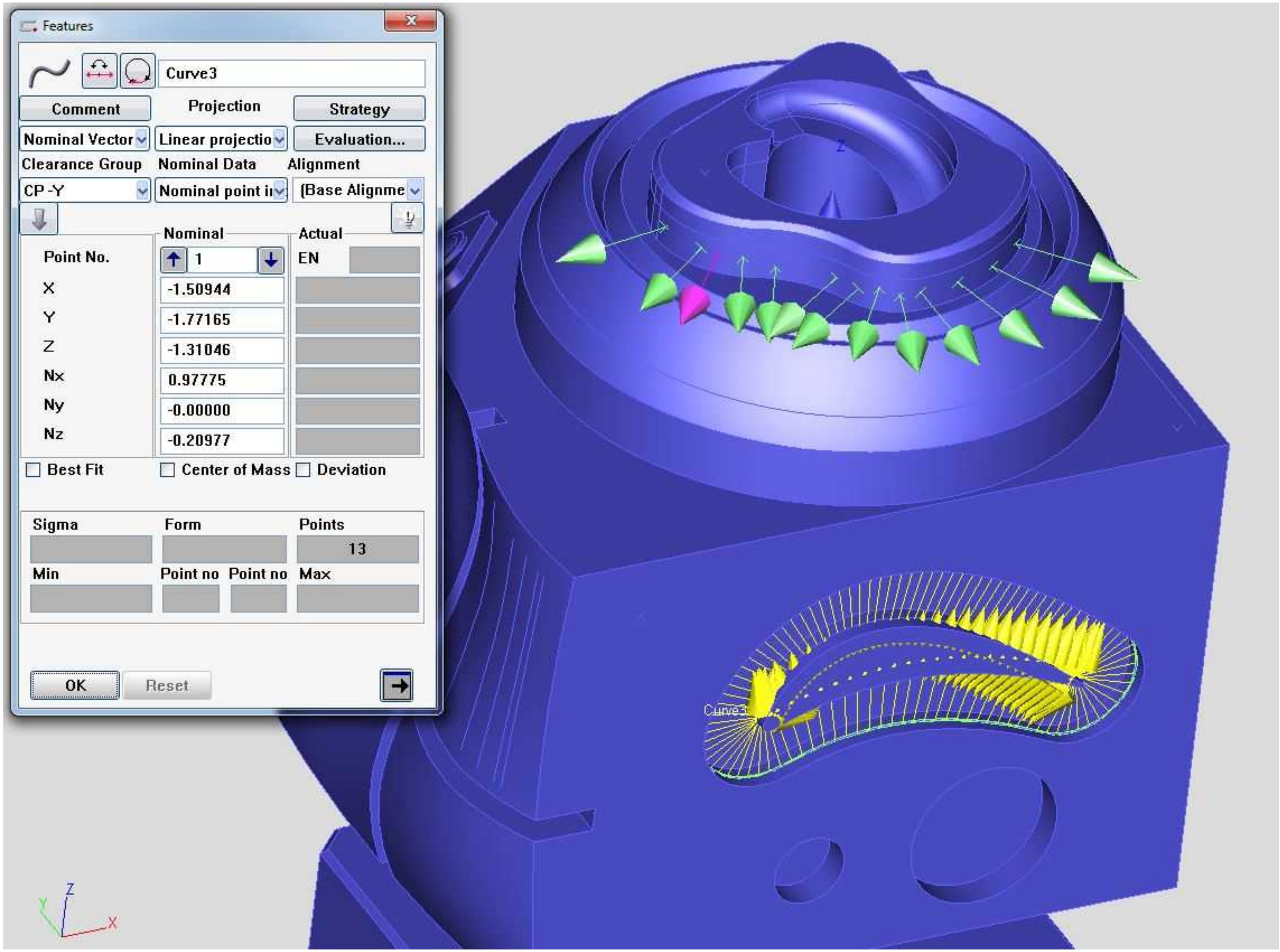
Step 5: The soft gaging software compares this cloud of points (or sometimes a reverse-engineered design model based on it) with the soft gage model and displays out-of-tolerance conditions.

Example - Zeiss Calypso

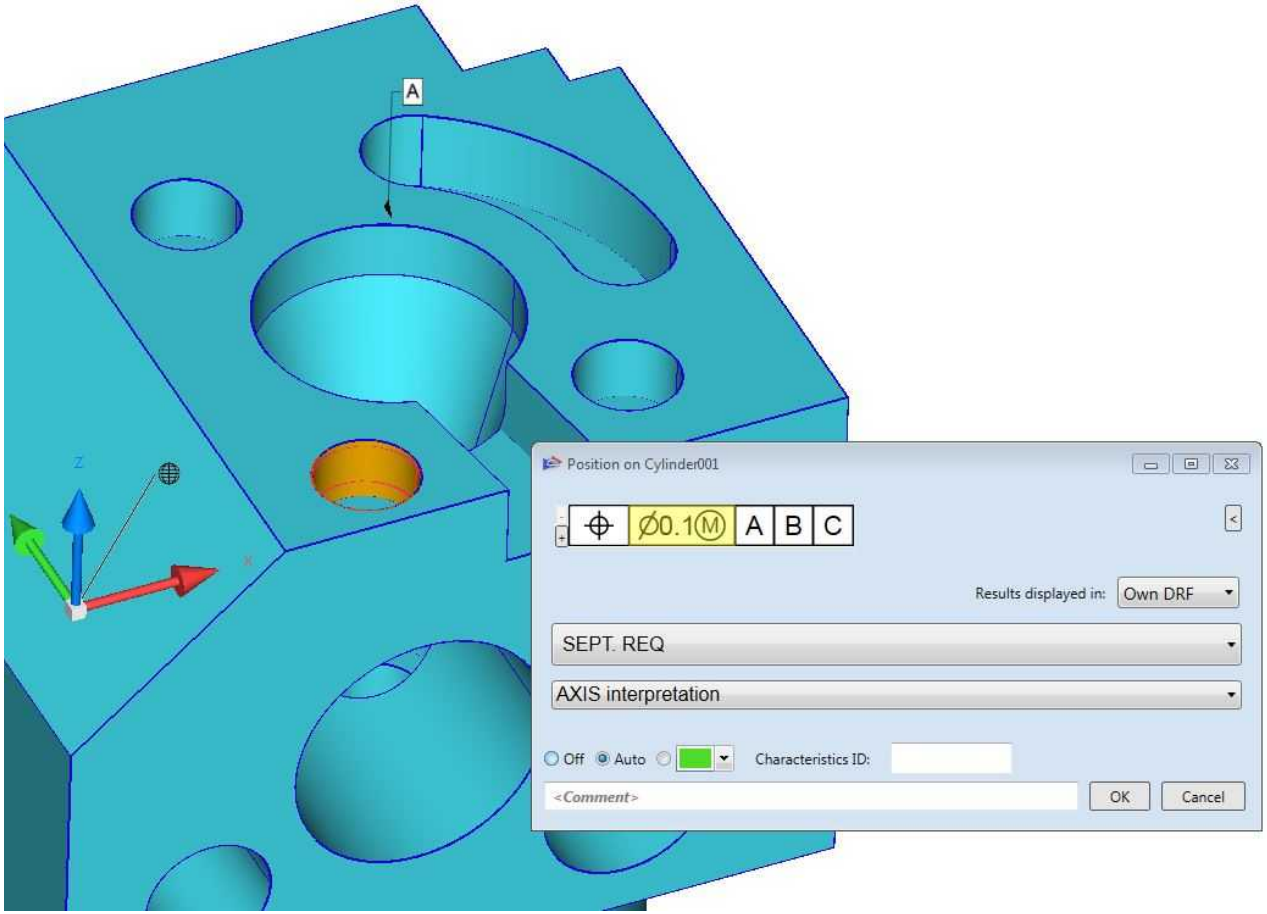




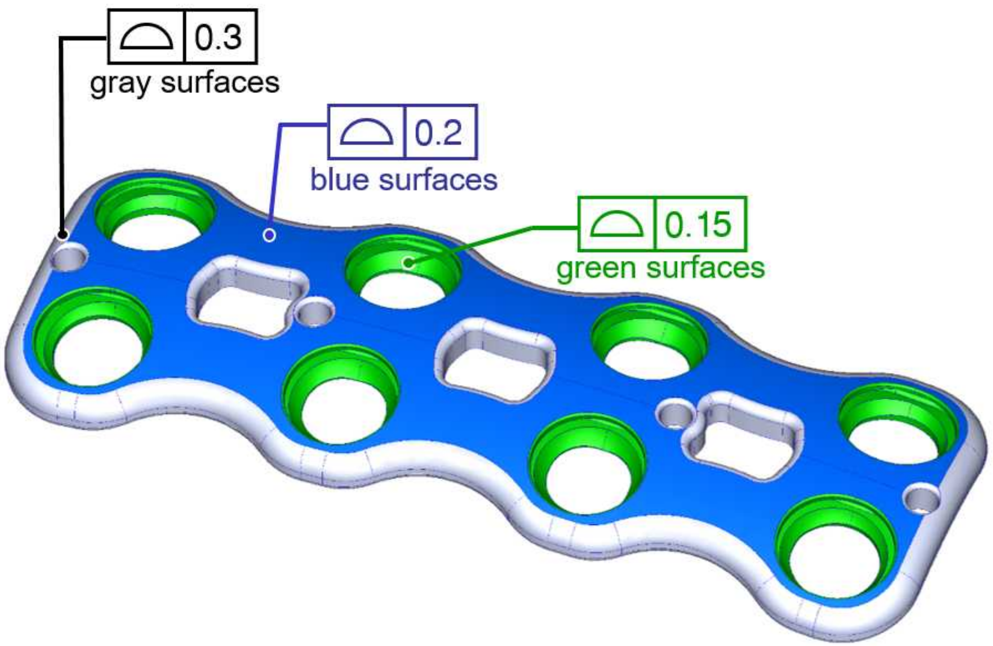
Example - Zeiss Calypso



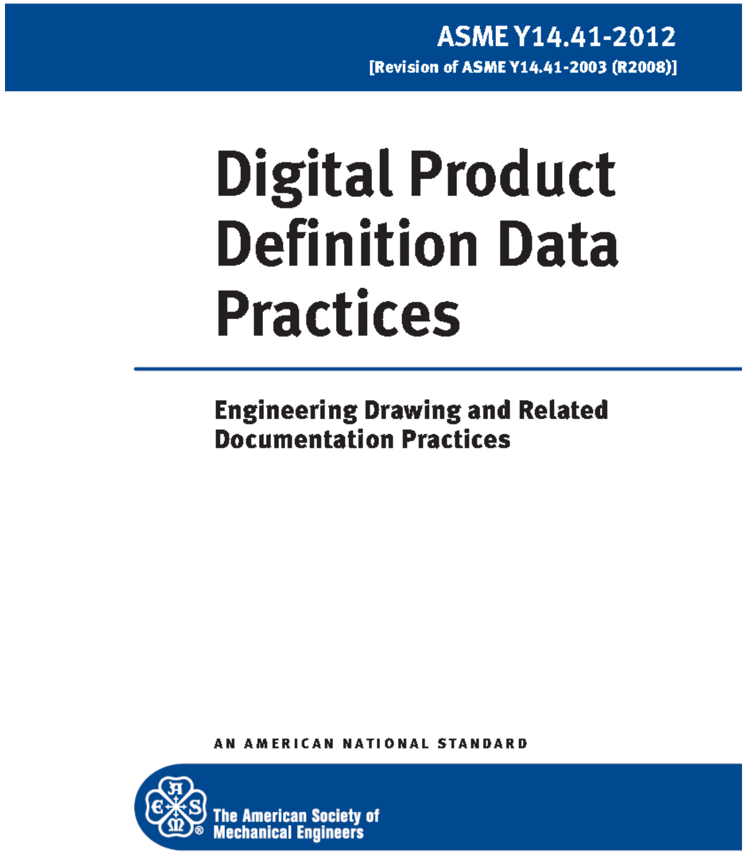
Example - Smart Profile



3D Profile Definition using ASME Y14.41



Drawing Note: Unless Otherwise Specified All Dimensions Are Basic and Controlled By The CAD Model and Controlled Simultaneously


ASME Y14.41-2012
[Revision of ASME Y14.41-2003 (R2008)]

Digital Product Definition Data Practices

Engineering Drawing and Related Documentation Practices

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The above engineering drawing example depicts profile tolerancing of all 3D surfaces being fully defined with three explicit profile of a surface callouts per the ASME Y14.41-2012 Standard.

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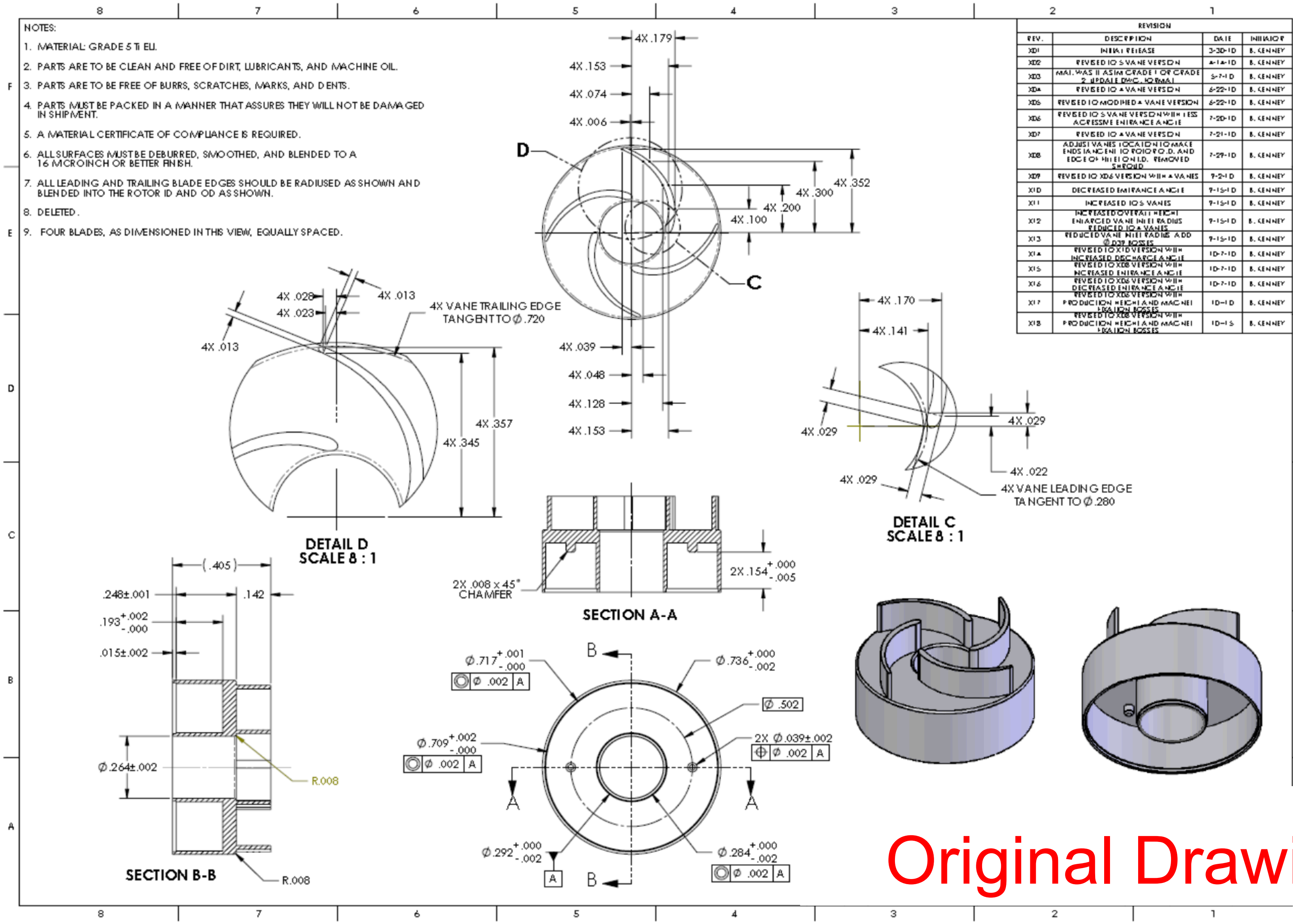

Original Drawing

3D Model Based Drawing

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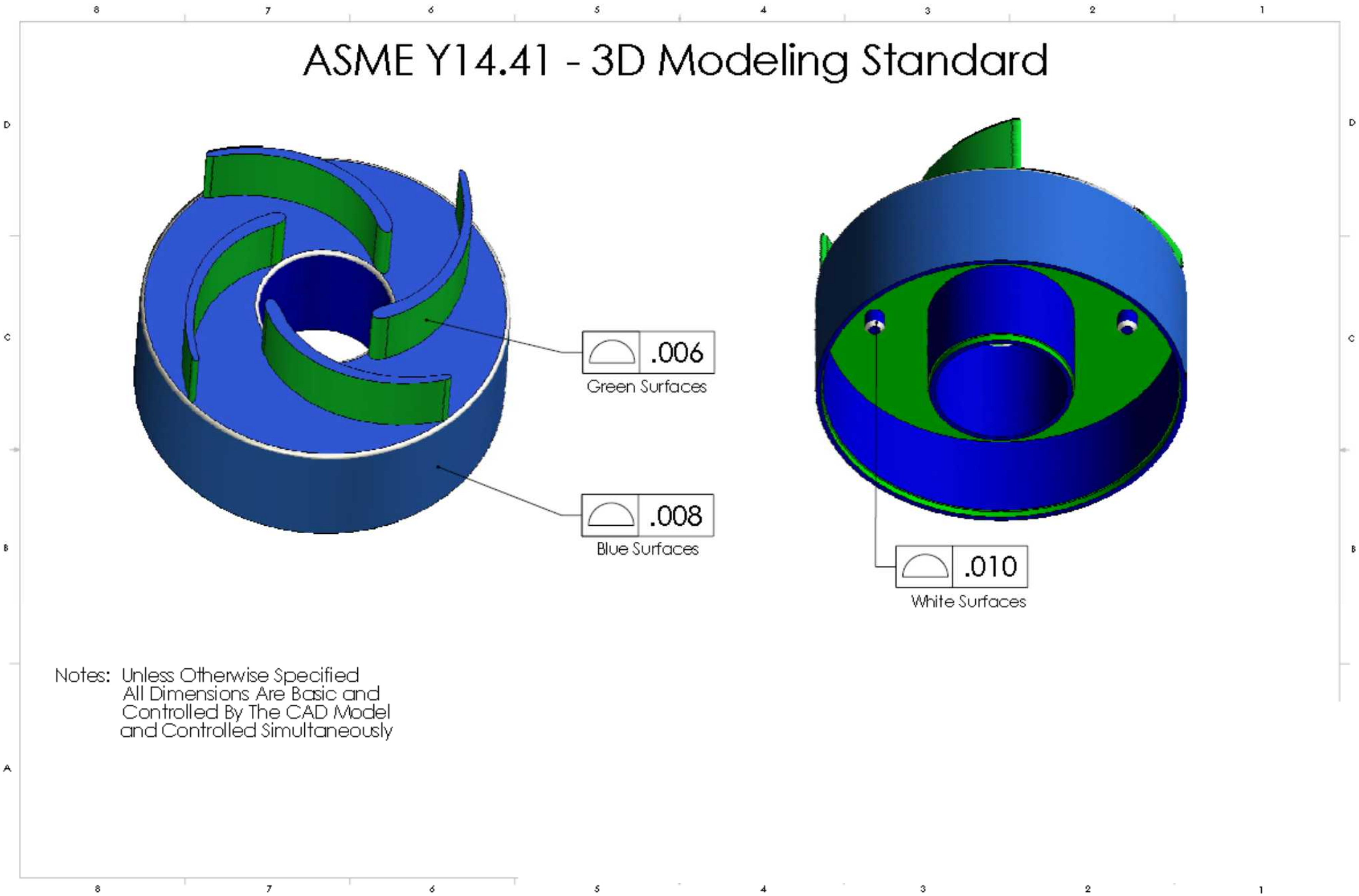
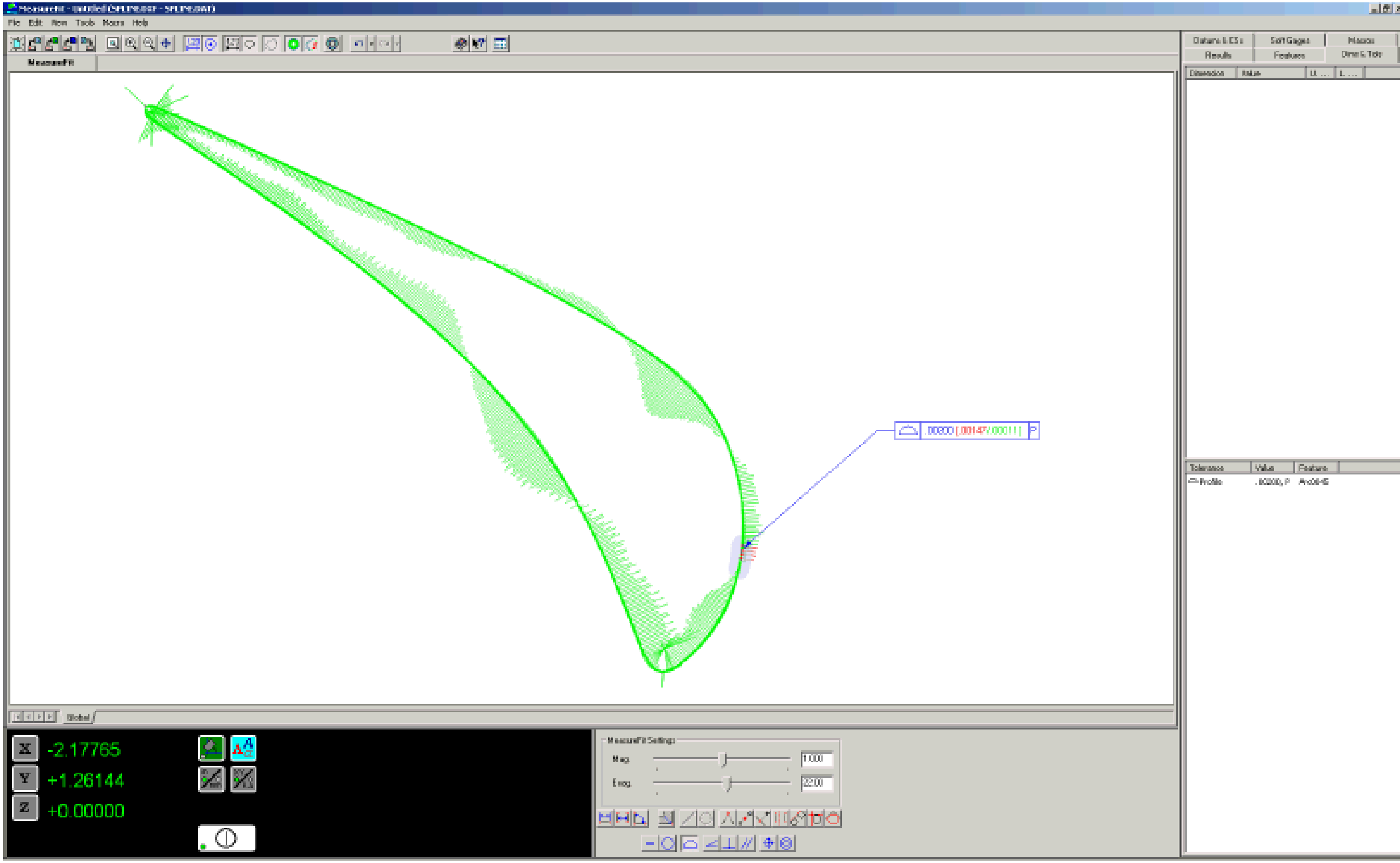


Example – OGP MeasureFit



Example – QVI/CCP Comparators

Questions?

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SETTING THE STANDARD

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March 15, 2017

Mr. E.A. "Tony" Bryce
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Dear Mr. Bryce:

In response to your e-mail dated March 14, 2017, ASME grants you permission to use excerpts from the standard listed below:

ASME Y14.43-2011
Cover Page
Section 4.12 – 4.12.2
Section B-2
Figure B-2

as requested to be used in a presentation titled "Use Support Models in Acceptance" at National Nuclear Security Administration (NNSA) Lawrence Livermore Laboratory (LLNL) site on April 18-19, 2017. As is customary, we ask that the source document and ASME be fully acknowledged. **"Reprinted from ASME Y14.43-2011, by permission of The American Society of Mechanical Engineers. All rights reserved". No further copies can be made without written permission. This permission is for this edition only.** If you have any questions do not hesitate to contact me.

Sincerely,

Ivette Estevez
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