ASME Y14.5M-**1994** ASME Y14.5-**2009**

Welcome!

Changes to the ASME Dimensioning and Tolerancing Standard, *A Summary*

By:
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ASME GD&T Professional - Technologist & Senior Level

Productivity Quality, Inc.

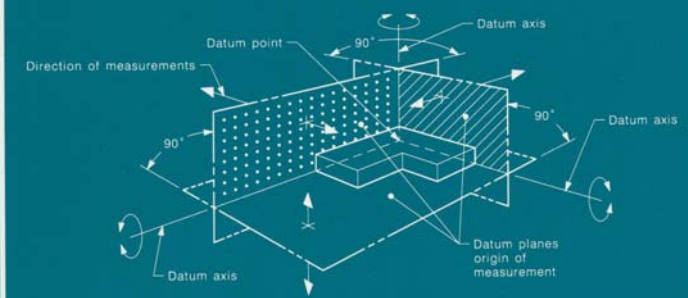
ADVANCED INSPECTION SERVICES

ASME Y14.5M-**1994**

ENGINEERING DRAWING AND
RELATED DOCUMENTATION PRACTICES

ASME Y14.5M-1994
[REVISION OF ANSI Y14.5M-1982 (R1988)]

Dimensioning and Tolerancing



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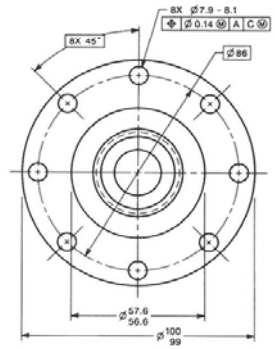
ASME Y14.5-**2009**

ASME Y14.5-2009
[Revision of ASME Y14.5M-1994 (R2004)]

Dimensioning and Tolerancing

Engineering Drawing and Related Documentation Practices



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ASME Y14.5-2009
[Revision of ASME Y14.5M-1994 (R2004)]

The Highlights

- Structural Changes (Formatting)
- New Symbology
- Terminology / Definition Changes
- Non-Uniform Zone Profile
- Custom Datum Reference Frames

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Structural Changes

1994

Section 1 – Scope and Definitions

Section 2 – General Tolerancing

Section 3 – Symbology

Section 4 – Datum Referencing

Section 5 – Tolerances of Location

Section 6 – Tolerances of Form, Profile, Orientation, & Runout

2009

Section 1 – Scope and Definitions

Section 2 – General Tolerancing

Section 3 – Symbology

Section 4 – Datum Reference Frames

Section 5 – Tolerances of Form

Section 6 – Tolerances of Orientation

Section 7 – Tolerances of Location

Section 8 – Tolerances of Profile

Section 9 – Tolerances of Runout

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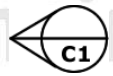
[Revision of ASME Y14.5M-1994 (R2004)]

New Symbology

Movable Datum Target	
All Over	
Unequally Disposed Profile	
Translation Modifier	
Independency	
Continuous Feature	

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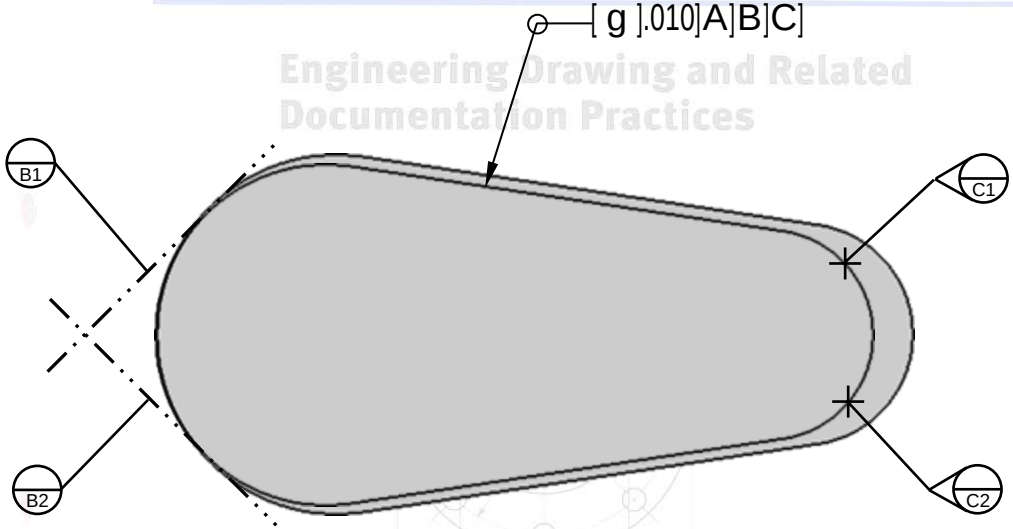
New Symbology

Movable Datum Target	C1



Datum Target are movable - moving normal to surface unless other direction is stated

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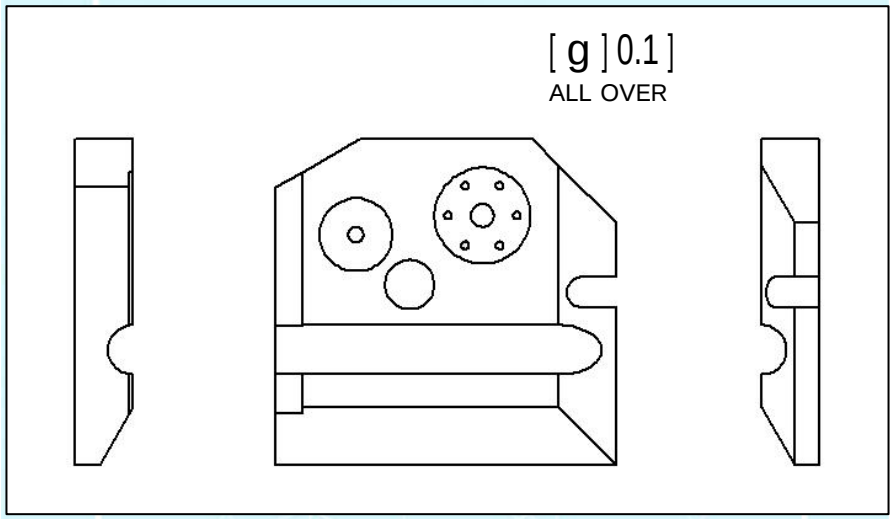
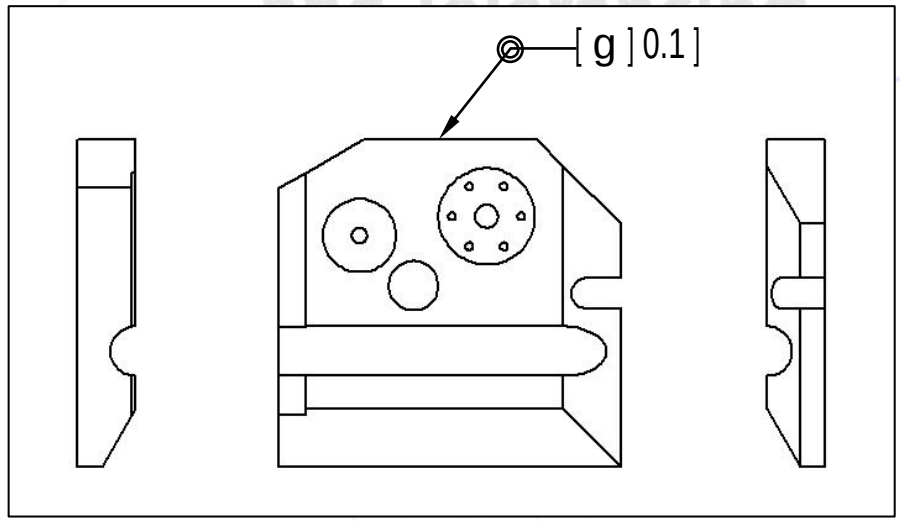
New Symbology

All Over	

1994



2009



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[Revision of ASME Y14.5M-1994 (R2004)]
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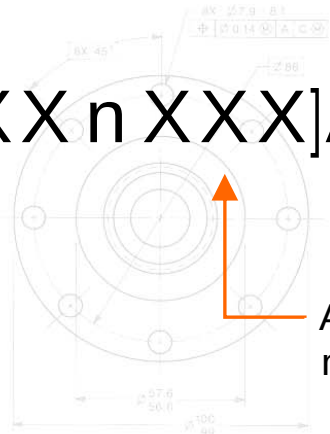
Engineering Drawing and Related Documentation Practices

New Symbology

Unequally Disposed Profile	Ⓤ

Total Profile Tolerance

[g] X X X n X X X]A]B]C]



Amount of tolerance in the “plus-material” direction

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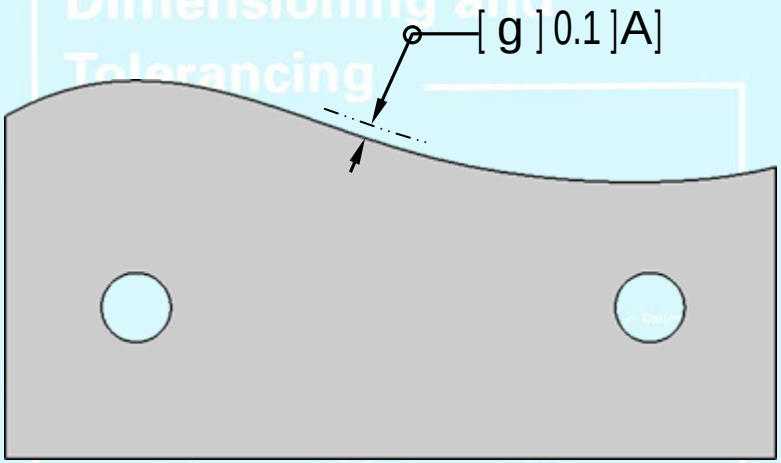
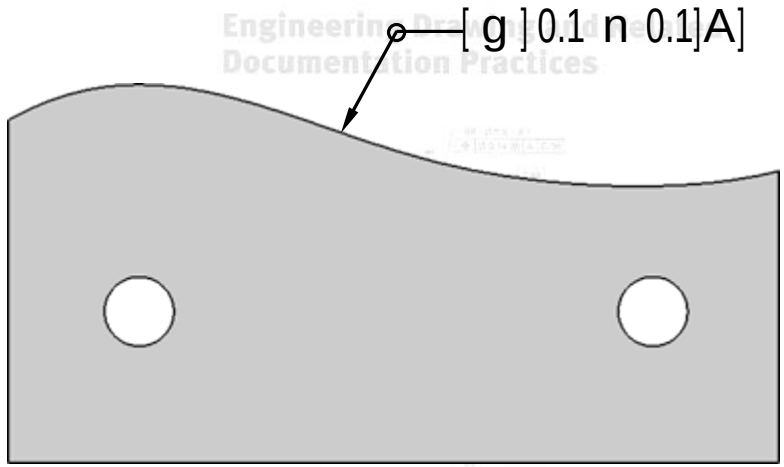
New Symbology

Unequally Disposed Profile	Ⓤ

1994



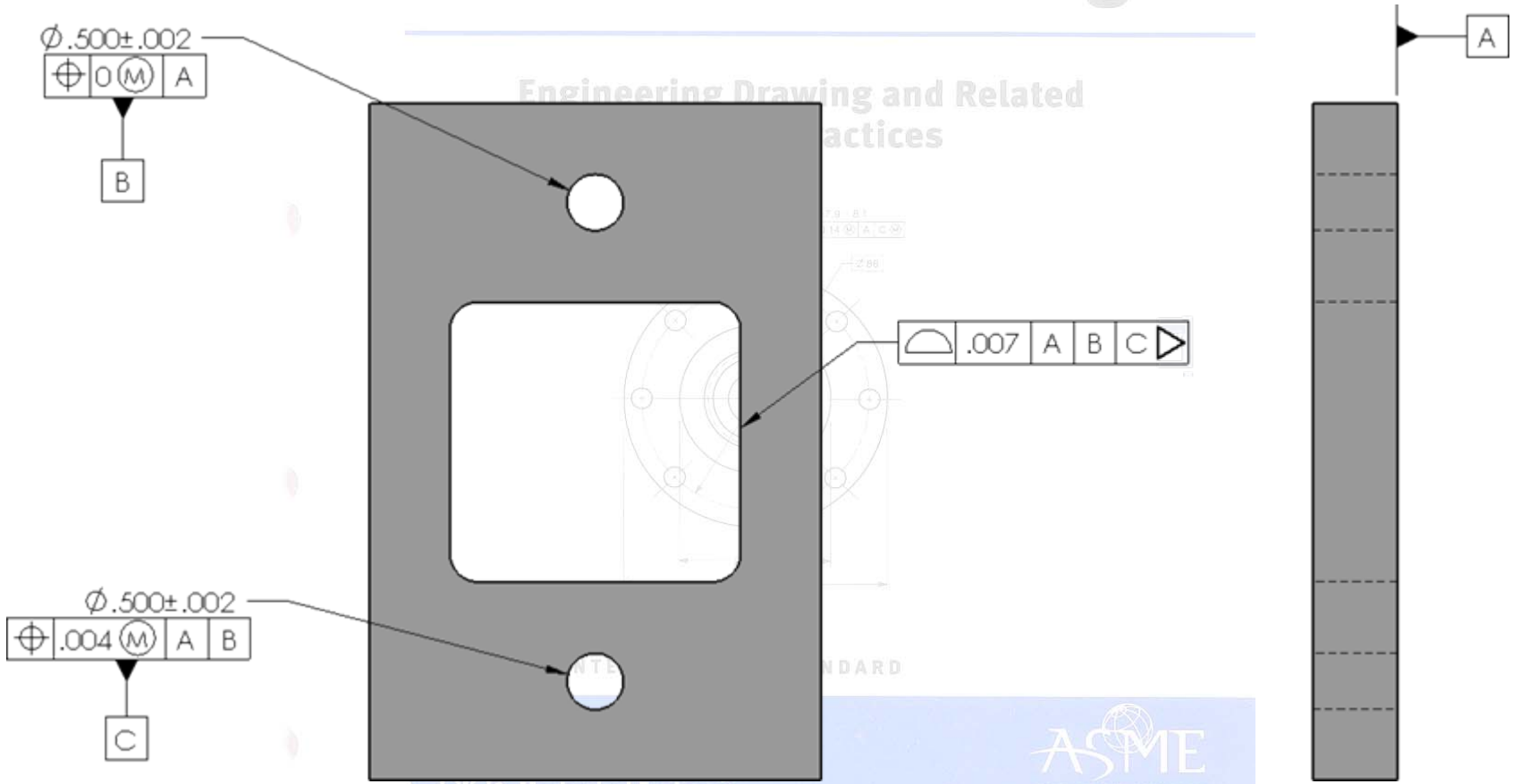
2009



"Alternate Practice"
in the 2009 standard

New Symbology

Translation Modifier	▷



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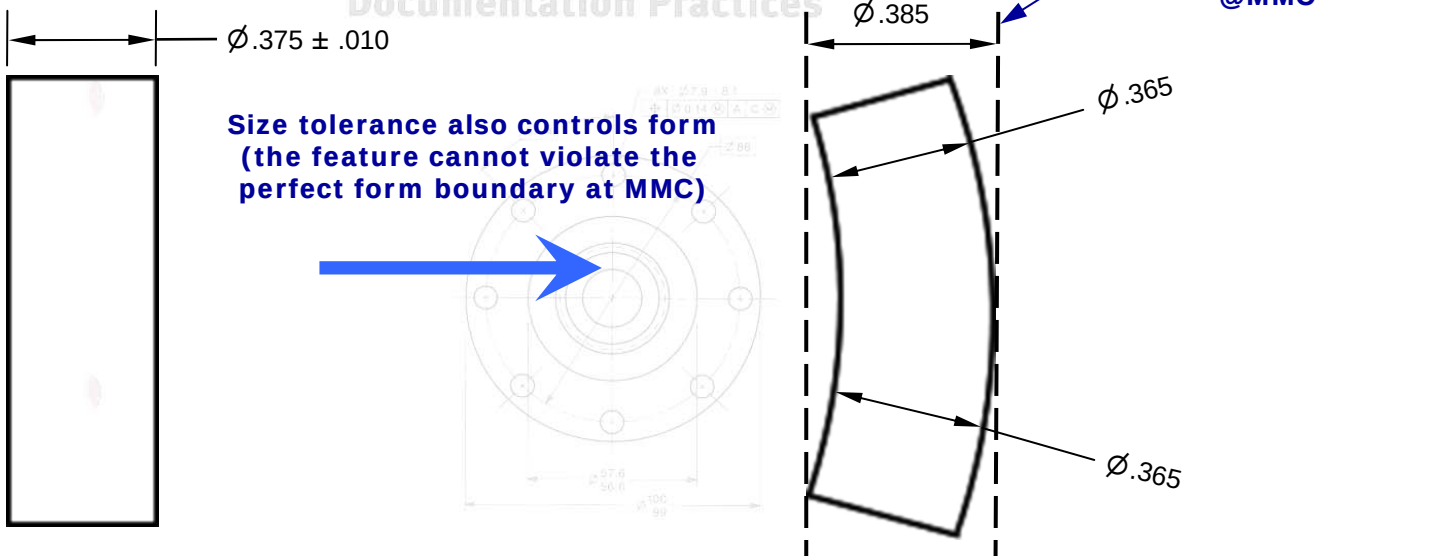
[Revision of ASME Y14.5M-1994 (R2004)]

New Symbology

Independency	Ⓘ



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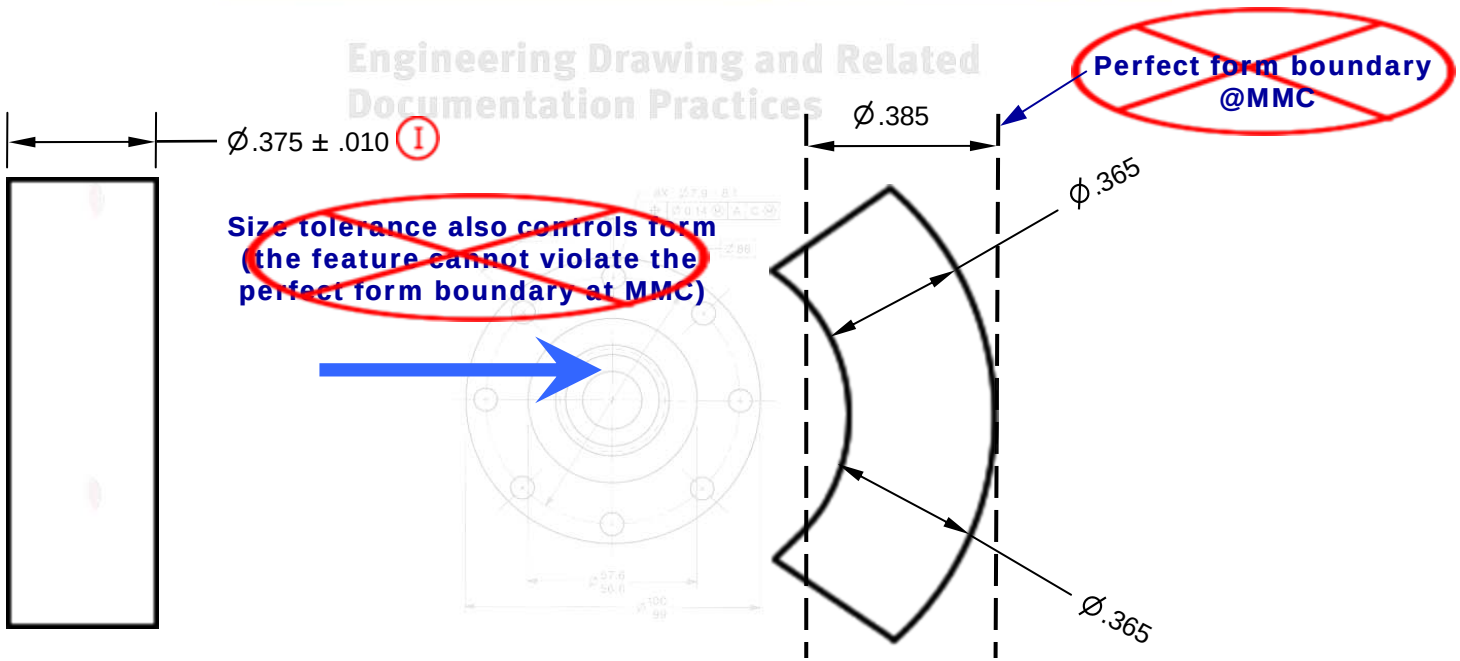
ASME Y14.5-2009
[Revision of ASME Y14.5M-1994 (R2004)]

New Symbology

Independency	Ⓘ



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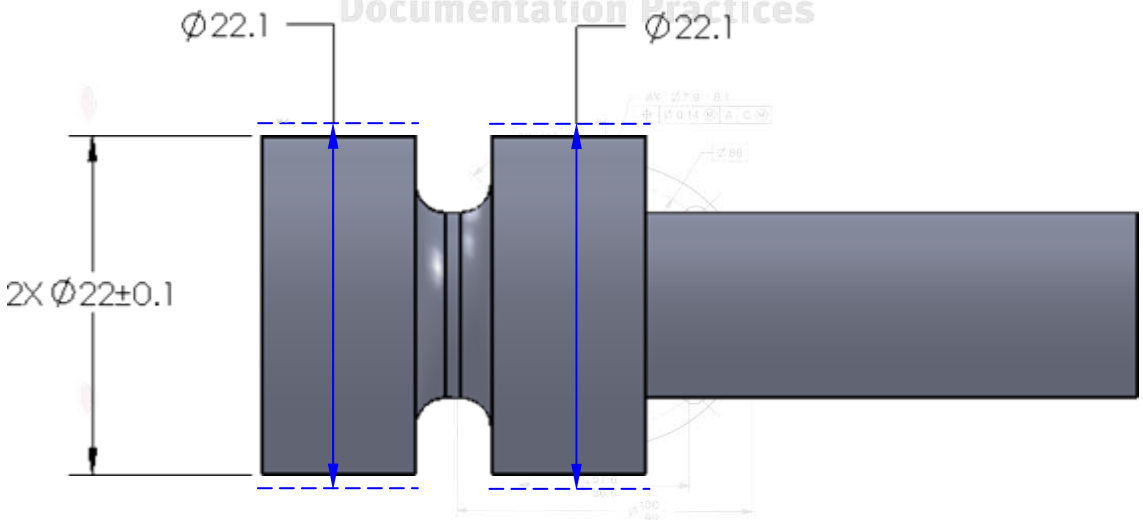
New Symbology

Continuous Feature	CF

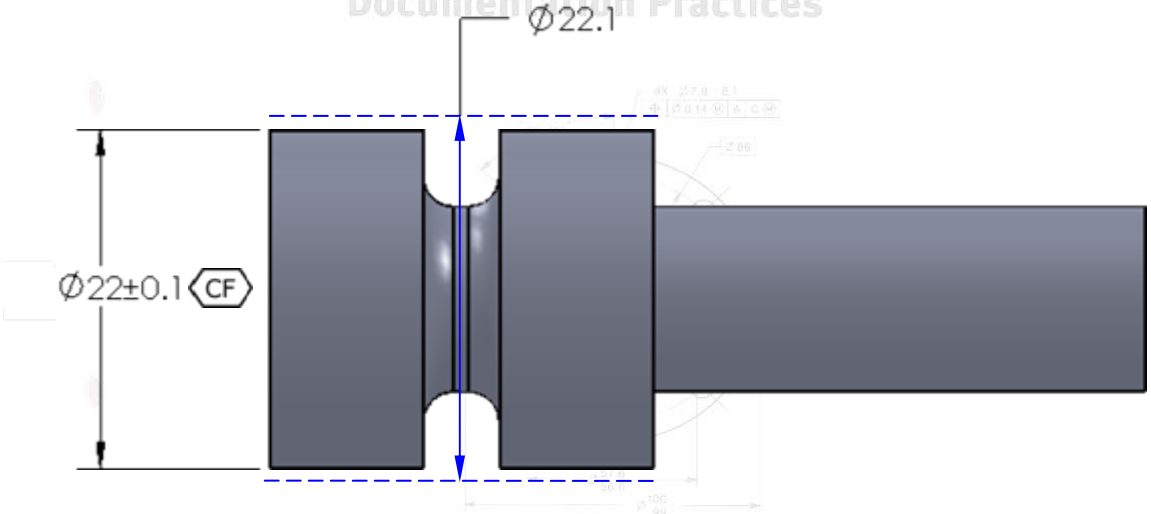
MMC Boundaries



New Symbology

Continuous Feature	CF

MMC Boundary



*The Continuous Feature symbol can only be used for a *feature of size.*

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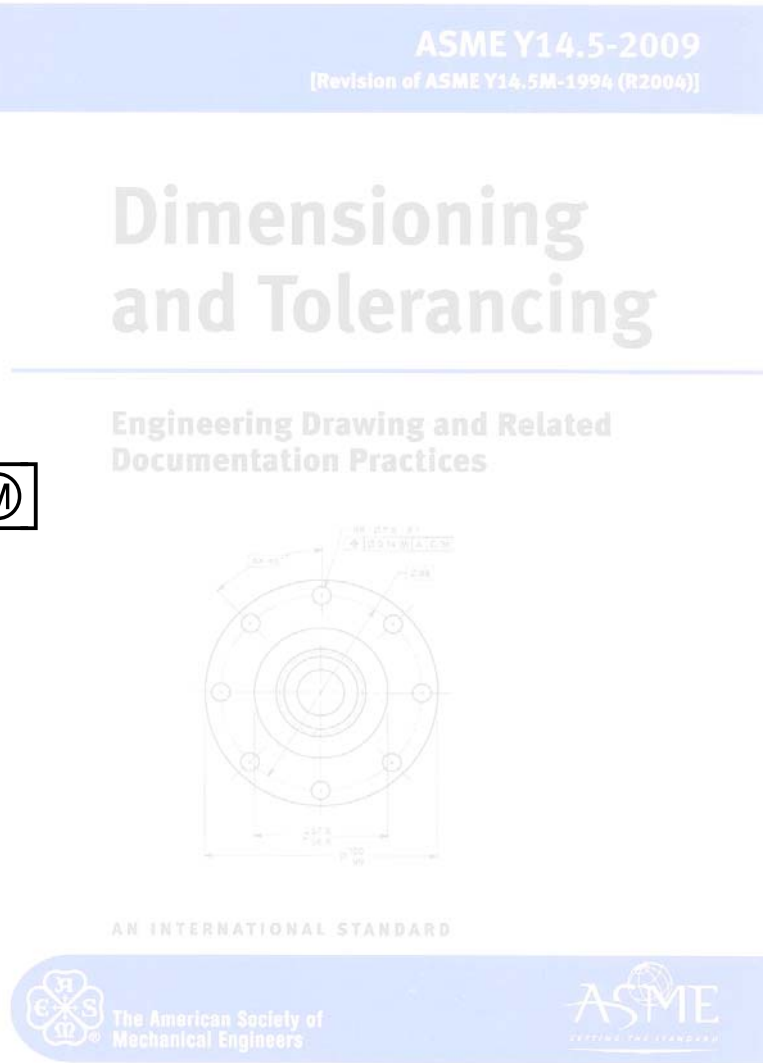
Terminology / Definition Changes

Modifiers

$\varnothing 25 \pm 0.05$

⌖	$\varnothing 0.15$Ⓜ	A	B Ⓜ



Terminology / Definition Changes

1994

Modifiers - Ⓢ Ⓜ Ⓛ

1) Ⓢ **R**egardless of **F**eature **S**ize (RFS)

- Applicable to positioned features *or datum features*
- Specifies how datum is simulated (expanding TGC)
- Default condition (Ⓢ symbol not required)

2009

Modifiers - Ⓢ Ⓜ Ⓛ

1) Ⓢ **R**egardless of **F**eature **S**ize (RFS)

- Applicable to positioned features

Ⓢ"**R**egardless of **M**aterial **B**oundary" (RMB)

- When used on a datum feature
- Specifies how datum is to be simulated (expanding TGC)
- RFS, RMB are default condition
- *symbol "Ⓢ" has been removed*

Terminology / Definition Changes

1994

Modifiers - Ⓢ Ⓜ Ⓛ

2) Ⓜ **M**aximum **M**aterial **C**ondition (MMC)

- Applicable to toleranced features *or datum features*
- Specifies how datum is to be simulated (@ it's virtual condition)

3) Ⓛ **L**east **M**aterial **C**ondition (LMC)

- Applicable to toleranced features *or datum features*
- Specifies how datum is to be simulated (@ it's virtual condition)

2009

Modifiers - Ⓢ Ⓜ Ⓛ

2) Ⓜ **M**aximum **M**aterial **C**ondition (MMC)

- Applicable to positioned features

Ⓜ"**M**aximum **M**aterial **B**oundary" (MMB)

- When used on a datum feature
- Specifies how datum is to be simulated (@ it's MMB, *not virtual condition*)

3) Ⓛ **L**east **M**aterial **C**ondition (LMC)

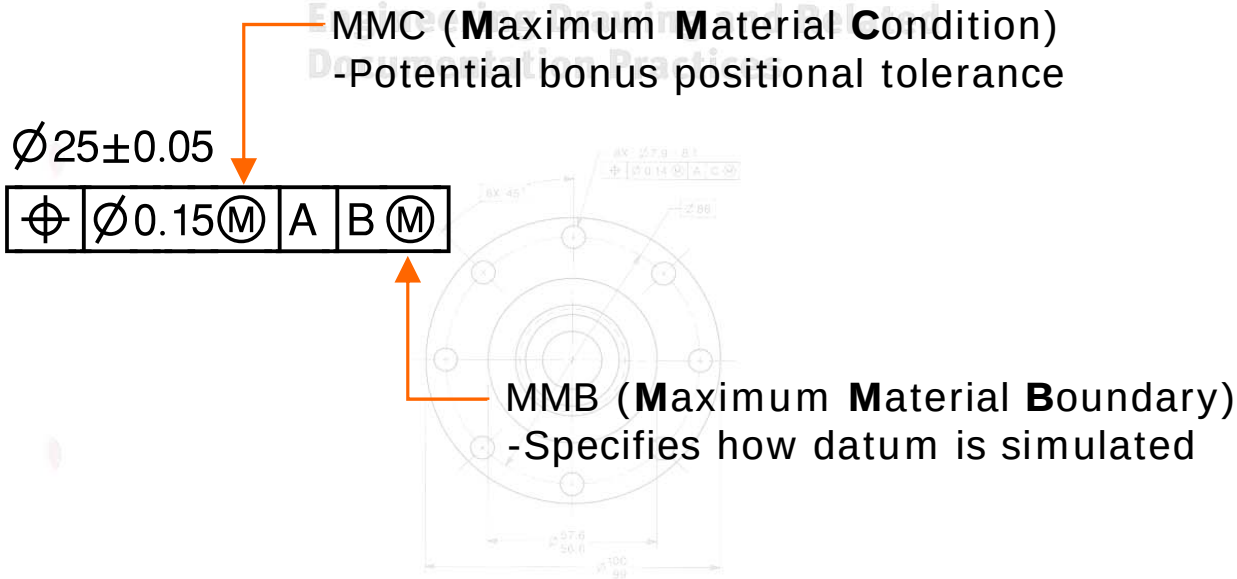
- Applicable to positioned features

Ⓛ"**L**east **M**aterial **B**oundary" (LMB)

- When used on a datum feature
- Specifies how datum is to be simulated (@ it's LMB, *not virtual condition*)

Terminology / Definition Changes

2009 Modifier Example



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Terminology / Definition Changes

1994

Resultant Condition

1) A variable boundary

Actual Mating Envelope

1) One term for a number of different possible boundaries depending on how it is used.

2009

Resultant Condition

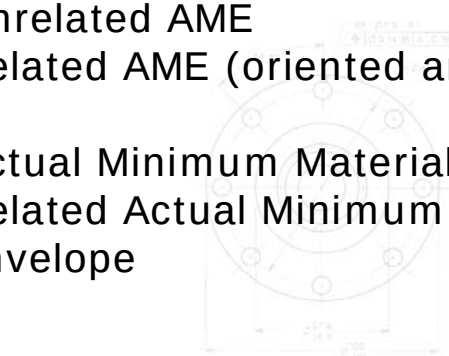
1) The single worst-case boundary (the opposite of the virtual condition boundary)

Actual Mating Envelope

1) Clarified by giving more specific AME terms for the different boundaries

   - Unrelated AME
   - Related AME (oriented and/or located)

   - Actual Minimum Material Envelope
   - Related Actual Minimum Material Envelope



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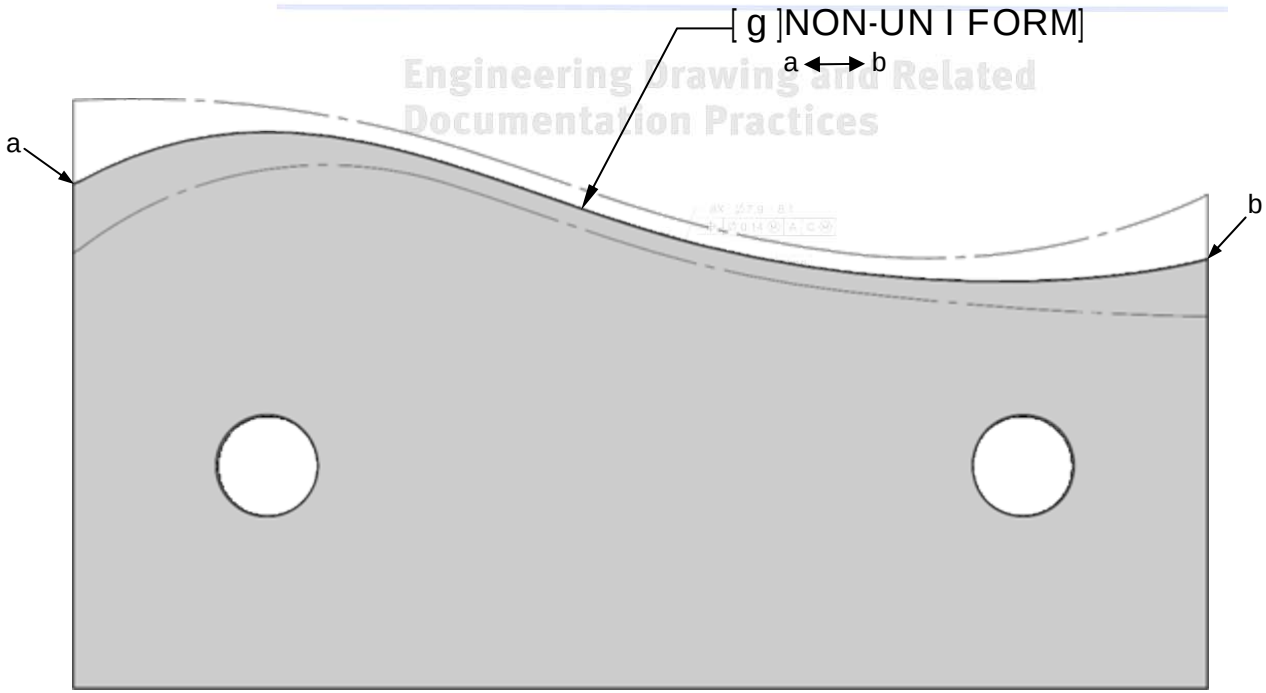
Non-Uniform Zone Profile



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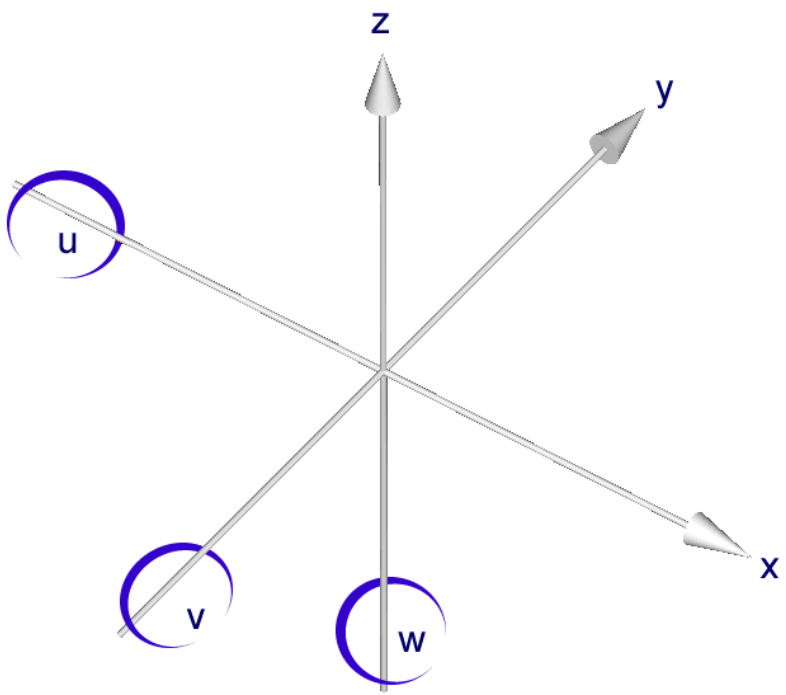
Custom Datum Reference Frames

Datums and Degrees of Freedom



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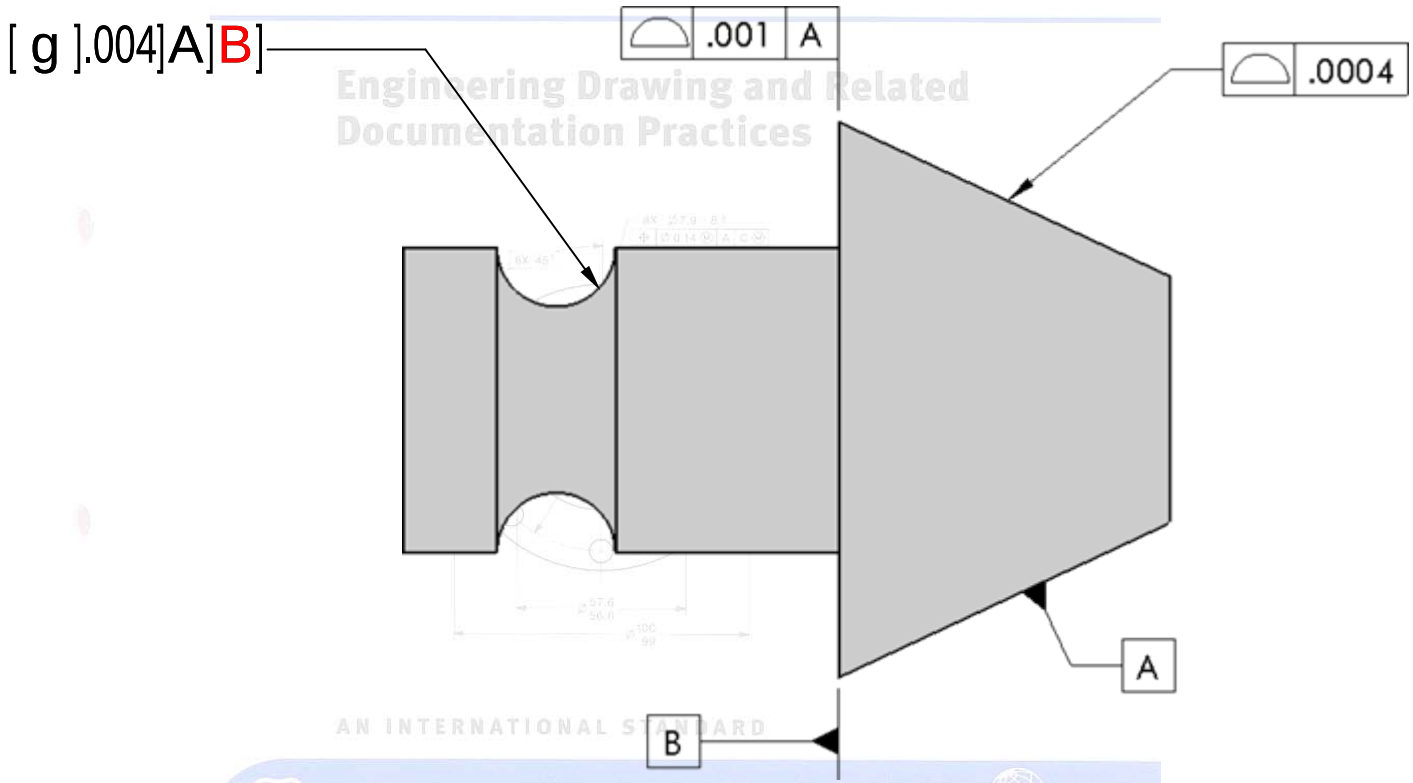
Custom Datum Reference Frames

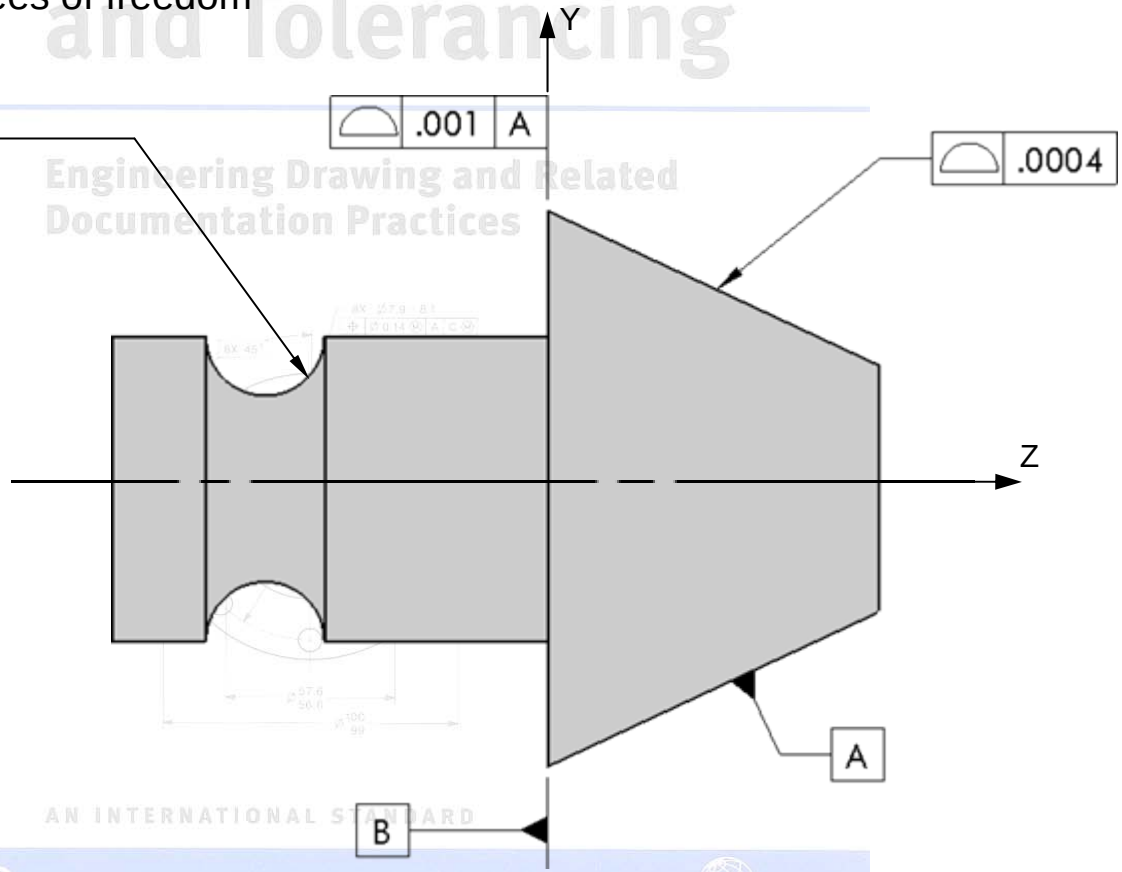


Custom Datum Reference Frames

Datum A is specified to constrain only 4 degrees of freedom

[g].004]A[x,y,u,v]B[z]]

Datum B controls the 5th degree of freedom (translation in Z)



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Looking Forward

Two critical components for *successful* implementation of the current standard for dimensioning and tolerancing -

Training

The GD&T standard is another "language"

We will not learn it correctly without adequate training

Everyone must be on the same page
-Design, Manufacturing, Quality

Needs to happen from the top-down
-Management must head the effort

Tools

It's one thing to put it on a print…

We must have software that is able to correctly evaluate complex GD&T

Measurement challenges
-Datums (MMB, LMB, simultaneity)
-Position (AME, simultaneity)
-Profile (optimal fitting, simultaneity)
-Custom Datum Reference Frames
-Non-Uniform Zone Profiles

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Thank You For Coming!

Training

Basic Blueprint Reading

GD&T - Introduction & Fundamentals

GD&T - Advanced Application

Tools

Hand Tools / Gaging

Surface Finish / Form Analysis

Contact / Vision CMM's

Inspection Software

Contract Inspection Services (AIS)

Productivity Quality, Inc.

AIS ADVANCED INSPECTION SERVICES

PQI - www.gagesite.com
AIS - www.advancedinspect.com
Training - eseminar.pqi.net

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