ENG 004 Lecture 15, Nov 15, 2012

Announcements

- Homework #6 due Tuesday, any questions?
- Read Chapter 10

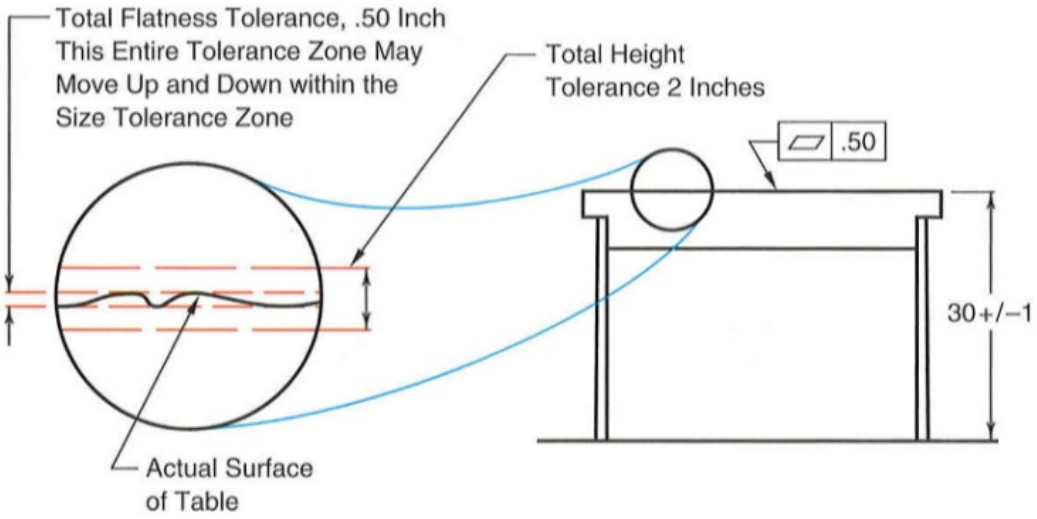
Topics

- Geometric Dimensioning and Tolerancing

Tolerancing

Tolerancing is the art and science of using the largest tolerance possible that will still allow a part to function.

Table Example



Geometric Dimensioning and Tolerancing

- A method of defining parts based on how the function, using standard ASME/ANSI symbols.
- Size cotnrol is the first rule
- Supplements size control in that it allows for feature/geometry control
- It uses a symbolic language

Rule #1

Individual Feature of Size

Where only a tolerance of size is specified, the limits of size of an individual feature prescribe the extent to which variations in its geometric form, as well as size, are allowed.

i.e.

If a feature is dimensioned only with a traditional tolerance, then that tolerance governs all of the tolerances for form. You only specify geomtric dimensions and tolerances to supplement the tradiational size/location tolerance.

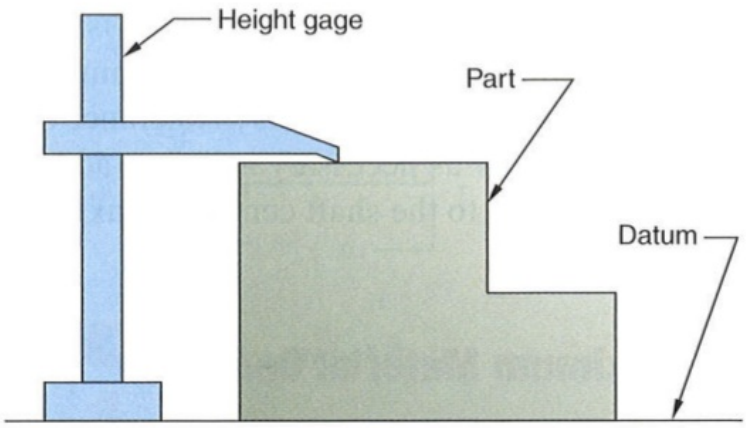
Datum

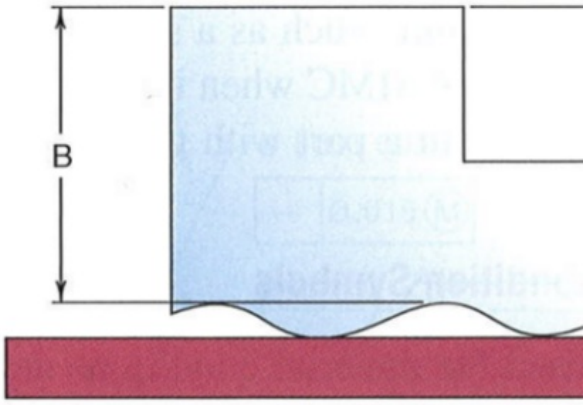
A starting place for a dimension such as a perfect plane, a center line, or a point.

Datums are perfect, ideal constructs

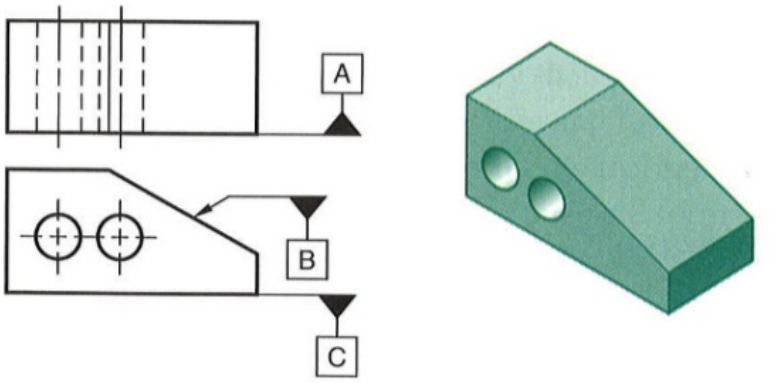
In reality "perfection" of a datum can mean that it is at least 10 times more accurate than the accuracy of the part being measured.

Datum





Datum Symbols



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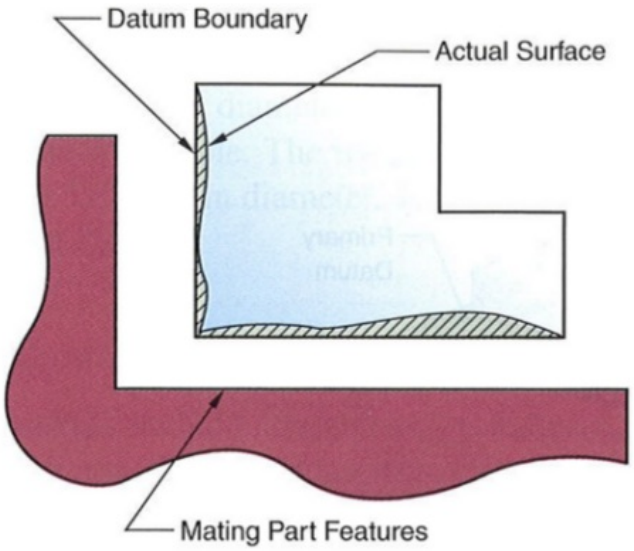

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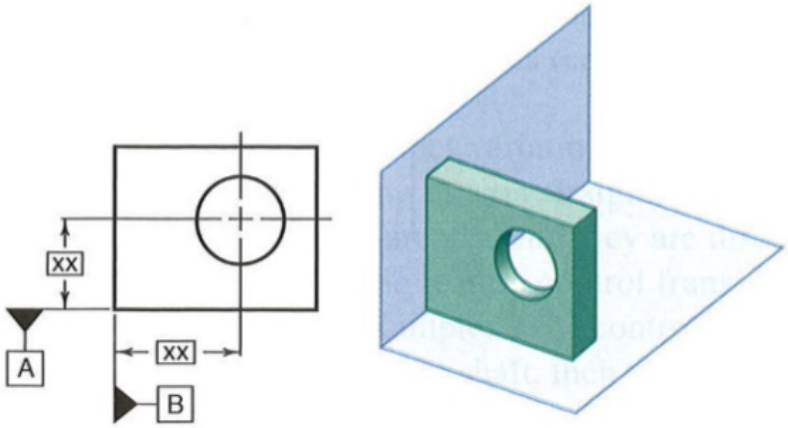

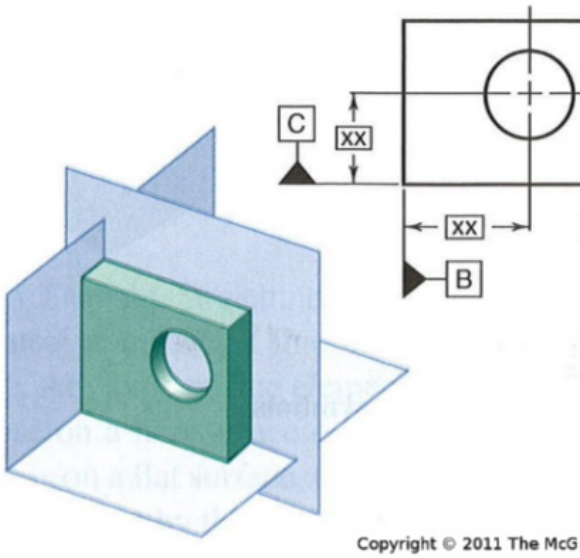

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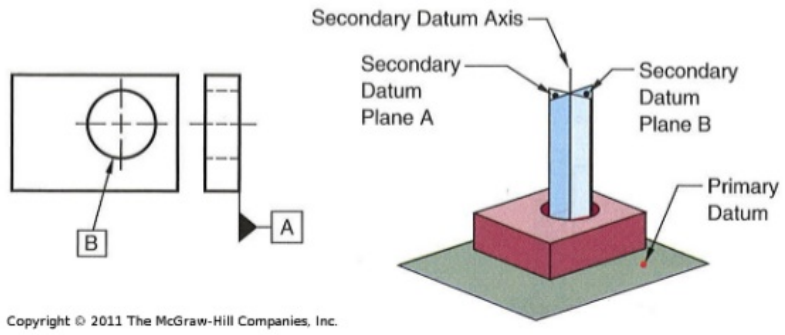
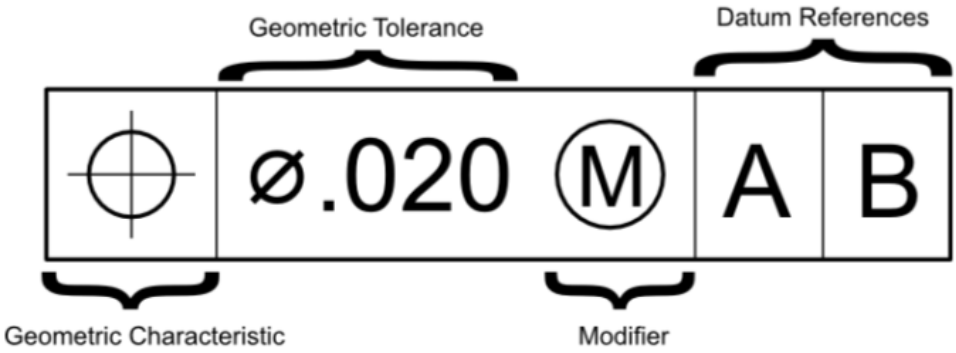


Feature Control Frame

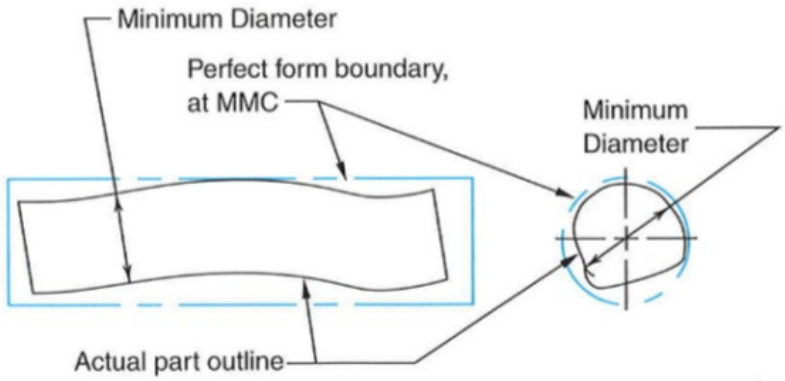
Used to specify the geometric tolerances. It is divided into two or more zones.



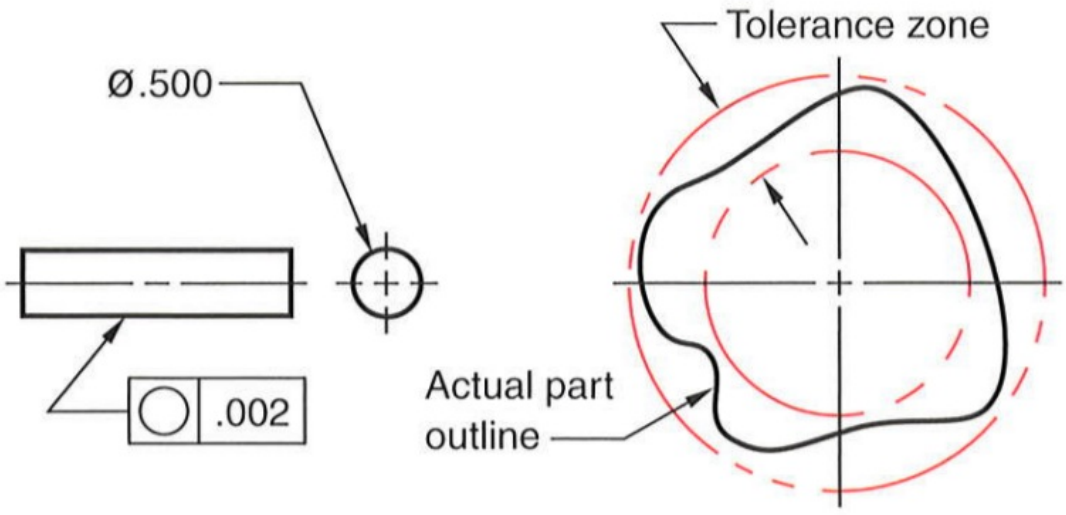
Feature Control Frame

Maximum/Least Material Condition

Ⓜ Ⓛ



Tolerance Zone



Geometric Characteristics

FEATURE	TYPE OF TOLERANCE	CHARACTERISTIC	SYMBOL
For individual features	*FORM*	Straightness	
		Flatness	
		Circularity	
		Cylindricity	
For individual or related features	*PROFILE*	Profile of a line	
		Profile of a surface	
For related features	*ORIENTATION*	Angularity	
		Perpendicularity	
		Parallelism	
	LOCATION	Position	
		Concentricity	
		Symmetry	
	RUNOUT	Circular runout	
		Total runout	

Tolerance Modifiers

TERM	SYMBOL
At maximum material condition	Ⓜ
At least material condition	Ⓛ
Projected tolerance zone	Ⓟ
Diameter	⌀
Spherical diameter	S⌀
Radius	R
Spherical radius	SR
Reference	( )
Arc length	⌒

Flatness

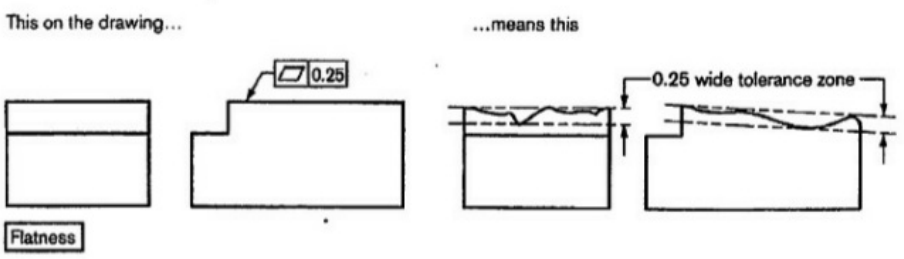
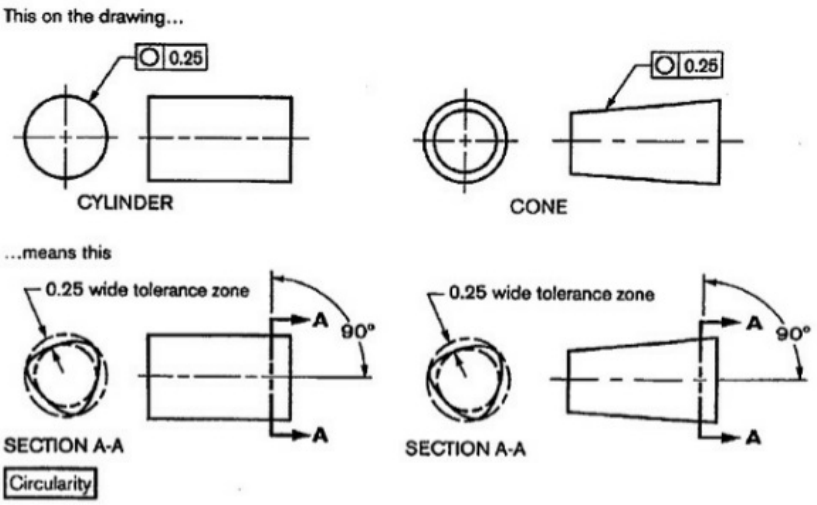


FIGURE 12.71 *Flatness (ANSI Y14.5M–1994.)*

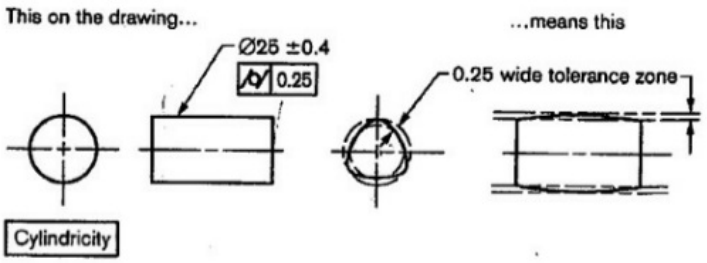
Circularity

FIGURE 12.72
Circularity (roundness) (ANSI Y14.5M–1994.)

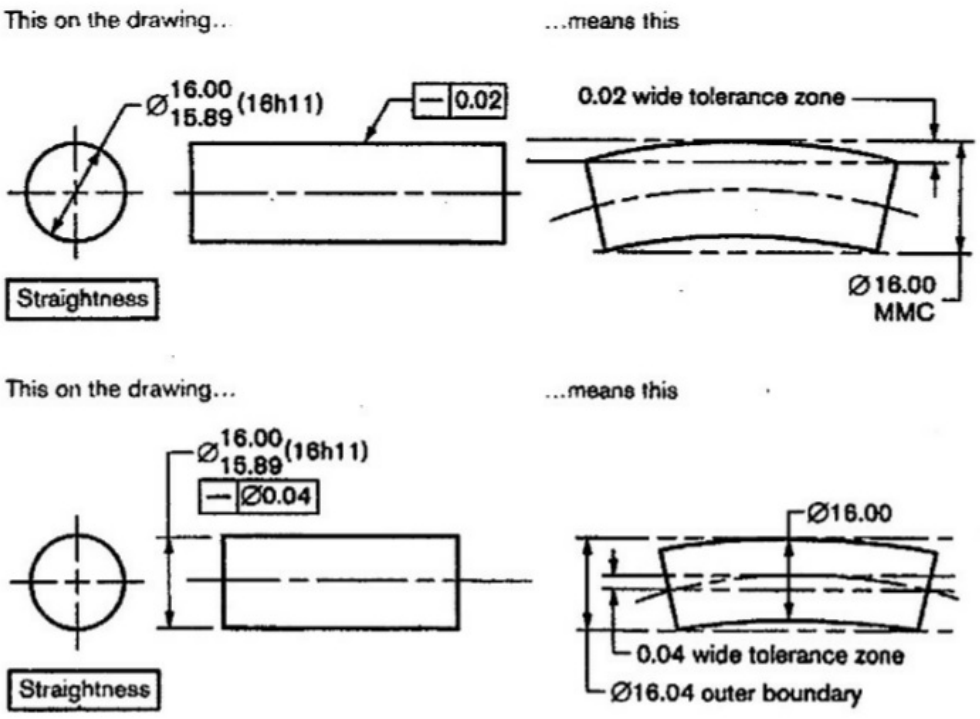


Cylindricity

FIGURE 12.73
Cylindricity (ANSI Y14.5M–1994.)



Straightness



Parallelism

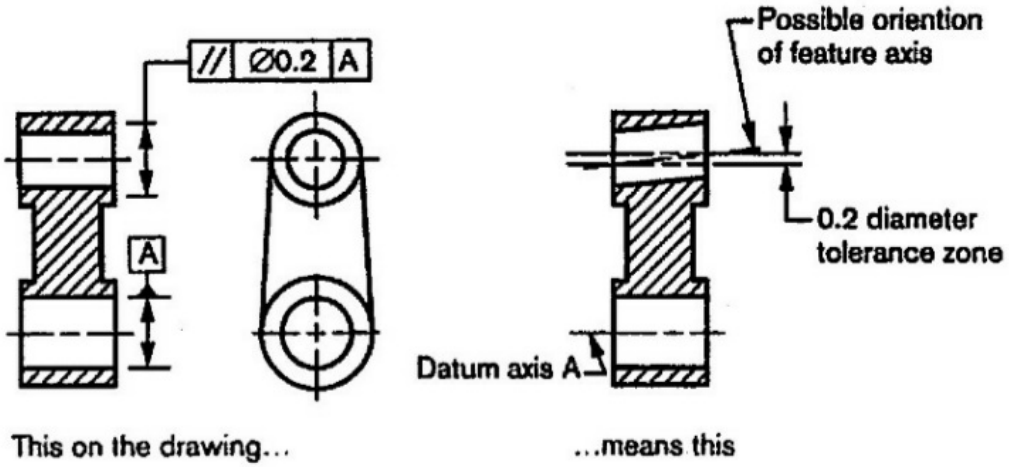


FIGURE 12.79
Parallelism for an axis

Perpendicularity

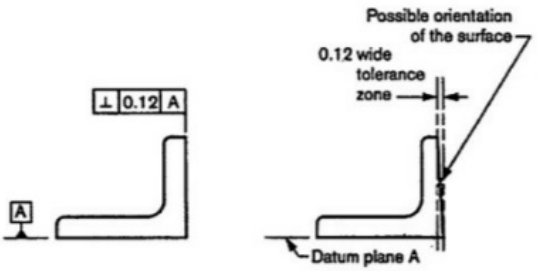
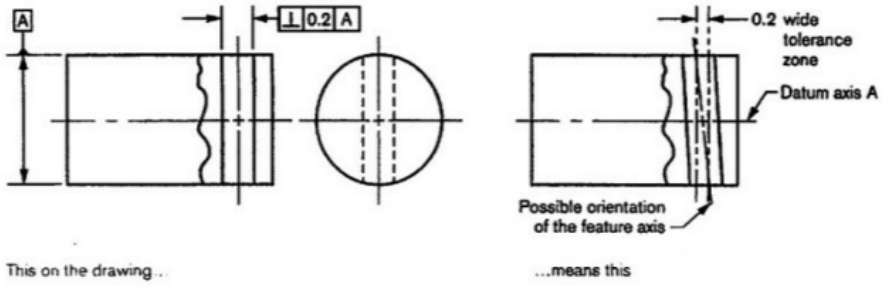
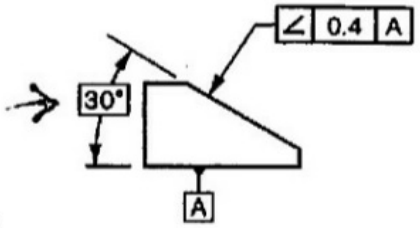


FIGURE 12.80
Perpendicularity for a plane

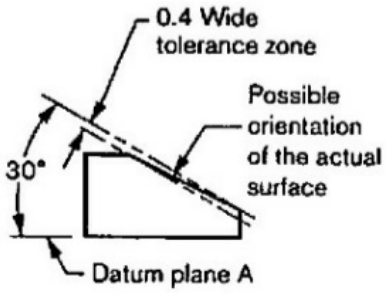


Angularity

BASIC DIM. HAS NO SIZE CONTROL EXPLICITLY

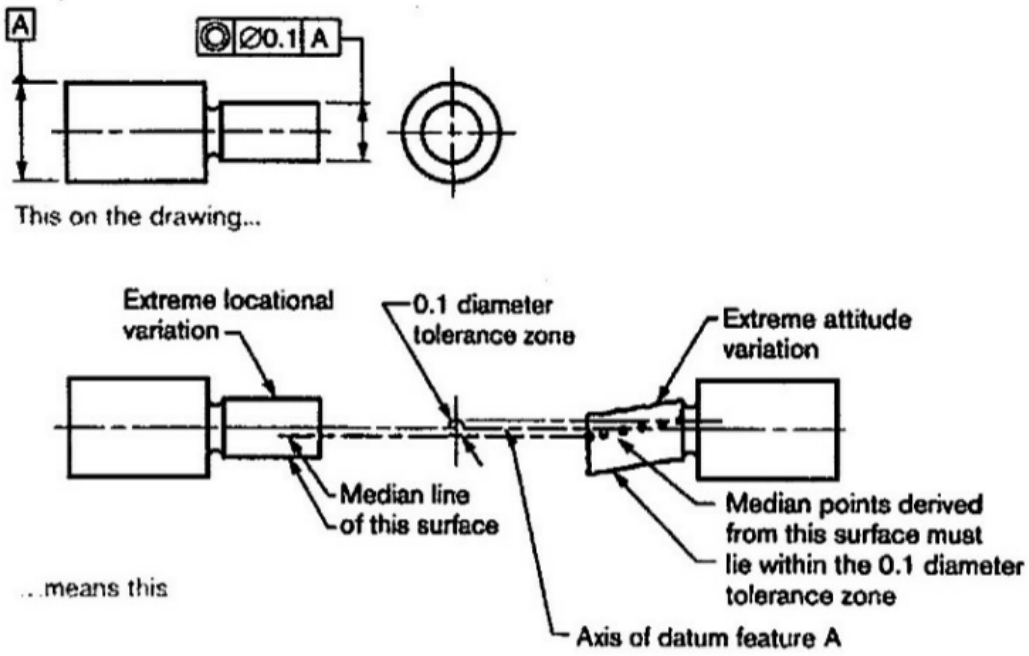


This on the drawing...



means that:

Concentricity



Surface Profile