TOLERANCING

Geometric Dimensioning & Tolerancing (GDT/GD&T)

- A means of defining parts and features more efficiently, taking into consideration how they function and fit with other parts.

- It involves the use a universally accepted graphic language, as published in national and international standards, it improves communication, product design, and quality.

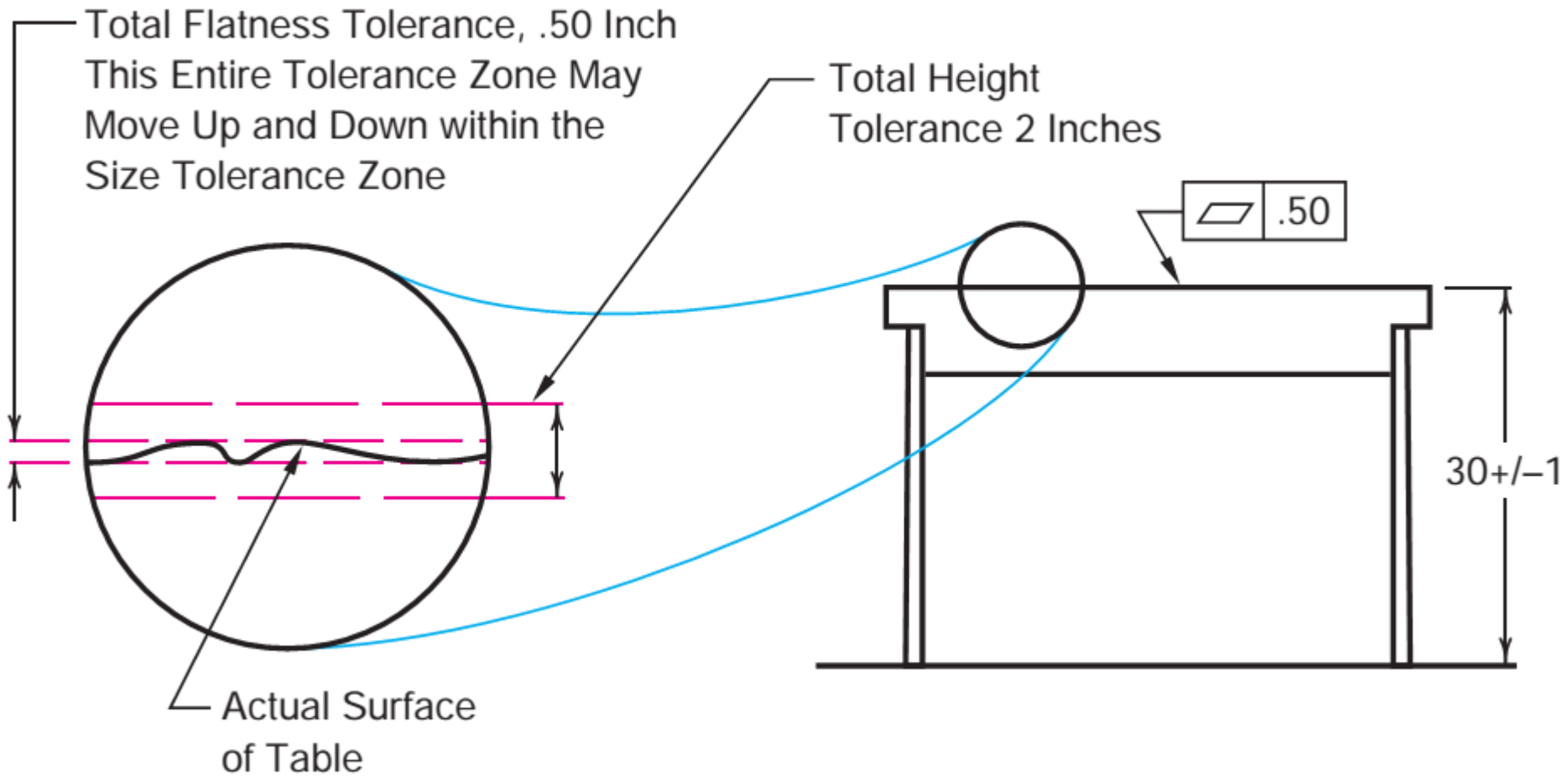
- GD&T is used to convey in a brief and precise manner complete geometrical requirements on engineering drawings.

- A popular GD&T standard is the ASME Y14.5.

- GD&T has an advantage of significantly reducing the need for notes on drawings, whiles creating manufacturing and inspection definitions with a minimum of confusion and misinterpretation, among others pros.

TOLERANCING

Geometric Dimensioning & Tolerancing (GDT/GD&T)



TOLERANCING

Some Geometric Tolerancing Symbols

Type of tolerance	Characteristics to be toleranced	Symbol	Datum needed	Applications
Form	Straightness		No	A straight line. The edge or axis of a feature.
	Flatness		No	A plane surface.
	Roundness		No	The periphery of a circle.Cross-section of a bore, cylinder, cone or sphere.
	Cylindricity		No	The combination of circularity, straightness and parallelism of cylindrical surfaces. Mating bores and plungers.
	Profile of a line		No	The profile of a straight or irregular line.
	Profile of a surface		No	The profile of a straight or irregular surface.

TOLERANCING

Some Geometric Tolerancing Symbols

Orientation	Parallelism		Yes	Parallelism of a feature related to a datum. Can control flatness when related to a datum.
	Perpendicularity		Yes	Surfaces, axes, or lines positioned at right angles to each other.
	Angularity		Yes	The angular displacement of surfaces, axes, or lines from a datum.
	Profile of a line		Yes	The profile of a straight or irregular line positioned by theoretical exact dimensions with respect to datum plane(s).
	Profile of a surface		Yes	The profile of a straight or irregular surface positioned by theoretical exact dimensions with respect to datum plane(s).

TOLERANCING

Some Geometric Tolerancing Symbols

Location	Position		See note below	The deviation of a feature from a true position.
	Concentricity and coaxiality		Yes	The relationship between two circles having a common centre or two cylinders having a common axis.
	Symmetry		Yes	The symmetrical position of a feature related to a datum.
	Profile of a line		Yes	The profile of a straight or irregular line positioned by theoretical exact dimensions with respect to datum plane(s).
	Profile of a surface		Yes	The profile of a straight or irregular surface positioned by theoretical exact dimensions with respect to datum plane(s).
Runout	Circular runout		Yes	The position of a point fixed on a surface of a part which is rotated 360° about its datum axis.
	Total runout		Yes	The relative position of a point when traversed along a surface rotating about its datum axis.

TOLERANCING

Representing Geometric Tolerances

FEATURE CONTROL FRAME

GEOMETRIC SYMBOL

TOLERANCE INFORMATION

DATUM REFERENCES

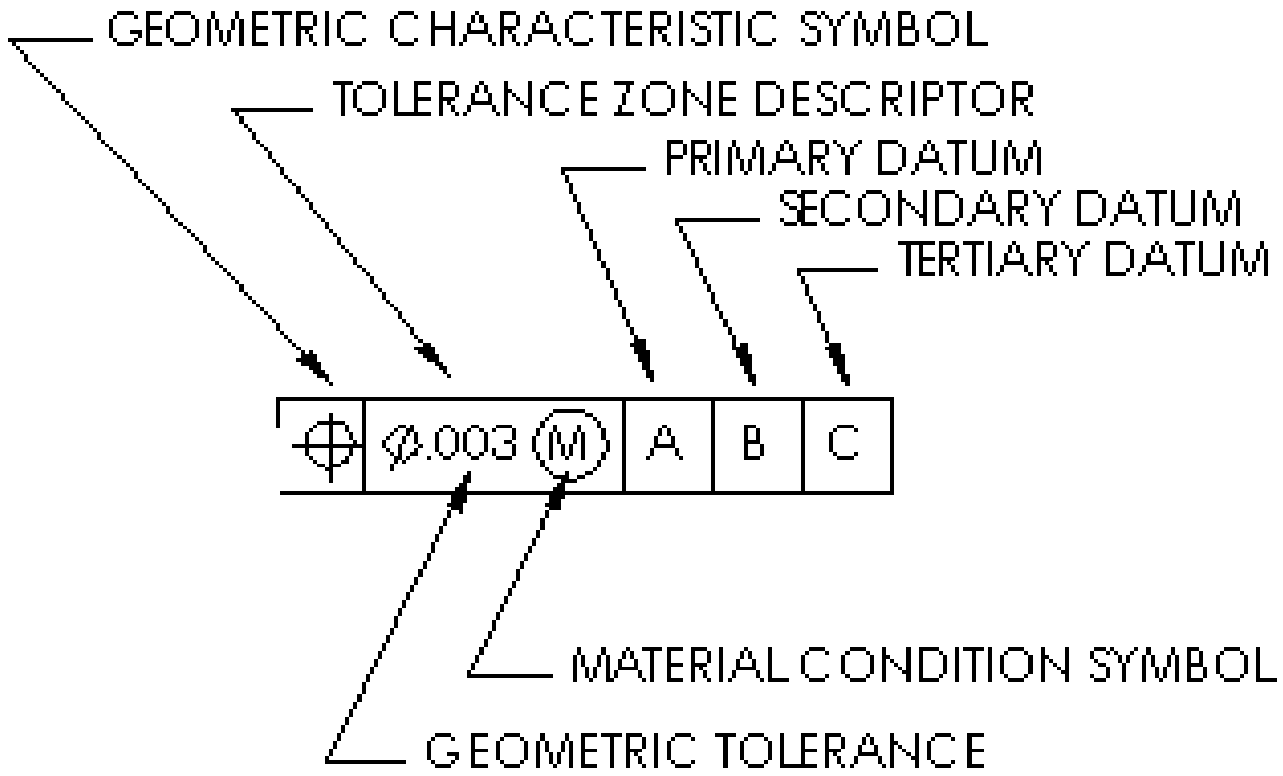
COMPARTMENT VARIABLES

OF THE FEATURE MUST BE WITHIN

CONNECTING WORDS

TOLERANCING

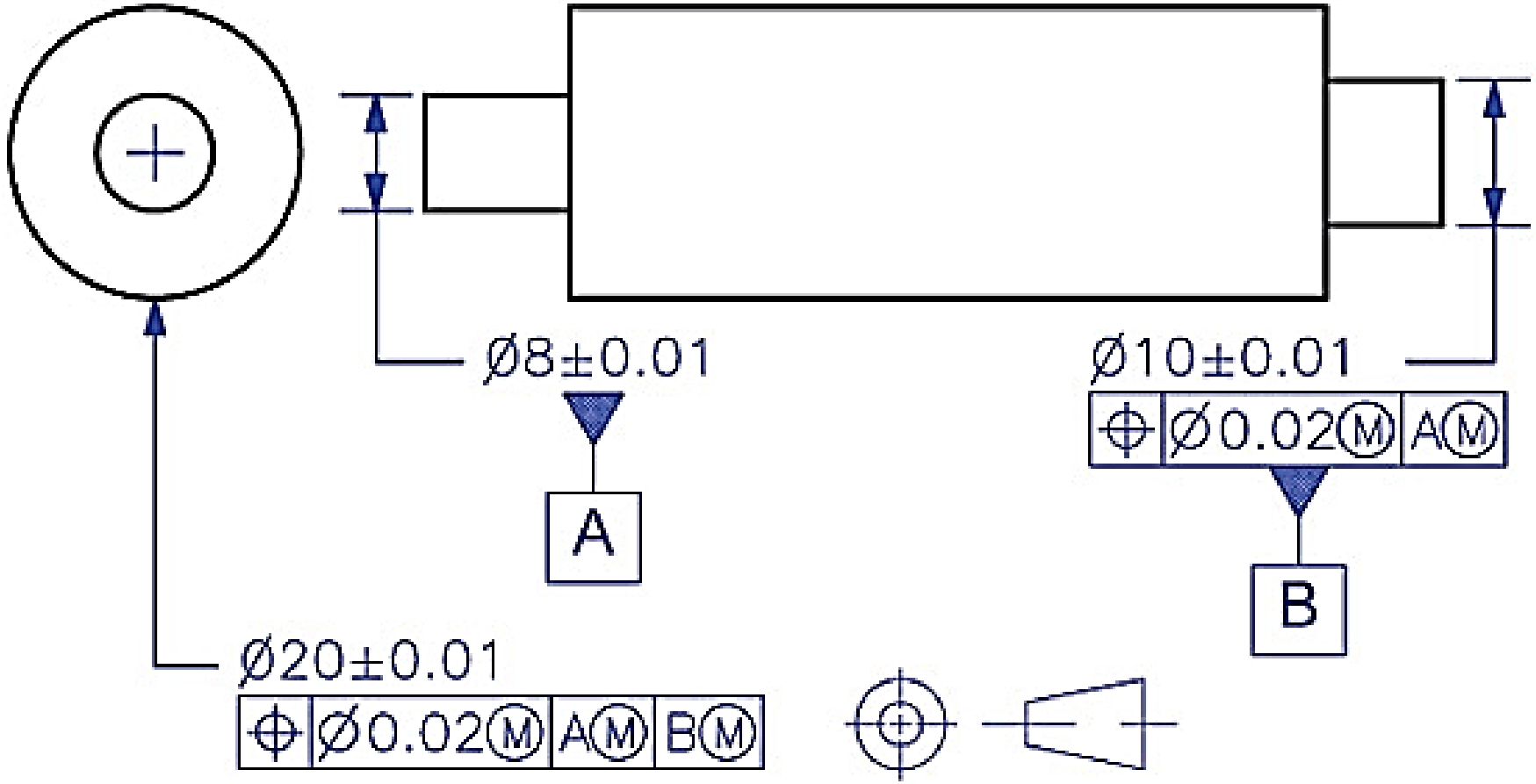
Reading Geometric Tolerances



Reads as: The position of the feature must be within a .003 diametrical tolerance zone at maximum material condition relative to datums A, B, and C.

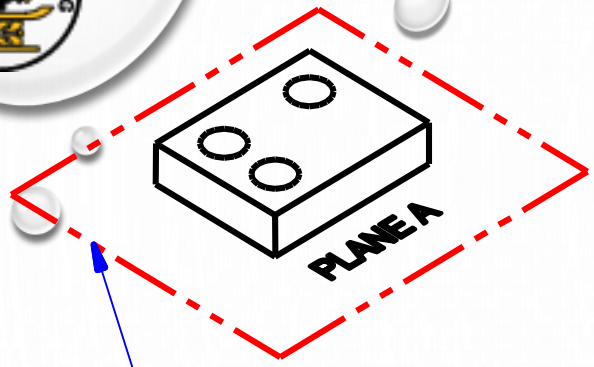
TOLERANCING

Placement of Geometric Tolerances on Drawings



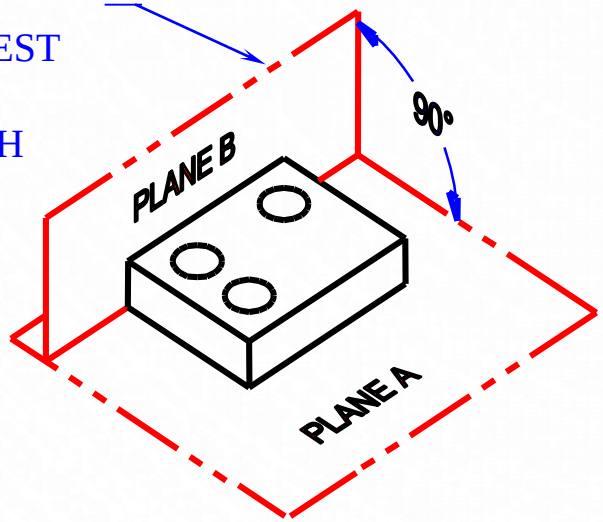
TOLERANCING

Datums

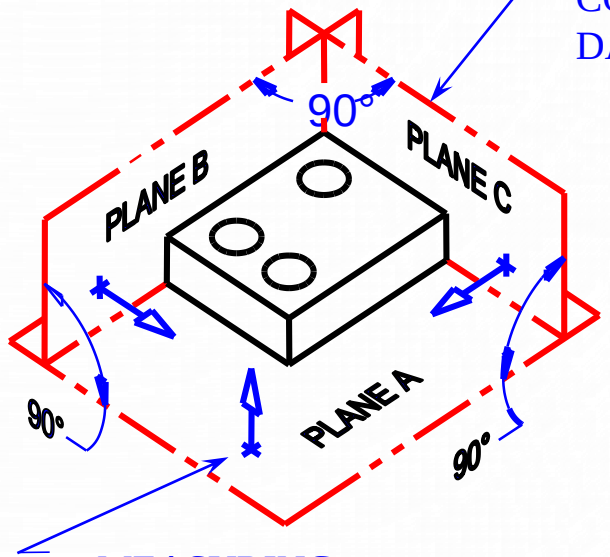


FIRST DATUM ESTABLISHED BY THREE HIGHEST POINTS CONTACT WITH SIMULATED DATUM A

SECOND DATUM ESTABLISHED BY TWO HIGHEST POINTS CONTACT WITH SIMULATED DATUM B



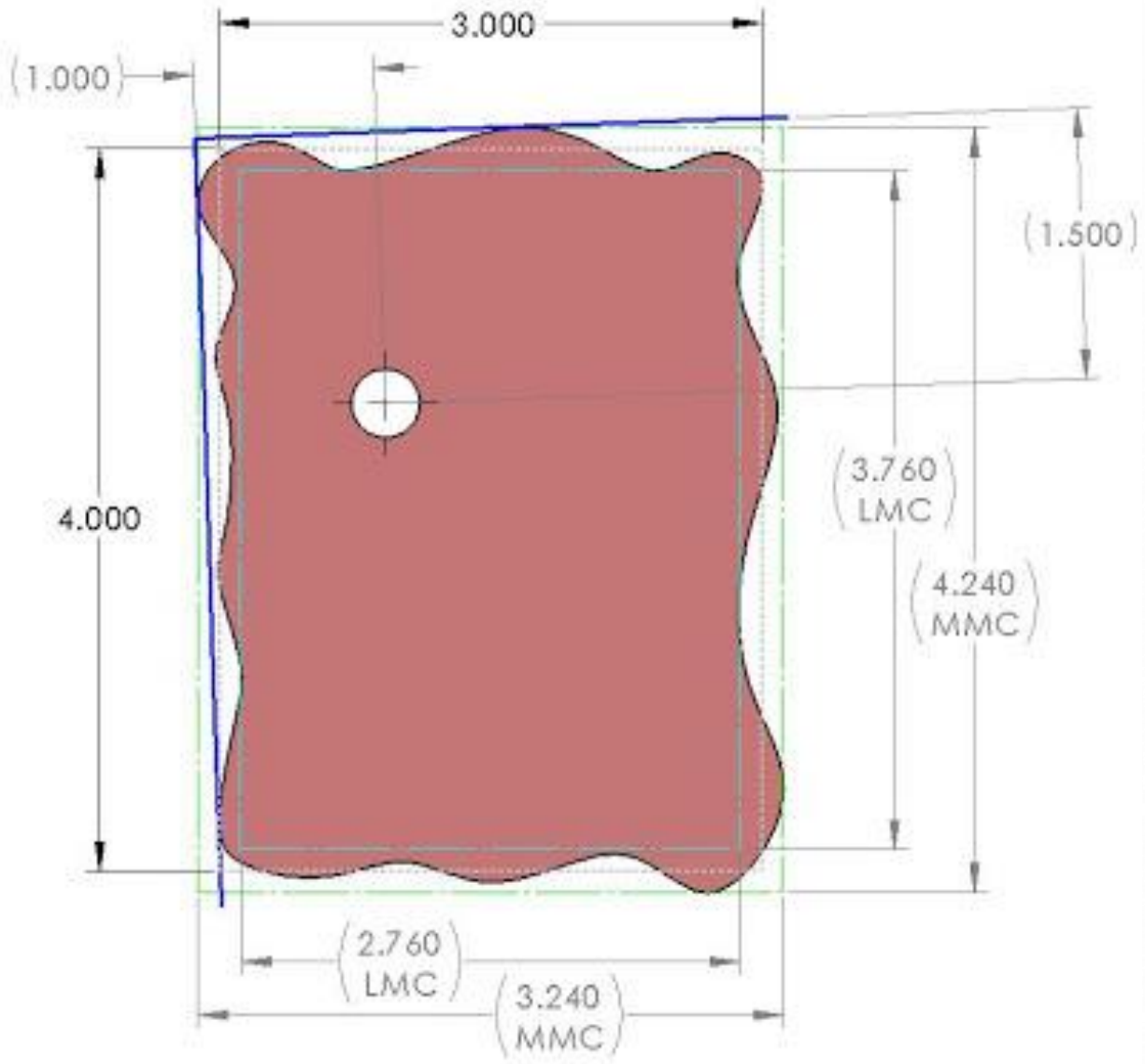
THIRD DATUM ESTABLISHED BY HIGHEST POINT CONTACT WITH SIMULATED DATUM C



MEASURING DIRECTIONS FOR RELATED DIMENSIONS

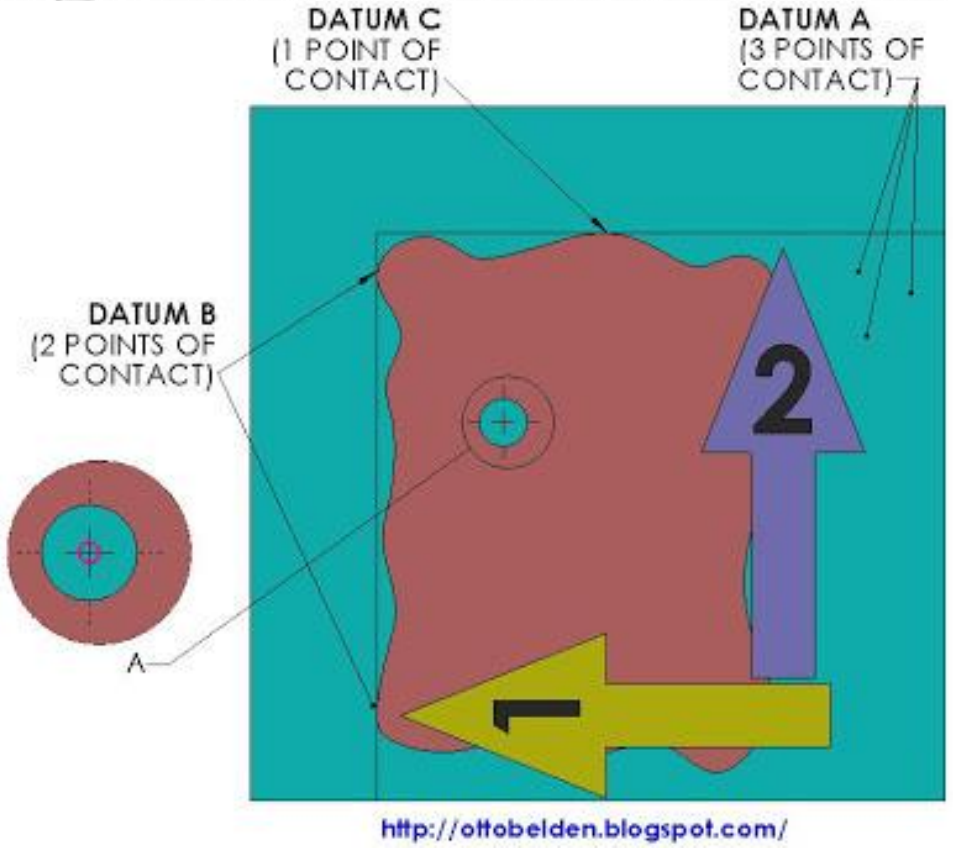
TOLERANCING

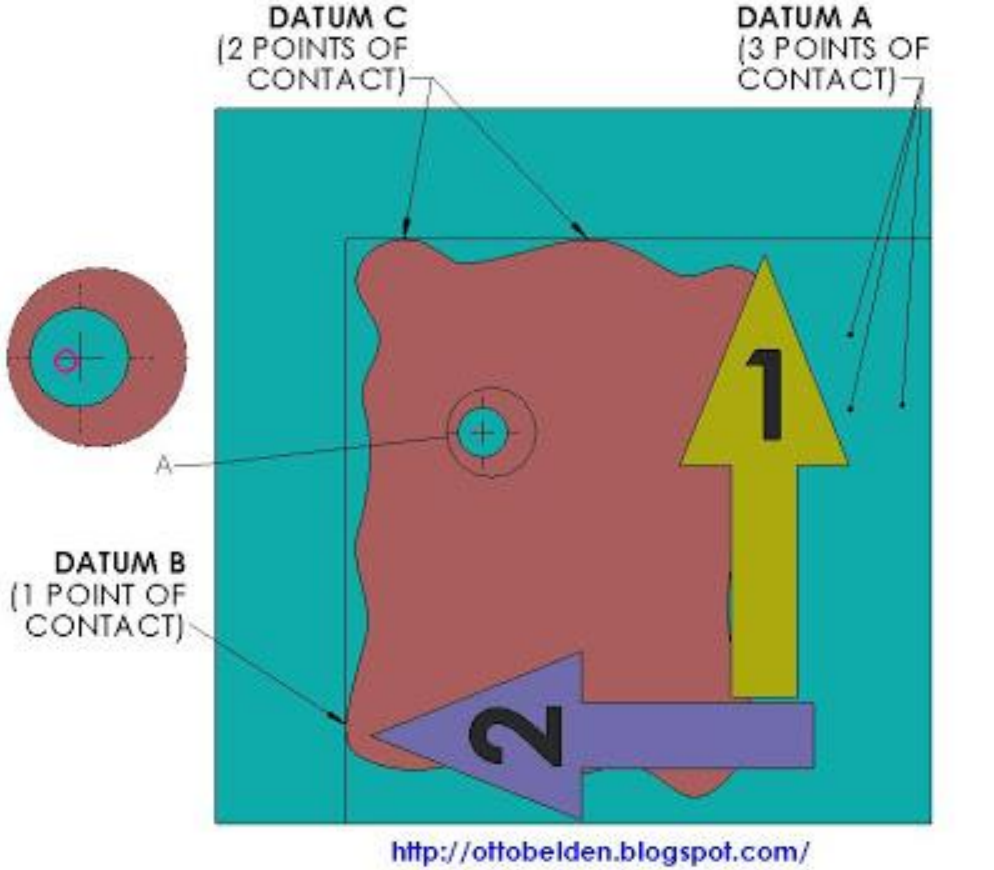
Effect of Order of Datums

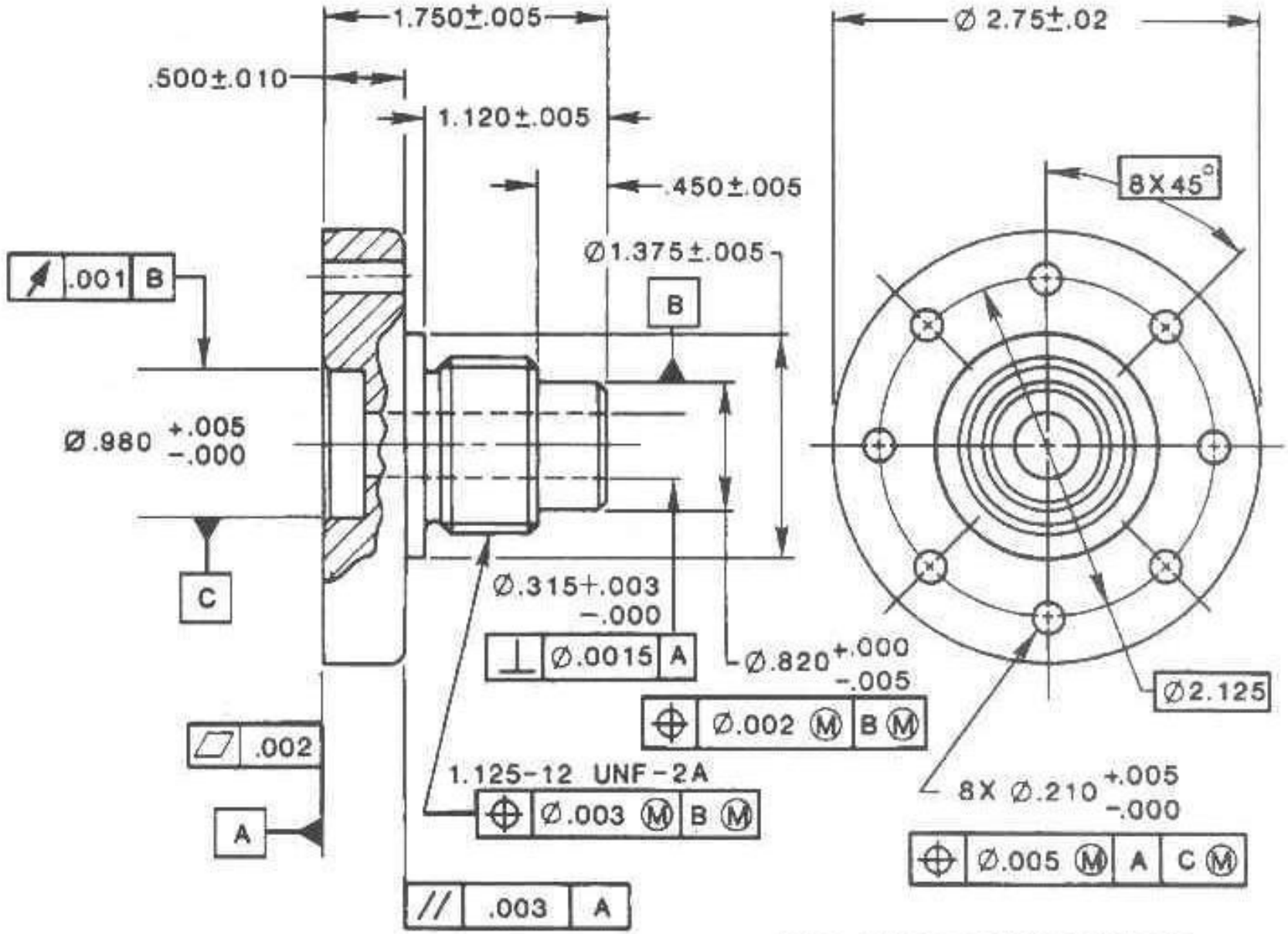


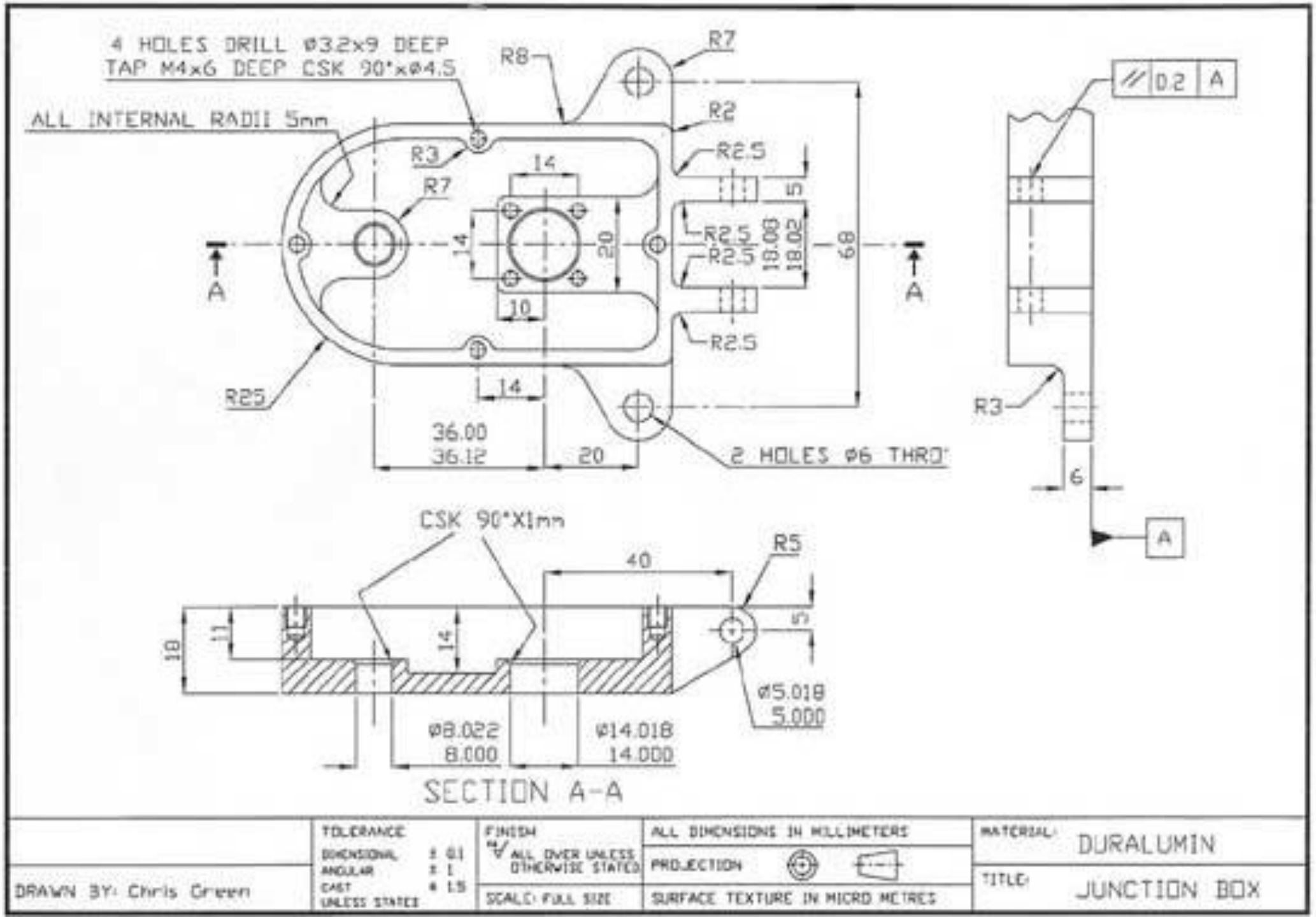
TOLERANCING

Effect of Order of Datums






1.750±.005
.500±.010
1.120±.005
.450±.005
Ø1.375±.005
Ø 2.75±.02
8X 45°
.001 B
B
Ø.980 +.005 −.000
C
Ø.315+.003 −.000
⊥ Ø.0015 A
Ø.820 +.000 −.005
⌖ Ø.002 Ⓜ B Ⓜ
Ø2.125
.002
A
1.125-12 UNF-2A
⌖ Ø.003 Ⓜ B Ⓜ
8X Ø.210 +.005 −.000
⌖ Ø.005 Ⓜ A C Ⓜ
// .003 A
NOTE: THIS DRAWING PREPARED IN ACCORDANCE WITH ASME Y14.5M-19--


4 HOLES DRILL ø3.2x9 DEEP
TAP M4x6 DEEP CSK 90°xø4.5
ALL INTERNAL RADII 5mm
R8
R7
R2
R2.5
R3
R7
14
5
20
14
10
18.00
18.02
68
R2.5
R2.5
R2.5
A
A
R25
14
36.00
36.12
20
2 HOLES ø6 THRO'
// 0.2 A
R3
6
A
CSK 90°X1mm
40
R5
5
18
11
14
ø5.018
5.000
ø8.022
8.000
ø14.018
14.000
SECTION A-A
TOLERANCE
DIMENSIONAL ± 0.1
ANGULAR ± 1
CAST ± 1.5
UNLESS STATED
FINISH
ALL OVER UNLESS OTHERWISE STATED
SCALE: FULL SIZE
ALL DIMENSIONS IN MILLIMETERS
PROJECTION
SURFACE TEXTURE IN MICRO METRES
MATERIAL: DURALUMIN
TITLE: JUNCTION BOX
DRAWN BY: Chris Green