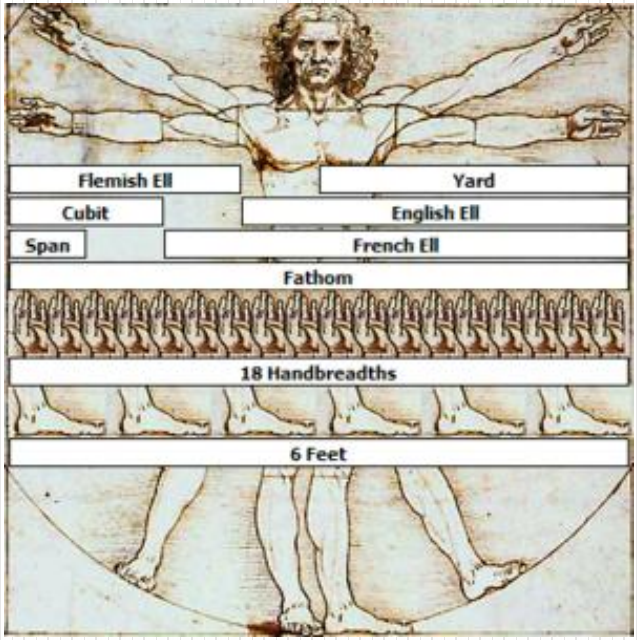
Workshop Practice
TA 102
Lec – 4 & 5 :Measurements and Quality in Manufacturing Problems



By Prof.A.Chandrashekhar

EXAMPLE 1

Find the type of fit obtained in the following type:

Size of Hole: $29.00^{+0.013}_{+0.0}$ mm

Size of shaft: $29.00^{+0}_{-0.013}$ mm

Maximum size of hole=29+0.013

= 29.013mm

Minimum size of hole = 29+0 = 29mm

Maximum size of shaft = 29 mm

minimum size of shaft = 29-0.013

= 28.987 mm

Max. clearance = Max. size of hole – Min size of shaft

= 29.013-28.987

= 0.026mm

Min. clearance = Min size of hole – Max. size of shaft

= 29 – 29 = 0 mm

Since, both clearances are greater than or equal to zero, the resulting fit is clearance fit.

PROBLEM 2

Determine the type of fit that can be obtained if the sizes of the hole and shaft are:

Size of Hole: $50.00^{-0.026}_{-0.065}$ mm

Size of shaft: $50.00^{-0}_{-0.011}$ mm

Maximum size of shaft = 50mm

minimum size of shaft = 50-0.011

= 49.989 mm

Maximum size of hole=50-0.026

= 49.974 mm

Minimum size of hole = 50 – 0.065 = 49.935mm

Max. clearance = Max. size of hole – Min size of shaft

= 49.974 - 49.989

= -0.015 mm

Min. clearance = Min size of hole – Max. size of shaft

= 49.935 - 50 =-0.065 mm

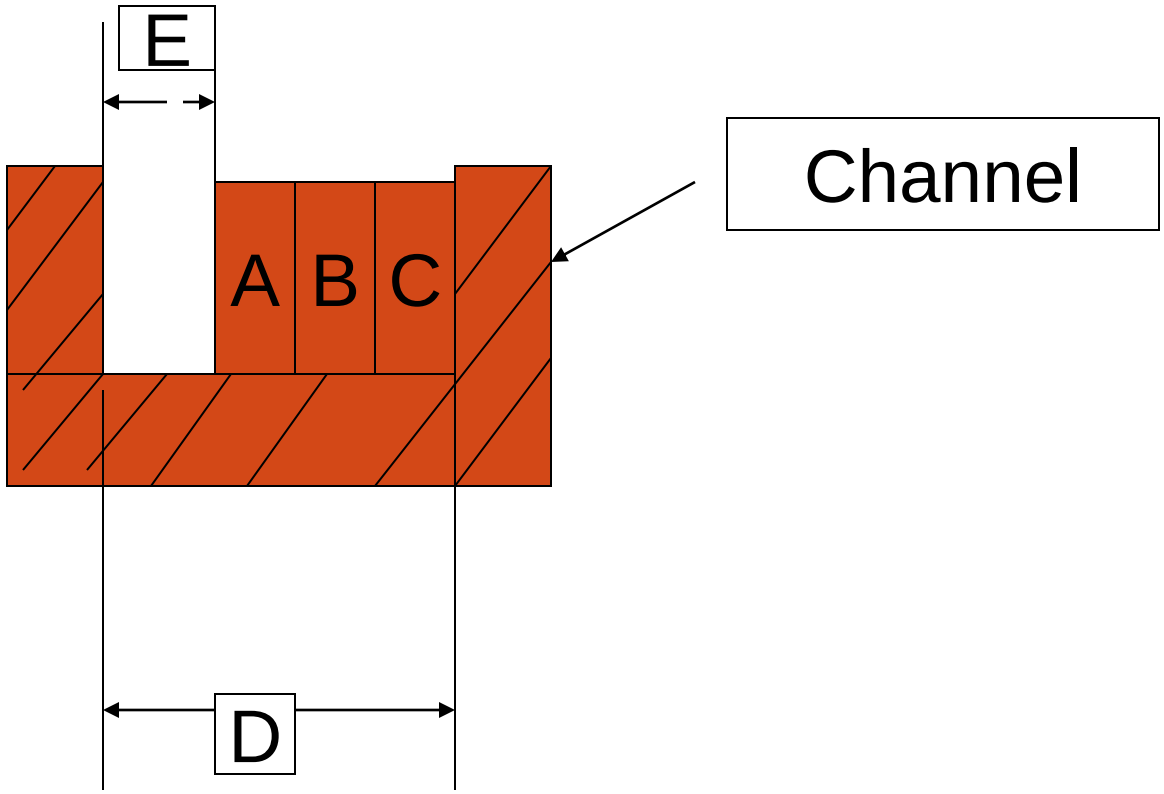
Since, both clearances are negative, it results in interference fit.

PROBLEM 3

Three blocks A,B and C are to be assembled in a channel of dimension D. except for the tolerances to be assigned to D, all the other basic sizes and tolerances are known. Determine the tolerance that must be assigned to D if it is essential that the minimum gap E is not less than 0.005mm. The dimensions of the blocks are as follows:

A = 0.75 $\pm$ 0.003 mm B = 1.00 $\pm$ 0.005 mm

C = 1.125 $\pm$ 0.004 mm and the basic dimension of channel D = 2.894 mm.


E
A
B
C
Channel
D

$$(0.750+0.003)+(1+0.005)+(1.125+0.004)+(0.005) = (2.894 - X)$$

$$X = 0.002 \text{ mm}$$

$$D = 2.894 \pm 0.002 \text{ mm}$$

Problem 4

- The nominal size of a part is 30 mm. the standard tolerance selected for this part is 0.010 mm. Express the size of the part using unilateral and Bilateral tolerances.

- $30.00\ ^{+0.010}_{-0}$ or $30.00\ ^{+0}_{-0.010}$

- 30.00 ± 0.010

Problem 5

- The dimensions of three shafts and holes are given in the table. For each assembly, identify the type of fit and compute the allowance (clearance / interference)

SIZE OF HOLE	SIZE OF SHAFT
a) $25.00\ ^{+0.02}_{-0}$	$25.00\ ^{+0}_{-0.02}$
b) $25.00\ ^{\pm 0.05}$	$25.00\ ^{\pm 0.05}$
c) $25.00\ ^{+0}_{-0.025}$	$25.00\ ^{+0.025}_{-0}$

a) Clearance = +0.06

b) Transition

c) Interference = - 0.06

Problem 6

- Find the values of the allowance, hole tolerance and shaft tolerance for the following dimensions of mated parts according to basic hole system.

Hole: 37.50 mm Shaft: 37.47 mm

37.52 mm 37.45 mm

Sol for Problem 6

- Hole tolerance = high limit – low limit

  = 37.52 – 37.50 = 0.02 mm

- Shaft tolerance = high limit – low limit

  = 37.47 – 37.45 = 0.02 mm

- Allowance = Low limit of hole – High Limit of shaft

  = 37.50 – 37.47 = 0.03 mm

Problem 7

- A 75 mm shaft rotates in a bearing. The tolerance for both shaft and bearing is 0.075 mm and the required allowance is 0.10 mm. Determine the dimensions of the shaft and bearing bore with the basic hole standard.

Sol for Problem 7

- Low limit of the hole = 75 mm
- High limit of the hole = low limit + tolerance

  = 75 + 0.075 = 75.075mm
- High limit of the shaft= low limit of hole - allowance

  = 75 – 0.10 = 74.90 mm
- Low limit of the shaft = high limit - tolerance

  = 75 – 0.075 = 74.825 mm

Problem 8

- A medium force fit on a 75 mm shaft requires a hole tolerance each equal to 0.225 mm and an average interference of 0.0375 mm. determine the proper hole and shaft dimensions with the basic hole standard.