Design procedure for helical compression spring of circular cross section

1) Diameter of wire:

Shear stress

$$\tau = \frac{8FDk}{\pi d^3}$$

Wahl's stress factor

$$k = \frac{4c - 1}{4c - 4} + \frac{0.615}{c}$$

Also refer for k value from DHB Figure

Spring index $\quad c = \frac{D}{d}$

Where d = diameter of spring wire

'c'generally varies from 4 to 12 for general use

2. Mean Diameter of Coil

Mean coil diameter D = cd

Outer diameter of coil D_o= D d

Inner diameter of coil D_i= D - d

3. Number of coil or turns

Axial Deflection

$$y = \frac{8FD^3 i}{Gd^4}$$

where i = Number of active turns or coils

4. Free length

Where,

$$l_o \geq (i+n)d + y + a$$

y = Maximum deflection

Clearance 'a' = 25% of maximum deflection or a = xdi, for x value refer figure in DHB
Assume squared and ground end

∴Number of additional coil n = 2

5. Stiffness or Rate of spring

$$F_o = \frac{F}{y}$$

6. Pitch

$$p = \frac{l_o - 2d}{i}$$