helical spring

- stress

> maximum force  $T = K_5 \frac{8ED}{\pi J^3}$ 

allowable

shear stress

$$F_{S} = \frac{S_{Sy} \pi d^{3}}{8 k_{B} N}$$

where

$$k_s = \frac{2C + 1}{2C}$$

$$K_{B} = \frac{4C + \lambda}{4C - 3}$$

C, spring index.

$$c = \frac{D}{d}$$

- deflection

### material strength.

Sut = 
$$\frac{A}{d^m}$$

# · absolute stability

$$\mathcal{L}_{o} < \frac{\pi \mathcal{D}}{\alpha} \cdot \left[ \frac{2(E-G)}{2G+E} \right]^{\frac{1}{2}}$$

for steel.

$$\frac{L_0 < 2.63}{\sqrt{8}}$$
 criterion

end-condition constant [Table 10-2]

#### **Table 10-2**

**End-Condition** Constants  $\alpha$  for Helical Compression Springs\*

End Condition	Constant $\alpha$
Spring supported between flat parallel surfaces (fixed ends)	0.5
One end supported by flat surface perpendicular to spring axis (fixed); other end pivoted (hinged)	0.707
Both ends pivoted (hinged)	1
One end clamped; other end free	2

<sup>\*</sup>Ends supported by flat surfaces must be squared and ground.

for calculation,

$$\mathcal{L}_{o} = y + \mathcal{L}_{s} = \frac{F}{k} + \mathcal{L}_{s}$$

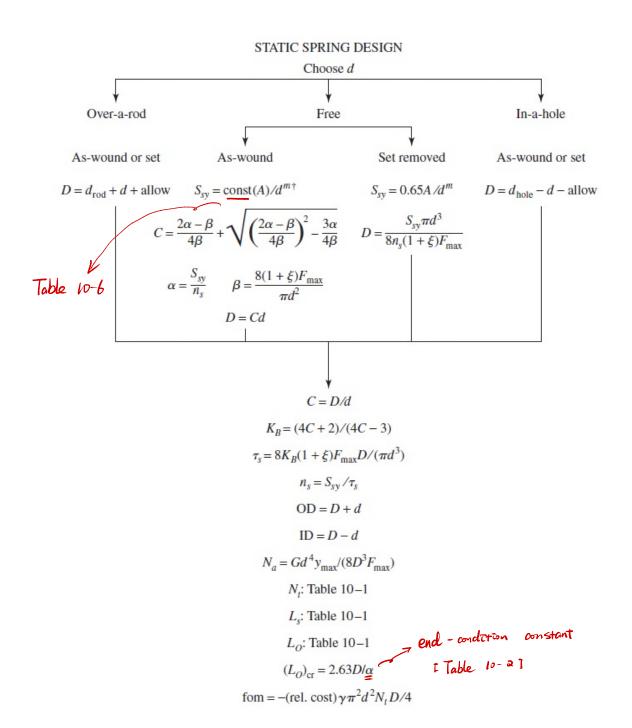
[ Table 10-1]

### Table 10-1

Formulas for the Dimensional Characteristics of Compression-Springs.  $(N_a = \text{Number of})$ Active Coils) Source: From Design Handbook, 1987, p. 32. Courtesy of Associated Spring.

	Type of Spring Ends			
Term	Plain	Plain and Ground	Squared or Closed	Squared and Ground
End coils, $N_e$	0	1	2	2
Total coils, $N_t$	$N_a$	$N_a + 1$	$N_a + 2$	$N_a + 2$
Free length, $L_0$	$pN_a + d$	$p(N_a + 1)$	$pN_a + 3d$	$pN_a + 2d$
Solid length, $L_s$	$d(N_t + 1)$	$dN_t$	$d(N_t + 1)$	$dN_t$
Pitch, p	$(L_0-d)/N_a$	$L_0/(N_a + 1)$	$(L_0-3d)/N_a$	$(L_0-2d)/N_a$

Title: static boading



$$4 \le C \le 12$$
$$3 \le N_a \le 15$$
$$\xi \ge 0.15$$
$$n_s \ge 1.2$$

Title: Fatigue boading

· surface treatement

## - fatīgue analysīs

$$F_{\alpha} = \left| \frac{F_{max} - F_{min}}{2} \right|$$