Have to alter approach from last problem.
Let's start with trial wire size of 8 mm (as before), but choose C to suit $D_o = (C+1)d$
$\leq 0.96 \times 40 = 38$ mm — i.e. $C = \frac{38}{8} - 1 = 3.75$.
(Note in previous problem we started out with an assumed n).

As previously:

$F_e = 2 \times 1.25 \times CK_s / 0.63 + 2 \times 0.25\, C K_{bo} / 0.13$
$= 2 \times 1.25 \times 3.75 \times 1.13 / 0.63 + 2 \times 0.25 \times 3.75 \times 1.41 / 0.13$
$= 37.2$ kN

whereas from Table, $F_{ut} = 62.8$ kN.
So $n = 62.8/37.2 = 1.7$ i.e. > previous problem.
Check feasibility of rest of design.
For required stiffness

$n_a = Gd/8kC^3 = 79 \times 10^3 \times 8 / 8 \times 16.7 \times 3.75^3 = 90$!!

Table 1 (5 & 6) $\quad n_t = 90 + 2 = 92$

$L_s = 92 \times 8 = 736$ mm.

But $\delta_s = 99$ mm (previous problem)

$\therefore L_0 = L_s + \delta_s = 736 + 99 = 835$ mm.

Buckling v. suspicious with this large L_0.

$\lambda L_0 / C_2 D = 0.5 \times 835 / 2.62 \times 30$ (ends constrained)
$= 5.31 > 1$ so buckle possibly

(3a): $\delta_c = 1.23 \times 835 (1 - \sqrt{(1 - 1/5.31^2)}) = 18.4$ mm

Since $\delta_{bi} = 90$ mm $> \delta_c$ buckling is certain.

Can either

1. — divide long spring into a lot of short ones with intermediate supports (v. expensive) or
2. — tolerate limited buckling & tube supports spring, or
3. — use more exotic material.

Generally seems not to be feasible — eg. scoring if "2" is implemented.

Compare this solution with previous problem — same stiffness. Here smaller diameter so must be longer for same stiffness.

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