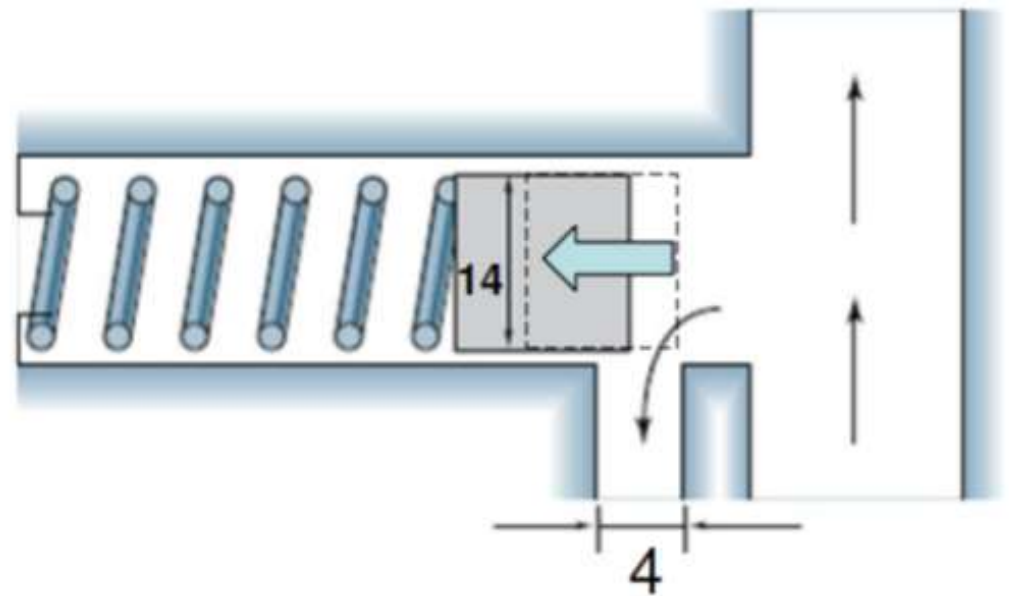


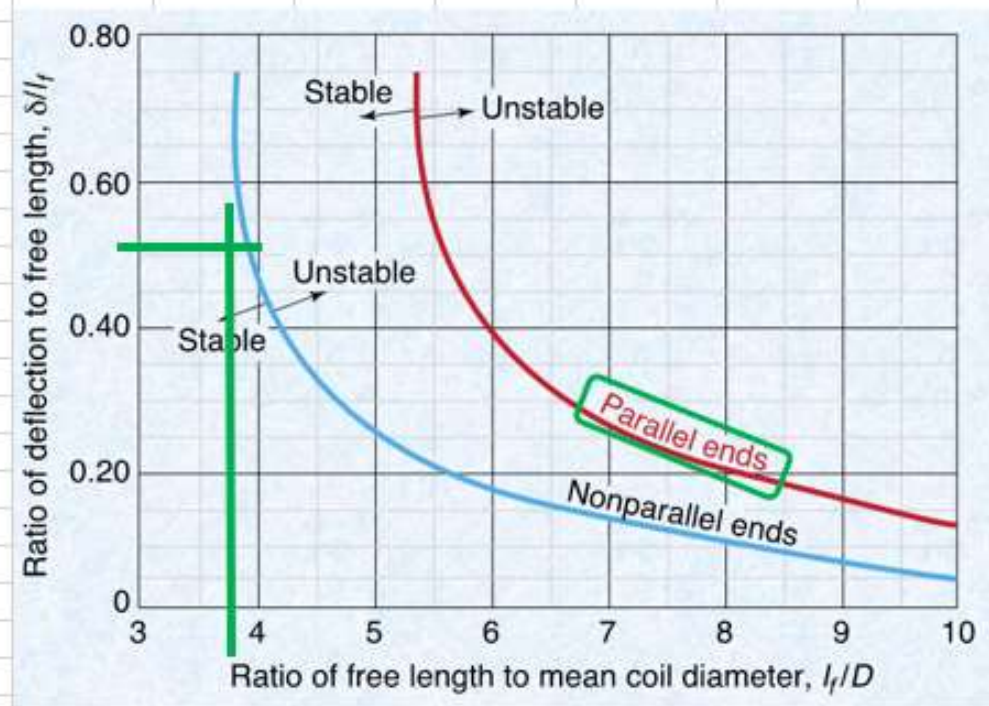
10.1

Dpiston	14	mm	
Lslit	4	mm	
Dmean	12	mm	
dwire	2.5	mm	
Pstart	0.15	MPa	
Pend	0.45	MPa	
ShearMod	80,000	MPa	
C	4.8		=Dmean/dwire
Area	153.938	mm ²	=PI()*Dpiston ² /4
Fstart	23.091	N	=Pstart*Area
Fend	69.272	N	=Pend*Area
K	11.545	N/mm	=(Fend-Fstart)/Lslit
Na	19.580		=ShearMod*dwire/(8*K*C ³)
	19.164		=ShearMod*dwire/(8*K*C ³ (1+0.5/C ²))
Nt	21.580		=Na+2
	21.164		Without (1+0.5/C ²)
Lsolid	53.950	mm	=Nt*dwire
	52.910		Without (1+0.5/C ²)
DeltaTotal	6.00	mm	=Fend/K
Lfree	59.950		=Lsolid+DeltaTotal
	58.910		Without (1+0.5/C ²)
Pitch	2.806		=(Lfree-2*dwire)/Na
	2.813		Without (1+0.5/C ²)
Kw	1.325		=(4*C ⁻¹)/(4*C ⁻⁴)+0.615/C ⁻
TauMax	179.571	MPa	=8*Dmean*Kw*Fend/(PI()*dwire ³)



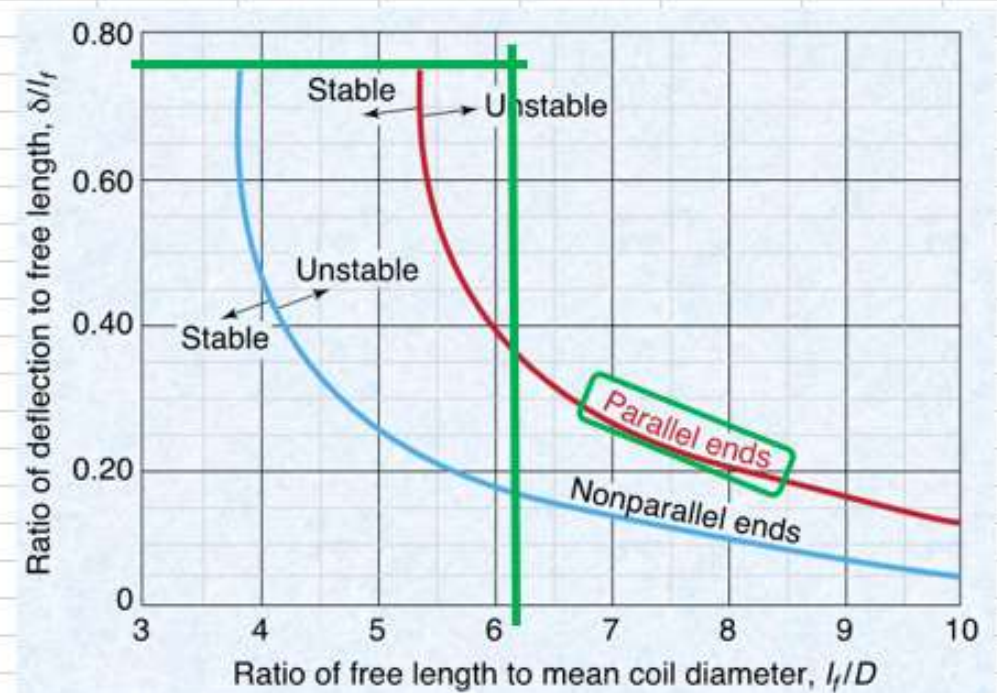
10.2

OD	15 mm		Music Wire	
Dmean	13 mm	=OD-dwire	Ap	2170
dwire	2 mm		m	0.146
ShearMod	79,300 MPa			
Sut	1961.14 MPa	=Ap/dwire^m		
Ssy	784.46 MPa	=0.4*Sut		
Na	10			
C	6.500	=Dmean/dwire		
K	7.135 N/mm	=ShearMod*dwire/(8*C_^3*Na*(1+0.5/C_^2))		
Nt	12	=Na+2	Squared & ground	
Lsolid	24 mm	=Nt*dwire		
Kd	1.0769	=(C_+0.5)/C_	Static	
P	176.032 N	=PI()*dwire^3*Ssy/(8*Dmean*Kd)		
DeltaTotal	24.67 mm	=P/K		
Lfree	48.673 mm	=Lsolid+DeltaTotal		
Delta/Lfree	0.507	=DeltaTotal/Lfree		
Lfree/D	3.744	=Lfree/Dmean		
				So buckling is not a problem



10.3

OD	21.5	mm		Chrome Vanadium
Dmean	20	mm	=OD-dwire	Ap 2000
dwire	1.5	mm		m 0.167
ShearMod	79,300	MPa		
Sut	1,869.06	MPa	=Ap/dwire*m	
Ssy	747.62	MPa	=0.4*Sut	
Na	18			
C	13.333		=Dmean/dwire	
FOS	1.5			
TauMax	498.42	MPa	=Ssy/FOS	
K	0.3475	N/mm	=ShearMod*dwire/(8*C_^3*Na*(1+0.5/C_^2))	
	0.3485	N/mm	=ShearMod*dwire/(8*C_^3*Na)	
Nt	20		=Na+2	
Lsolid	30	mm	=Nt*dwire	
Kd	1.0375		=(C_+0.5)/C_	Static
P	31.835161	N	=PI()*dwire^3*TauMax/(8*Dmean*Kd)	
DeltaTotal	91.61	mm	=P/K	
	91.35	mm	Alt with simple C	
Lfree	121.610		=Lsolid+DeltaTotal	
	121.35		Alt with simple C	
Delta/Lfree	0.753		=DeltaTotal/Lfree	
Lfree/D	6.080		=Lfree/Dmean	
			Not stable, is it?	



10.4

Arm	40	mm		Hard Drawn	
d	2	mm		Ap	1750
Dmean	25	mm		m	0.192
ID	23	mm	=Dmean-d		
Turns	7.5				
E	207000	MPa			
C	12.5		=Dmean/d		
Sut	1,531.93	MPa	-		
Sy	919.16	MPa	=0.6*Sut		
FOS	2				
Smax	459.58	MPa	=Sy/FOS		
Ki	1.0635		$=\frac{4 \cdot C^2 - C - 1}{4 \cdot C \cdot (C - 1)}$		
Moment	339.41	Nmm	$=S_{max} \cdot \pi \cdot d^3 / (32 \cdot K_i)$		
P	8.49	N	=Moment/Arm		
	0.170		$=\text{Arm} / (3 \cdot \pi \cdot D_{mean})$		
Na	7.840		$=\text{Turns} + 2 \cdot \text{Arm} / (3 \cdot \pi \cdot D_{mean})$		
Revs	0.204		$=10.18 \cdot \text{Moment} \cdot D_{mean} \cdot N_a / (E \cdot d^4)$		
Ntot	8.044		=Na+Revs		
Diprime	22.415		=Na*ID/Ntot		
Stiffness	264.046	Nmm/Radian	$=d^4 \cdot E / (64 \cdot D_{mean} \cdot N_a)$		

