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Thanks for visiting our site,

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Content Based
Chemical Engineering

ENGINEERING DESIGN CALCULATION - DENNIS KIRK

MECHANICAL COIL SPRING CALCULATION

v 1.000

For linear springs where F = ky.
Based on method of *Mechanical Engineering Design* , Shigley.

CLIENT:
PROJECT:
TITLE:

SPRING PROPERTIES

D_o	Coil Outer Diameter	24.75	mm				
D_{mean}	Coil Mean Diameter	22.25	mm				
d	Wire Diameter	2.5	mm				
C	C = D_{mean} / d	8.90	(Normally between 6 and 12)				
N_{total}	Total Number of Coils	18					
N_{dead}	Number of Dead Coils	2					
N	Number of Coils	16					
L_{free}	Free Length	90	mm				
L_{min}	Minimum length (fully compressed)	45	mm				
P	Pitch	5.2	mm				
K_s	$K_s = 1 + 0.5 / C$	1.056					
k	Spring Constant, $k = d^4G/(8D^3N)$	2197	N/m	0.2240	kg/mm	4.47	mm/kg

MATERIAL PROPERTIES (Table 10-2 and A-5)

G	Shear Modulus of Elasticity	79.3	GPa	Material	
S_{ut}	Tensile Strength $S_{ut} = A/d^m$	1585	MPa		
S_y	Yield Strength $S_y = 0.75S_{ut}$	1189.0	MPa		
S_{sy}	**Shear Yield** **$S_{sy} = 0.577S_y$**	686.0	**MPa**		

FULL COMPRESSION

F_{max}	Max. Force	98.9	N	(Equivalent to 10.08 kg weight)	
y_{max}	Max. Deflection	45.0	mm		
$\tau_{\mu\alpha\xi}$	Max. Shear Stress = $8kFD/(\pi d^3)$	378.6	MPa	55%	

F	Force F	45.3	N	(Equivalent to 4.62 kg weight)	
y	Deflection ($y = 8FD^3N/(d^4G)$)	20.62	mm	46%	
l	Compressed Length	69.38	mm		
L - y	Remaining Travel	24.38	mm		
τ	Shear Stress = $8kFD/(\pi d^3)$	173.5	MPa	25%	
-	Calculation Check, F = ky	45.3	N		

F	Force F	90.0	N	(Equivalent to 9.17 kg weight)	
y	Deflection ($y = 8FD^3N/(d^4G)$)	40.96	mm	**91%**	**Warning, highly compressed!**
l	Compressed Length	49.04	mm		
L - y	Remaining Travel	4.04	mm		
τ	Shear Stress = $8kFD/(\pi d^3)$	344.7	MPa	**50%**	**Warning, highly stressed!**
-	Calculation Check, F = ky	90.0	N		