



i Calculation without errors.

ii Project information

? Input section

1.0 Preliminary shaft diameter design

1.1 Calculation units	Imperial (lbf, in, HP...)		1.6 Type of shaft load	C...Repeated torsion + bending
1.2 Transmitted power	25,00	[HP]	1.7 Material of the shaft	C...High-strength structural steel (174000)
1.3 Shaft speed	1500	[/min]		
1.4 Torsion moment	1050,00	[lb.in]		
1.5 Preliminary min. diameter	1,26	[in]		

2.0 Shaft shape and dimensions

2.1 The scale of the displayed shaft diameter. Calculation units Imperial (lbf, in, HP...)

2.2 Table	1	2	3	4	5	6	7	8	9	10
Origin	0,00	0,80	1,20	5,20	5,60	6,40	8,40	8,40	8,40	8,40
L	0,800	0,400	4,000	0,400	0,800	2,000				
ø Da	0,800	1,200	2,000	1,600	1,200	1,000				
ø Db	0,800	1,200	2,000	1,600	1,200	1,000				
ø da	0,200	0,200	0,200	0,200	0,200	0,000				
ø db	0,200	0,200	0,200	0,200	0,200	0,000				
R	0,039	0,039	0,039	0,039	0,039	0,039				

2.3 Total length of the shaft: 8,40 [in]

2.4 X-coordinate of the left support (bearing): Fixed 0,40 [in]

2.5 X-coordinate of the right support (bearing): Free 6,00 [in]

2.6 The shaft surface (Roughness Ra): C...Ground (32)

3.0 Notches and necking-down on the shaft

3.1 The ultimate tensile strength (Su, Rm): 86297,0 [psi]

3.2 Notch sensitivity factor (q): 0,45

3.3 A. Transverse hole

X[in]	d[in]	β c	β b	β t
0,00	0,00	1,00	1,00	1,00
0,00	0,00	1,00	1,00	1,00

3.4 B. Necking-down

X[in]	d[in]	r[in]	β c	β b	β t
0,00	0,00	0,00	1,00	1,00	1,00
0,00	0,00	0,00	1,00	1,00	1,00
0,00	0,00	0,00	1,00	1,00	1,00

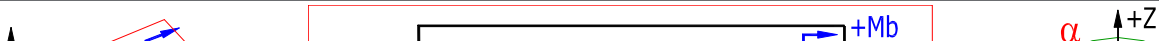
3.5 C. General notch

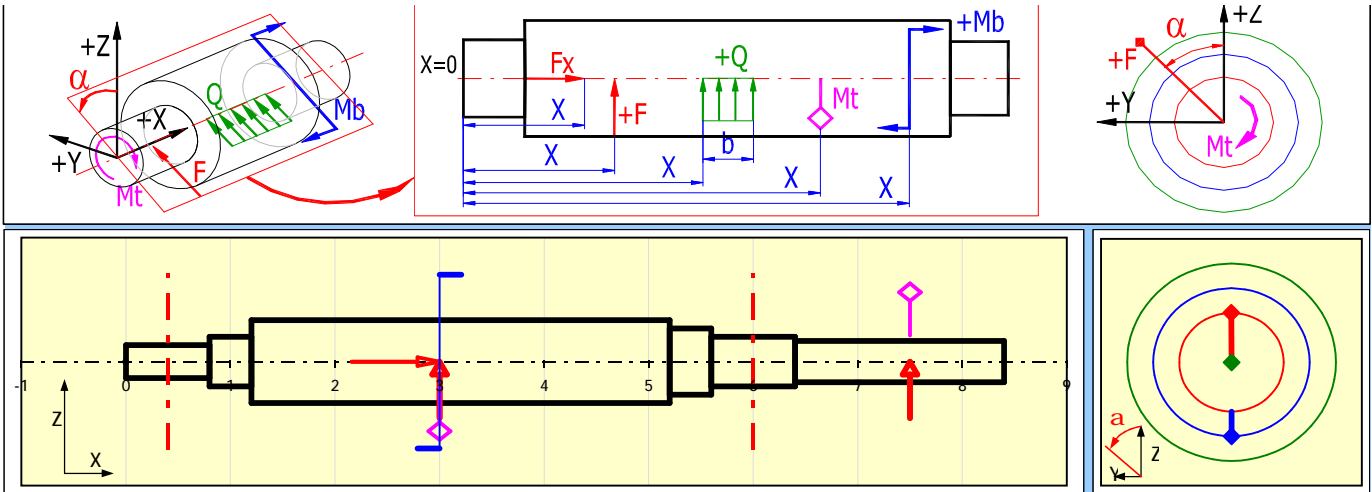
X[in]	b[in]	β c	β b	β t
0,00	0,00	1,00	1,00	1,00
0,00	0,00	1,00	1,00	1,00
0,00	0,00	1,00	1,00	1,00
0,00	0,00	1,00	1,00	1,00
0,00	0,00	1,00	1,00	1,00

3.6 D. Rounding between cylindrical sections of the shaft

	1	2	3	4	5	6	7	8	9
β c	1,61	1,79	1,81	1,73	1,60	1,00	1,00	1,00	1,00
β b	1,50	1,64	1,68	1,60	1,51	1,00	1,00	1,00	1,00
β t	1,26	1,34	1,34	1,31	1,26	1,00	1,00	1,00	1,00

4.0 Loading of the shaft





4.1 Loading	X	Fx	F	alfa	Mt	Mb	alfa	Q	b	alfa
	[in]	[lbf]	[lbf]	[°]	[lbf*ft]	[lbf]	[°]	[lbf/in]	[in]	[°]
1	3,00	220,0	450,0	0	30,00	25,00	180			
2	7,50		110,0	180	-30,00					
3										
4										
5										
6										
7										
8										
9										
10										

5.0 Rotating masses

5.1 Additional rotating masses (resonance speed)

5.2 Use loading from the weight of disks in the calculation? Yes

5.3	X	D	d	b	Ro	m
	[in]				[lb/feet^3]	[lb]
M1	0,00	0,00	0,00	0,00	486,9	0,00
M2	0,00	0,00	0,00	0,00	486,9	0,00
M3	0,00	0,00	0,00	0,00	486,9	0,00
M4	0,00	0,00	0,00	0,00	486,9	0,00
M5	0,00	0,00	0,00	0,00	486,9	0,00

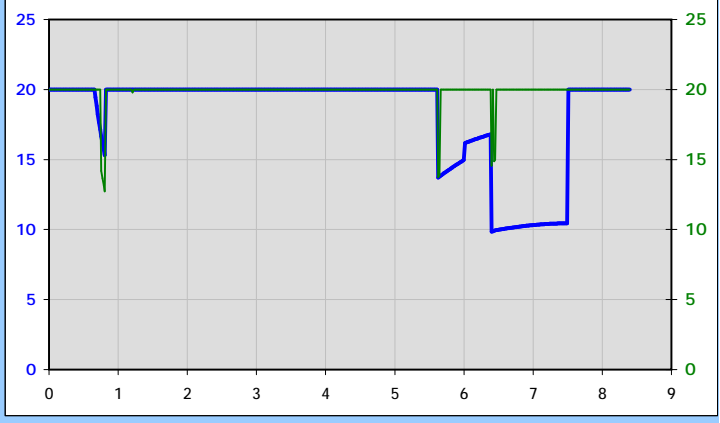
6.0 Material and the type of loading

6.1 Shaft material (Ultimate tensile strength min-max)	A...Structural steel (50800 - 101500)	86300	[psi]	6.17 Dead load	Yes <input type="checkbox"/>
6.2 Ultimate tensile strength	Su/Rm	86297	[psi]	6.18 Max. displayed coefficient of safety	20 <input type="checkbox"/>
6.3 Yield strength in tension	Sv/Re	50052	[psi]	6.19 Stress ratio factor	α_0 0,85 <input type="checkbox"/>
6.4 Yield strength in bending	Svb/Reb	65068	[psi]	6.20 Coefficient of maximum loading	
6.5 Yield strength in shear	Svs/Res	35037	[psi]	6.21 Bending	1,70
6.6 For reversed loading				6.22 Radial load	1,70
6.7 Fatigue limit - tension-press	σ_c	32793	[psi]	6.23 Torsion	1,70
6.8 Fatigue limit - bending	σ_{ec}	42286	[psi]	6.24 Tension/Compression	1,70
6.9 Fatigue limit - torsion	τ_c	30204	[psi]	6.25 Loading conditions	
6.10 For cyclic loading				6.26 Loading from bending moment	C...Reversed <input type="checkbox"/>
6.11 Fatigue limit - tension-press	σ_{hc}	49189	[psi]	6.27 Loading from radial force	C...Reversed <input type="checkbox"/>
6.12 Fatigue limit - bending	σ_{ehc}	63428	[psi]	6.28 Load from torsional moment	B...Repeated <input type="checkbox"/>
6.13 Fatigue limit - torsion	τ_{hc}	34735	[psi]	6.29 Loading from tension/pressure force	B...Repeated <input type="checkbox"/>
6.14 Specific mass	Ro	490,0	[lb/feet^3]	6.30 Dynamic strength check	
6.15 Modulus of elasticity in tensi	E	30457800	[psi]	6.31 Impact from shaft surface	Yes <input type="checkbox"/>
6.16 Modulus of elasticity in shea	G	11603000	[psi]	6.32 Impact from shaft size	Yes <input type="checkbox"/>
6.16 Modulus of elasticity in shea	G	11603000	[psi]	6.33 Impact from stress concentration (not)	Yes <input type="checkbox"/>

7.0 Results - summary

x	y	z	S y+z	7.17 Graph
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7.1 Reaction in the support R1	-220	-1,421E-08	-215,08492	215,084919	[lbf]	41...Safety coefficient (static)
7.2 Reaction in the support R2	0	-5,066E-08	-120,23549	120,235486	[lbf]	42...Safety coefficient (dynamic)
7.3 Total shaft weight	m	4,68	[lb]			
7.4 Maximum deflection	y	0,0003	[in]			
7.5 Maximum angular deflection	φ	0,0305	[°]			
7.6 Angular deflection in R1	ϑ	0,0050	[°]			
7.7 Angular deflection in R2	ϑ	0,0048	[°]			
7.8 Max. bending stress	σ_e	1746,7	[psi]			
7.9 Max. stress in shear	τ_s	456,7	[psi]			
7.10 Max. stress in torsion	τ_t	1836,2	[psi]			
7.11 Max. stress in tension/press	σ_q	466,9	[psi]			
7.12 Max. equivalent stress	σ_r	3170,7	[psi]			
7.13 Min. static safety	SF _{st}	9,85				
7.14 Min. dynamic safety	SF _D	12,73				
7.15 Critical speed (A)	n_c	0,0	[/min]			
Critical speed (B)	n_c	302676,0	[/min]			
Critical speed (C)	n_c	272895,1	[/min]			

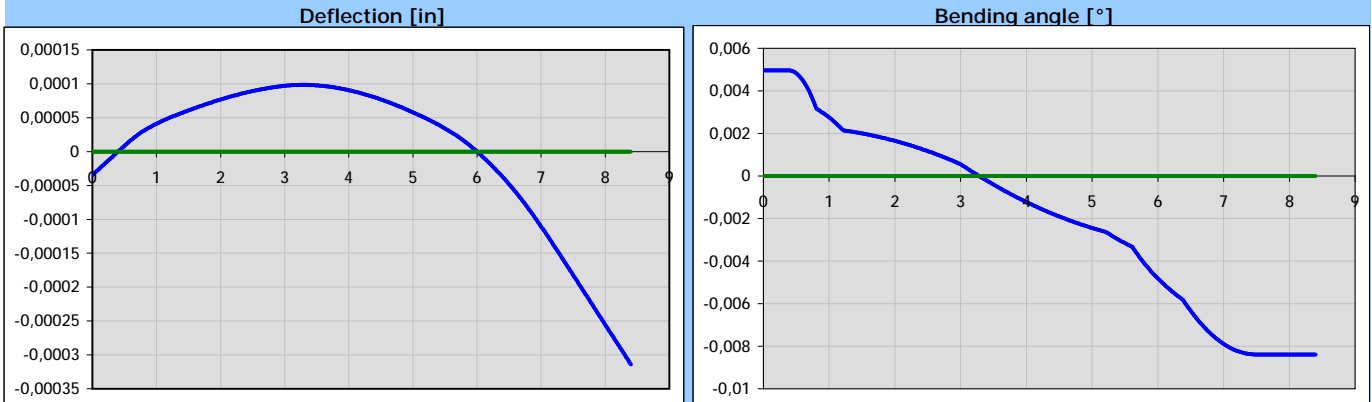


Shaft freely rotating in bearings, rotating disc between the bearings (K=1)

7.16 Results for X co-ordinate	6,88	54,00	55,00	82,50	83,75	83,75	83,75	83,75
04...Z - Deflection [in]	-9,319E-05	-0,000314	-0,000314	-0,000314	-0,000314	-0,000314	-0,000314	-0,000314
42...Safety coefficient (dynamic)	20	20	20	20	20	20	20	20
31...Total coefficient - bending	1,14416476	1,14416476	1,14416476	1,14416476	1,14416476	1,14416476	1,14416476	1,14416476
42...Safety coefficient (dynamic)	20	20	20	20	20	20	20	20
43...Empty graph	0	0	0	0	0	0	0	0

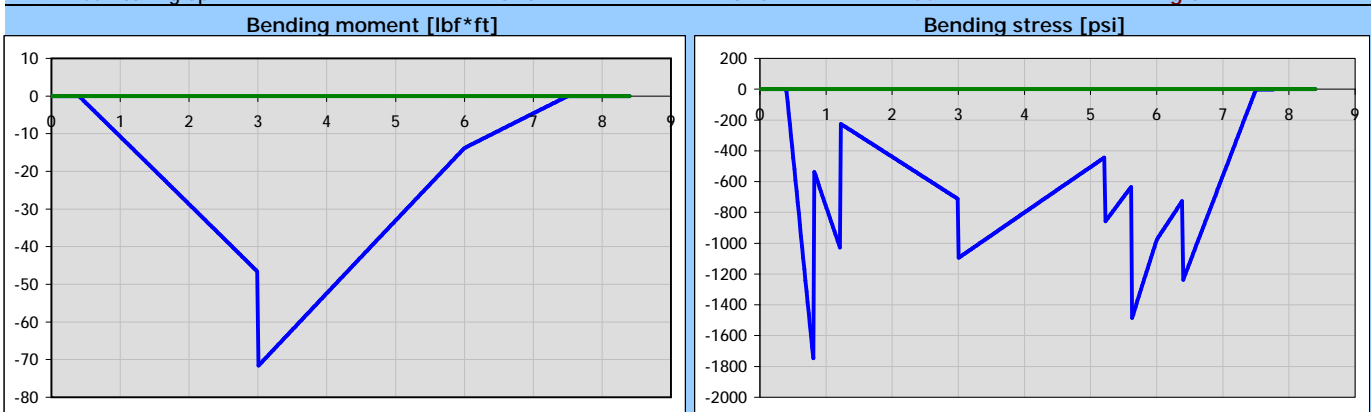
8.0 Graph - Deflection, Bending angle

8.1 Curves in graph XZ Plane XY Plane Sum Angle



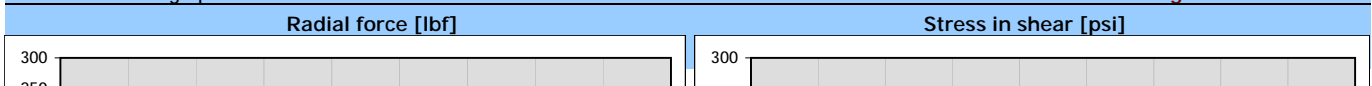
9.0 Graph - Bending moment, Bending stress

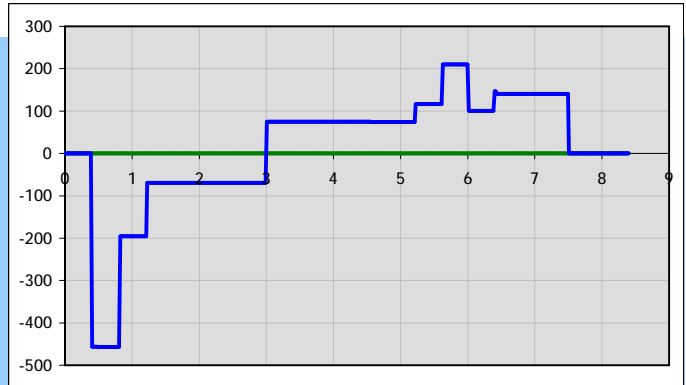
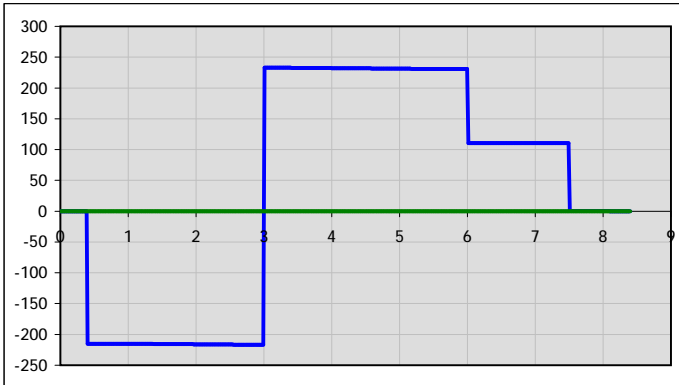
9.1 Curves in graph XZ Plane XY Plane Sum Angle



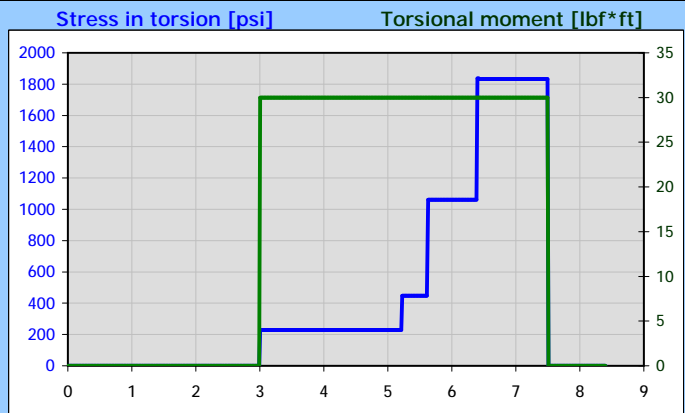
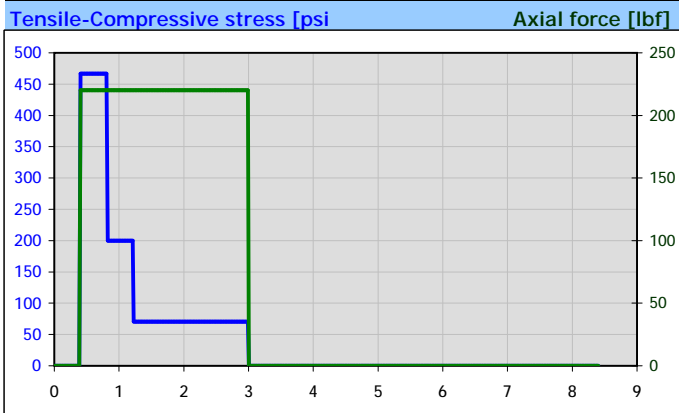
10.0 Graph - Radial force, Stress in shear

10.1 Curves in graph XZ Plane XY Plane Sum Angle

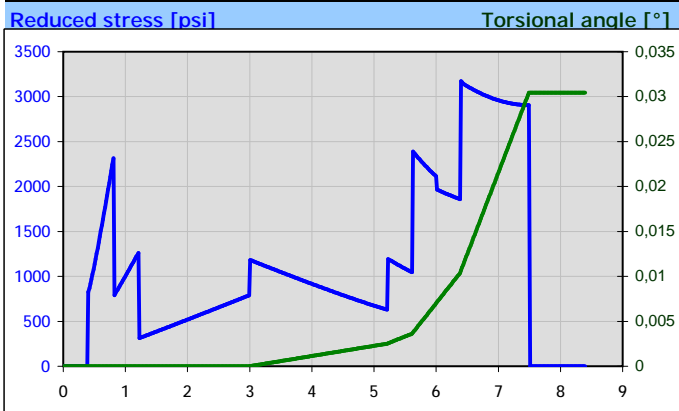




11.0 Graph - Axial force, Torsional moment



12.0 Graph - Torsional angle, Reduced stress, Safety coefficient



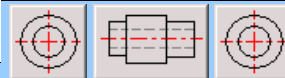
13.0 Graphical output, CAD systems

13.1 Output of 2D drawing to:

DXF File

13.2 2D drawing scale

Automatic



13.3 Text description (Information for BOM)

Row 1 (BOM attribute 1)

Row 2 (BOM attribute 2)

Row 3 (BOM attribute 3)

Shaft

Dmax=2 [in]; Lmax=8,4 [in]

Material:Structural steel Rm=86297

