Stress Summary for SLC Flexures

SLC Assembly						Bending Limit gap							Extensional Stress			Bending Stress				Yield
D#	Name	Flexure D#	material	elastic modulus (Pa)	yield stress (Pa)	gap (in)	distance (in)	slope (rad)	Mass (lb)	max d (in)	ℓ (in)	A (in^2)	Nominal Stress (Pa)	Stress Conc. Factor	Max Stress (Pa)	Nominal Stress (Pa)	Stress Conc. Factor	Max Stress (Pa)	Max Normal Stress (Pa)	Factor of Safety
D1200275-v2	ITM ACB Suspension Assy	D1200781-v1	316 SS	1.93E+11	2.40E+08	0.150	16.316	9.19E-03	170	0.136	0.749	0.0145	8.07E+07	1.144109	9.23E+07	1.61E+08	1.146799	1.85E+08	2.77E+08	0.87
		D1200781-v2	maraging C250	1.90E+11	1.76E+09	0.150	16.316	9.19E-03	170	0.136	0.749	0.0145	8.07E+07	1.144109	9.23E+07	1.59E+08	1.146799	1.82E+08	2.74E+08	6.43
D1101885-v3	ITM Elliptical Baffle Suspension Assy	D1002340-v3	316 SS	1.93E+11	2.40E+08	0.150	16.381	0.009157	51	0.110	0.740	0.0095	3.70E+07	1.07467	3.98E+07	1.31E+08	1.108968	1.46E+08	1.85E+08	1.29
		D1002340-v3 except 0.135" dia	316 SS	1.93E+11	2.40E+08	0.150	16.381	0.009157	51	0.136	0.740	0.0145	2.42E+07	1.144109	2.77E+07	1.62E+08	1.146799	1.86E+08	2.14E+08	1.12
		D1002340-v3 except material change	maraging C250	1.90E+11	1.76E+09	0.150	16.381	0.009157	51	0.110	0.740	0.0095	3.70E+07	1.07467	3.98E+07	1.29E+08	1.108968	1.43E+08	1.83E+08	9.63
		D1002340-v3 except material change	410 SS, tempered at 453°C	2.00E+11	9.20E+08	0.150	16.381	0.009157	51	0.110	0.740	0.0095	3.70E+07	1.07467	3.98E+07	1.36E+08	1.108968	1.51E+08	1.91E+08	4.82
		D1200781-v2	maraging C250	1.90E+11	1.76E+09	0.150	16.381	0.009157	51	0.134	0.749	0.0141	2.49E+07	1.144109	2.85E+07	1.56E+08	1.146799	1.78E+08	2.07E+08	8.52
D0902617-v3	Manifold Cryopump Baffle Assy, ITM	D1001970-v3	302 SS	1.93E+11	2.40E+08	0.250	60.700	0.004119	314	0.157	0.700	0.0194	1.12E+08	1.238526	1.39E+08	8.91E+07	1.198248	1.07E+08	2.45E+08	0.98
D1003228-v2	Manifold Cryopump Baffle Assy, ETMy H1	D1001970-v3	304 SS	2.00E+11	2.05E+08	0.250	60.700	0.004119	314	0.157	0.700	0.0194	1.12E+08	1.238526	1.39E+08	9.24E+07	1.198248	1.11E+08	2.49E+08	0.82
D1003181-v2	Manifold Cryopump Baffle Assy, ETMx H1	D1001970-v3	316 SS	1.93E+11	2.40E+08	0.250	60.700	0.004119	314	0.157	0.700	0.0194	1.12E+08	1.238526	1.39E+08	8.91E+07	1.198248	1.07E+08	2.45E+08	0.98
		D1001970-v3 except material change	maraging C250	1.90E+11	1.76E+09	0.250	60.700	0.004119	314	0.157	0.700	0.0194	1.12E+08	1.238526	1.39E+08	8.78E+07	1.198248	1.05E+08	2.44E+08	7.24
		D1001970-v3 except material change	410 SS, annealed	2.00E+11	3.13E+08	0.250	60.700	0.004119	314	0.157	0.700	0.0194	1.12E+08	1.238526	1.39E+08	9.24E+07	1.198248	1.11E+08	2.49E+08	1.26
		D1001970-v3 except material change	410 SS, tempered at 453°C	2.00E+11	9.20E+08	0.250	60.700	0.004119	314	0.157	0.700	0.0194	1.12E+08	1.238526	1.39E+08	9.24E+07	1.198248	1.11E+08	2.49E+08	3.69
		D1001970-v3 except material change	414 SS, tempered at 453°C	2.00E+11	9.85E+08	0.250	60.700	0.004119	314	0.157	0.700	0.0194	1.12E+08	1.238526	1.39E+08	9.24E+07	1.198248	1.11E+08	2.49E+08	3.95

Notes:

1) The minimum Factor of Safety on yield, FS = 1.8 (per section 3.4.2 of E010613-v2)

2) In the ITM ACB and ITM Elliptical Baffle Suspension Assemblies, the flexure bending is limited by the D1001120-v2, Earthquake Stop Ring, which limits the motion of the D1002612-v2, Upper Tube

3) The torsional stress has not been calculated here! The torsional deflection of the ACB & ITM Elliptical Baffle is limited by D1002561 () and D1201235 ()

4) yield stress values for 302, 304 and 316 SS are for bar in annealed condition. While strain/work hardened SS could be used, residual stresses are likely to cause distortion during machining

5) Note that of the heat-treatable, martensitic stainless steel 400 series, all are permitted in the LIGO UHV except (a) 416 because of high sulfur content and (b) 414 must be reviewed