Column & Tube Elongation Chart

millimetres (mm) elongation per 30 metres of Column

HYDRAULIC THRUST kg	COLUMN DIAMETER mm -millimetres (inches)						
	80mm 3"	100mm 4"	125mm 5"	150mm 6"	200mm 8"	250mm 10"	300mm 12"
100	0.07	0.05	0.04	0.03			
200	0.15	0.11	0.09	0.06			
300	0.22	0.16	0.13	0.09	0.06		
400	0.29	0.21	0.17	0.13	0.09		
500	0.36	0.27	0.21	0.16	0.12	0.06	
600	0.44	0.32	0.25	0.19	0.13	0.08	
700	0.51	0.37	0.30	0.23	0.15	0.09	0.09
800	0.58	0.43	0.34	0.26	0.17	0.11	0.10
900	0.66	0.48	0.38	0.29	0.19	0.12	0.11
1,000	0.73	0.53	0.42	0.32	0.21	0.14	0.12
1,200	0.88	0.64	0.51	0.39	0.26	0.18	0.15
1,400	1.02	0.75	0.59	0.45	0.30	0.21	0.18
1,600	1.17	0.86	0.68	0.52	0.34	0.24	0.20
1,800	1.31	0.96	0.76	0.58	0.38	0.27	0.23
2,000	1.46	1.07	0.85	0.64	0.43	0.31	0.25
2,250		1.20	0.95	0.72	0.48	0.34	0.28
2,500		1.34	1.60	0.81	0.53	0.38	0.31
2,750		1.47	1.16	0.89	0.59	0.42	0.34
3,000		1.60	1.27	0.97	0.64	0.46	0.37
3,250			1.38	1.05	0.70	0.50	0.41
3,500			1.48	1.13	0.75	0.53	0.44
3,750			1.59	1.21	0.80	0.57	0.47
4,000			1.69	1.29	0.86	0.61	0.50
4,500			1.90	1.45	0.96	0.69	0.56
5,000				1.61	1.07	0.76	0.62
5,500				1.77	1.18	0.84	0.69
6,000				1.93	1.28	0.91	0.75
6,500				2.09	1.39	0.99	0.81
7,000				2.25	1.50	1.07	0.87
8,000					1.71	1.22	1.00
9,000					1.92	1.37	1.12
10,000					2.14	1.52	1.25
11,000					2.35	1.68	1.37
12,000					2.56	1.83	1.50
13,000						1.98	1.62
14,000						2.13	1.75
15,000						2.29	1.87
16,000						2.44	2.00
18,000						2.74	2.25
20,000							2.50
	32	38	38	50	64	76	90
	ENCLOSING TUBE DIAMETER mm						

Figures shown are based on standard pipe column and enclosing tube with nominal ID.
For open line shaft column multiple value by 1.3

Downthrust due to the hydraulic thrust of the pump causes the shaft and column to stretch after the pump is in operation.
Unless the impellers can be and are raised off the bottom of the bowls enough to allow for this stretch plus some running clearences,
the impellers will rub, causing the pump to wear and increase kW power required.
With the total hydraulic downthrust known and the Column Elongation determined from this Chart, the total stretch of the column shaft for the setting in question can be determined.
To find the net elongation subtract from shaft elongation the column elongation.

$$e = \frac{L \times 1000 \times HT \times 9.8}{E \times GSA}$$

e = elongation	(mm)
L = Shaft length	(m)
E = Modulas of elast.	(200×10^3 Mpa)
HT = Hydraulic thrust	(kg)
CSA = Cross Section Area	(mm^2)