



**THERMAL EXPANSION OF PIPE**  
IN INCHES PER 100 FEET

**Examples:**

A 3" steel pipe line is 138 feet long. Maximum temperature the line will encounter is 440°F. Lowest temperature is 20°F.

**Calculation:**

From the chart - the expansion of steel pipe at:  
440°F 3.595 inches per 100 feet of pipe  
20°F 0.148 inches per 100 feet of pipe  
Difference 3.447 inches per 100 feet of pipe

$$\frac{138 \times 3.447}{100} = 4.75" \text{ or approximately } 4\frac{3}{4}" \text{ total traverse}$$

A 4" stainless steel line is 50 feet long. Maximum temperature the line will encounter is approximately 580°F. Lowest temperature is approximately -180°F.

**Calculation:**

From the chart  
— the expansion of stainless steel pipe at:  
580°F 6.780 inches per 100 feet of pipe

— the contraction of stainless steel pipe at:  
-180°F -1.850 inches per 100 feet of pipe

Total Movement 8.630 inches per 100 feet of pipe

$$\frac{50 \times 8.630}{100} = 4.315 \text{ or approximately } 4 \frac{5}{16}" \text{ total traverse.}$$

Vacuum inches of HG

Pressure PSI Gauge

Temperature, Degrees Fahrenheit	Carbon and Carbon Molybdenum Steel		Wrought Iron	4 - 6% Cr Alloy Steel	12% Cr Stainless Steel	18 Cr - 8 Ni Stainless Steel	Copper	Brass	Aluminum 6061 Alloy	Monel Alloy 400
	Cast Iron									
- 320					1.770	3.110	2.975		3.960	2.600
- 300					1.670	2.930	2.805		3.710	2.440
- 280					1.570	2.750	2.635		3.460	2.280
- 260					1.470	2.570	2.465		3.210	2.120
- 240					1.370	2.390	2.295		2.960	1.960
- 220					1.270	2.210	2.125		2.710	1.800
- 200	1.058	1.282	1.289	1.250	1.170	2.030	1.955	2.065	2.460	1.640
- 180	0.982	1.176	1.183	1.150	1.070	1.850	1.782	1.890	2.220	1.480
- 160	0.891	1.066	1.073	1.030	0.970	1.670	1.612	1.705	1.970	1.320
- 140	0.797	0.948	0.955	0.970	0.870	1.480	1.428	1.508	1.730	1.150
- 120	0.697	0.826	0.833	0.800	0.750	1.300	1.235	1.308	1.470	0.980
- 100	0.593	0.698	0.705	0.700	0.630	1.090	1.040	1.098	1.220	0.820
- 80	0.481	0.563	0.570	0.550	0.520	0.880	0.835	0.888	0.980	0.660
- 60	0.368	0.428	0.435	0.430	0.400	0.670	0.630	0.673	0.740	0.490
- 40	0.248	0.288	0.295	0.290	0.270	0.450	0.421	0.452	0.490	0.320
- 20	0.127	0.145	0.152	0.145	0.130	0.225	0.210	0.227	0.250	0.170
0	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
20	0.128	0.148	0.180	0.140	0.140	0.223	0.238	0.233	0.340	0.197
30	0.209	0.230	0.280	0.234	0.234	0.356	0.366	0.373	0.540	0.315
40	0.270	0.300	0.350	0.280	0.280	0.446	0.451	0.466	0.680	0.394
50	0.410	0.448	0.540	0.430	0.430	0.669	0.684	0.690	1.010	0.591
60	0.550	0.580	0.710	0.500	0.600	0.892	0.896	0.920	1.350	0.790
70	0.680	0.753	0.887	0.650	0.750	1.115	1.134	1.150	1.690	0.985
80	0.830	0.910	1.058	0.800	0.900	1.338	1.366	1.390	2.020	1.180
90	0.970	1.064	1.240	0.950	1.050	1.545	1.590	1.625	2.360	1.380
100	1.110	1.200	1.420	1.100	1.220	1.784	1.804	1.865	2.680	1.580
110	1.240	1.360	1.580	1.250	1.370	2.000	2.051	2.100	3.030	1.770
120	1.390	1.520	1.750	1.400	1.520	2.230	2.296	2.340	3.380	1.970
130	1.480	1.610	1.870	1.500	1.600	2.361	2.428	2.467	3.590	2.090
140	1.530	1.680	1.940	1.550	1.675	2.460	2.516	2.580	3.720	2.170
150	1.670	1.840	2.120	1.720	1.825	2.680	2.756	2.830	4.050	2.360
160	1.820	2.020	2.300	1.880	2.000	2.920	2.985	3.070	4.390	2.560
170	1.970	2.180	2.470	2.050	2.150	3.150	3.218	3.315	4.720	2.760
180	2.130	2.350	2.670	2.200	2.320	3.390	3.461	3.565	5.070	2.950
190	2.268	2.530	2.850	2.370	2.470	3.615	3.696	3.820	5.410	3.150
200	2.430	2.700	3.040	2.530	2.625	3.840	3.941	4.065	5.740	3.350
210	2.590	2.880	3.230	2.700	2.780	4.100	4.176	4.320	6.080	3.550
220	2.750	3.060	3.425	2.860	2.980	4.346	4.424	4.560	6.420	3.740
230	2.910	3.230	3.620	3.010	3.130	4.580	4.666	4.825	6.770	3.940
240	3.090	3.421	3.820	3.180	3.300	4.800	4.914	5.080	7.100	4.140
250	3.250	3.595	4.020	3.350	3.470	5.050	5.154	5.340	7.440	4.340
260	3.410	3.784	4.200	3.530	3.650	5.300	5.408	5.600	7.770	4.530
270	3.570	3.955	4.400	3.700	3.800	5.540	5.651	5.925	8.110	4.730
280	3.730	4.151	4.600	3.860	4.000	5.800	5.906	6.120	8.440	4.920
290	3.900	4.342	4.810	4.040	4.150	6.050	6.148	6.380	8.780	5.120
300	4.080	4.525	5.020	4.200	4.340	6.280	6.410	6.650	9.130	5.320
310	4.250	4.730	5.220	4.400	4.500	6.520	6.646	6.920	9.460	5.520
320	4.430	4.930	5.430	4.560	4.640	6.780	6.919	7.170	9.800	5.710
330	4.600	5.130	5.620	4.750	4.850	7.020	7.184	7.440	10.140	5.910
340	4.790	5.330	5.840	4.920	5.020	7.270	7.432	7.715	10.490	6.110
350	4.970	5.530	6.050	5.100	5.180	7.520	7.689	7.980	10.820	6.300
360	5.150	5.750	6.258	5.300	5.350	7.770	7.949	8.240		6.500
370	5.330	5.950	6.470	5.480	5.550	8.020	8.196	8.515		6.700
380	5.520	6.160	6.670	5.650	5.700	8.280	8.472	8.780		6.890
390	5.710	6.360	6.880	5.850	5.900	8.520	8.708	9.050		7.090
400	5.900	6.570	7.100	6.030	6.040	8.780	8.999	9.324		7.290
410	6.090	6.790	7.320	6.220	6.280	9.050	9.256	9.600		7.490
420	6.280	7.000	7.530	6.410	6.480	9.300	9.532	9.870		7.680
430	6.470	7.230	7.730	6.610	6.680	9.580	9.788	10.150		7.880
440	6.660	7.450	7.960	6.800	6.890	9.820	10.068	10.425		8.080
450	6.850	7.660	8.180	7.000	7.090	10.100	10.308	10.690		8.280
460	7.049	7.970	8.400	7.190	7.300	10.370	10.610	10.975		8.470
470	7.248	8.100	8.630	7.380	7.500	10.630	10.971	11.250		8.670
480	7.460	8.340	8.870	7.580	7.720	10.900	11.156	11.545		8.860
490	7.668	8.540	9.070	7.770	7.950	11.180	11.421	11.815		9.090
500	7.862	8.770	9.300	7.970	8.140	11.460	11.707	12.120		9.260
510	8.073	8.990	9.520	8.170	8.350	11.730	11.976	12.420		9.460
520	8.300	9.220	9.740	8.360	8.550	12.000	12.269	12.720		9.650
530	8.510	9.420	9.970	8.550	8.750	12.260	12.543	13.080		9.850
540		9.650		8.750	12.550					
550		9.870		8.950	12.820					
560		10.080		9.150	13.100					
570		10.320		9.350	13.370					
580		10.570		9.540	13.620					
590		10.750		9.750	13.910					
600		10.980		9.950	14.170					
610		11.210		10.150	14.450					
620		11.430		10.360	14.720					
630		11.630		10.490	14.980					
640		11.870		10.750	15.260					
650		12.100		10.950	15.530					
660		12.330		11.150	15.810					
670		12.550		11.350	16.080					
680		12.750		11.550	16.340					
690		12.980		11.750	16.620					
700		13.210		11.950	16.900					
710		13.420		12.150	17.170					
720		13.650		12.350	17.430					
730		13.870		12.540	17.700					
740					17.980					
750					18.250					
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