

TABLE C1
TOTAL THERMAL EXPANSION , U.S. UNITS , FOR METALS¹

TOTAL LINEAR THERMAL EXPANSION BETWEEN 70 °F
AND INDICATED TEMPERATURE, IN / 100 FT

TEMP °F	MATERIAL							
	CARBON STEEL CARBON-MOLY- LOW-CHROME (THROUGH 3Cr-Mo)	5Cr-Mo THROUGH 9Cr-Mo	AUSTENITIC STAINLESS STEELS 18Cr-8Ni	12Cr 17Cr 27Cr	25Cr-20Ni	MONEL 67Ni-30Cu	3 1/2 Ni	36Ni
-425	...	...	...	...	...	...	...	-0.48
-400	...	...	...	...	...	...	...	-0.48
-375	...	...	...	...	...	...	...	-0.48
-350	...	...	...	...	...	...	...	-0.48
-325	-2.37	-2.22	-3.85	-2.04	...	-2.62	-2.25	-0.47
-300	-2.24	-2.10	-3.63	-1.92	...	-2.50	-2.17	-0.44
-275	-2.11	-1.98	-3.41	-1.80	...	-2.38	-2.07	-0.42
-250	-1.98	-1.86	-3.19	-1.68	...	-2.26	-1.96	-0.38
-225	-1.85	-1.74	-2.96	-1.57	...	-2.14	-1.86	-0.35
-200	-1.71	-1.62	-2.73	-1.46	...	-2.02	-1.76	-0.31
-175	-1.58	-1.50	-2.50	-1.35	...	-1.90	-1.62	-0.28
-150	-1.45	-1.37	-2.27	-1.24	...	-1.79	-1.48	-0.24
-125	-1.30	-1.23	-2.01	-1.11	...	-1.59	-1.33	-0.20
-100	-1.15	-1.08	-1.75	-0.98	...	-1.38	-1.17	-0.18
-75	-1.00	-0.94	-1.50	-0.85	...	-1.18	-1.01	-0.16
-50	-0.84	-0.79	-1.24	-0.72	...	-0.98	-0.84	-0.12
-25	-0.68	-0.63	-0.98	-0.57	...	-0.77	-0.67	-0.08
0	-0.49	-0.46	-0.72	-0.42	...	-0.57	-0.50	-0.06
25	-0.32	-0.30	-0.46	-0.27	...	-0.37	-0.32	-0.02
50	-0.14	-0.13	-0.21	-0.12	...	-0.20	-0.15	-0.01
70	0	0	0	0	0	0	0	0
100	0.23	0.22	0.34	0.20	0.32	0.28	0.23	0.02
125	0.42	0.40	0.62	0.36	0.58	0.52	0.42	0.05
150	0.61	0.58	0.90	0.53	0.84	0.75	0.61	0.06
175	0.80	0.76	1.18	0.69	1.10	0.99	0.81	0.08
200	0.99	0.94	1.46	0.86	1.37	1.22	1.01	0.10
225	1.21	1.13	1.75	1.03	1.64	1.46	1.21	0.13
250	1.40	1.33	2.03	1.21	1.91	1.71	1.42	0.17
275	1.61	1.52	2.32	1.38	2.18	1.96	1.63	0.20
300	1.82	1.71	2.61	1.56	2.45	2.21	1.84	0.24
325	2.04	1.90	2.90	1.74	2.72	2.44	2.05	0.30
350	2.26	2.10	3.20	1.93	2.99	2.68	2.26	0.36
375	2.48	2.30	3.50	2.11	3.26	2.91	2.47	0.42
400	2.70	2.50	3.80	2.30	3.53	3.25	2.69	0.48
425	2.93	2.72	4.10	2.50	3.80	3.52	2.91	0.56
450	3.16	2.93	4.41	2.69	4.07	3.79	3.13	0.66
475	3.39	3.14	4.71	2.89	4.34	4.06	3.35	0.76
500	3.62	3.35	5.01	3.08	4.61	4.33	3.58	0.84
525	3.86	3.58	5.31	3.28	4.88	4.61	3.81	0.96
550	4.11	3.80	5.62	3.49	5.15	4.90	4.04	1.08

THERMAL EXPANSION DATA

-425 °F - 550 °F

ID. NO.

Error! AutoText entry not defined.

ISSUE

2

SHEET

1 of 4

DOC.NO.

BN-DS-C33

TABLE C1 (CONT'D)**TOTAL THERMAL EXPANSION , U.S. UNITS , FOR METALS¹**

TOTAL LINEAR THERMAL EXPANSION BETWEEN 70 °F

AND INDICATED TEMPERATURE, IN / 100 FT

TEMP °F	MATERIAL							
	CARBON STEEL CARBON-MOLY- LOW-CHROME (THROUGH 3Cr-Mo)	5Cr-Mo THROUGH 9Cr-Mo	AUSTENITIC STAINLESS STEELS 18Cr-8Ni	12Cr 17Cr 27Cr	25Cr-20Ni	MONEL 67Ni-30Cu	3 1/2 Ni	36Ni
575	4.35	4.02	5.93	3.69	5.42	5.18	4.27	1.20
600	4.60	4.24	6.24	3.90	5.69	5.46	4.50	1.32
625	4.86	4.47	6.55	4.10	5.96	5.75	4.74	...
650	5.11	4.69	6.87	4.31	6.23	6.05	4.98	...
675	5.37	4.92	7.18	4.52	6.50	6.34	5.22	...
700	5.63	5.14	7.50	4.73	6.77	6.64	5.46	...
725	5.90	5.38	7.82	4.94	7.04	6.94	5.70	...
750	6.16	5.62	8.15	5.16	7.31	7.25	5.94	...
775	6.43	5.86	8.47	5.38	7.58	7.55	6.18	...
800	6.70	6.10	8.80	5.60	7.85	7.85	6.43	...
825	6.97	6.34	9.13	5.82	8.15	8.16	6.68	...
850	7.25	6.59	9.46	6.05	8.45	8.48	6.93	...
875	7.53	6.83	9.79	6.27	8.75	8.80	7.18	...
900	7.81	7.07	10.12	6.49	9.05	9.12	7.43	...
925	8.08	7.31	10.46	6.71	9.35	9.44	7.68	...
950	8.35	7.56	10.80	6.94	9.65	9.77	7.93	...
975	8.62	7.81	11.14	7.17	9.95	10.09	8.17	...
1000	8.89	8.06	11.48	7.40	10.25	10.42	8.41	...
1025	9.17	8.30	11.82	7.62	10.55	10.75	...	...
1050	9.46	8.55	12.16	7.95	10.85	11.09	...	...
1075	9.75	8.80	12.50	8.18	11.15	11.43	...	...
1100	10.04	9.05	12.84	8.31	11.45	11.77	...	...
1125	10.31	9.28	13.18	8.53	11.78	12.11	...	...
1150	10.57	9.52	13.52	8.76	12.11	12.47	...	...
1175	10.83	9.76	13.86	8.98	12.44	12.81	...	...
1200	11.10	10.00	14.20	9.20	12.77	13.15	...	...
1225	11.38	10.26	14.54	9.42	13.10	13.50	...	...
1250	11.66	10.53	14.88	9.65	13.43	13.86	...	...
1275	11.94	10.79	15.22	9.88	13.76	14.22	...	...
1300	12.22	11.06	15.56	10.11	14.09	14.58	...	...
1325	12.50	11.30	15.90	10.33	14.39	14.94	...	...
1350	12.78	11.55	16.24	10.56	14.69	15.30	...	...
1375	13.06	11.80	16.58	10.78	14.99	15.66	...	...
1400	13.34	12.05	16.92	11.01	15.29	16.02	...	...
1425	...	...	17.30	...	...	...	...	...
1450	...	...	17.69	...	...	...	...	...
1475	...	...	18.08	...	...	...	...	...
1500	...	...	18.47	...	...	...	...	...

NOTE :

(1) FOR CODE REFERENCES TO THIS APPENDIX, SEE
 PARA 319.3.1 THESE DATA ARE FOR USE IN THE ABSENCE
 OF MORE APPLICABLE DATA.
 IT IS THE DESIGNER' S RESPONSIBILITY TO VERIFY THAT
 MATERIALS ARE SUITABLE FOR THE INTENDED SERVICE AT
 THE TEMPERATURES SHOWN

THERMAL EXPANSION DATA

575 °F - 1500 °F

ID. NO.

Error! AutoText entry not defined.

ISSUE

2

SHEET

2 of 4

DOC.NO.

BN-DS-C33

TABLE C1**TOTAL THERMAL EXPANSION , U.S. UNITS , FOR METALS¹**

TOTAL LINEAR THERMAL EXPANSION BETWEEN 70 °F
AND INDICATED TEMPERATURE, IN / 100 FT

TEMP °F	MATERIAL							
	ALUMINUM	GRAY CAST IRON	BRONZE	BRASS	70Cu-30Ni	Ni-Fe-Cr	Ni-Cr-Fe	DUCTILE IRON
-425	...	...	...	...	...	...	...	...
-400	...	...	...	...	...	...	...	...
-375	...	...	...	...	...	...	...	...
-350	...	...	...	...	...	...	...	...
-325	-4.68	...	-3.98	-3.88	-3.15	...	...	...
-300	-4.46	...	-3.74	-3.64	-2.87	...	...	...
-275	-4.21	...	-3.50	-3.40	-2.70	...	...	...
-250	-3.97	...	-3.26	-3.16	-2.53	...	...	...
-225	-3.71	...	-3.02	-2.93	-2.36	...	...	...
-200	-3.44	...	-2.78	-2.70	-2.19	...	...	-1.51
-175	-3.16	...	-2.54	-2.47	-2.12	...	...	-1.41
-150	-2.88	...	-2.31	-2.24	-1.95	...	...	-1.29
-125	-2.57	...	-2.06	-2.00	-1.74	...	...	-1.16
-100	-2.27	...	-1.81	-1.76	-1.53	...	...	-1.04
-75	-1.97	...	-1.56	-1.52	-1.33	...	...	-0.91
-50	-1.67	...	-1.32	-1.29	-1.13	...	...	-0.77
-25	-1.32	...	-1.25	-1.02	-0.89	...	...	-0.62
0	-0.97	...	-0.77	-0.75	-0.66	...	...	-0.46
25	-0.63	...	-0.49	-0.48	-0.42	...	...	-0.23
50	-0.28	...	-0.22	-0.21	-0.19	...	...	-0.14
70	0	0	0	0	0	0	0	0
100	0.46	0.21	0.36	0.35	0.31	0.28	0.26	0.21
125	0.85	0.38	0.66	0.64	0.56	0.52	0.48	0.39
150	1.23	0.55	0.96	0.94	0.82	0.76	0.70	0.57
175	1.62	0.73	1.26	1.23	1.07	0.99	0.92	0.76
200	2.00	0.90	1.56	1.52	1.33	1.23	1.15	0.94
225	2.41	1.08	1.86	1.83	1.59	1.49	1.38	1.13
250	2.83	1.27	2.17	2.14	1.86	1.76	1.61	1.33
275	3.24	1.45	2.48	2.45	2.13	2.03	1.85	1.53
300	3.67	1.64	2.79	2.76	2.40	2.30	2.09	1.72
325	4.09	1.83	3.11	3.08	2.68	2.59	2.32	1.93
350	4.52	2.03	3.42	3.41	2.96	2.88	2.56	2.13
375	4.95	2.22	3.74	3.73	3.24	3.18	2.80	2.36
400	5.39	2.42	4.05	4.05	3.52	3.48	3.05	2.56
425	5.83	2.62	4.37	4.38	...	3.76	3.29	2.79
450	6.28	2.83	4.69	4.72	...	4.04	3.53	3.04
475	6.72	3.03	5.01	5.06	...	4.31	3.78	3.28
500	7.17	3.24	5.33	5.40	...	4.59	4.02	3.54
525	7.63	3.46	5.65	5.75	...	4.87	4.27	3.76
550	8.10	3.67	5.98	6.10	...	5.16	4.52	3.99

THERMAL EXPANSION DATA

-425 °F - 550 °F

ID. NO.

Error! AutoText entry not defined.

ISSUE

2

SHEET

3 of 4

DOC.NO.

BN-DS-C33

TABLE C1 (CONT'D)

TOTAL THERMAL EXPANSION , U.S. UNITS , FOR METALS¹

TOTAL LINEAR THERMAL EXPANSION BETWEEN 70 °F
AND INDICATED TEMPERATURE, IN / 100 FT

TEMP °F	MATERIAL							
	ALUMINUM	GRAY CAST IRON	BRONZE	BRASS	70Cu-30Ni	Ni-Fe-Cr	Ni-Cr-Fe	DUCTILE IRON
575	8.56	3.89	6.31	6.45	...	5.44	4.77	4.22
600	9.03	4.11	6.64	6.80	...	5.72	5.02	4.44
625	...	4.34	6.96	7.16	...	6.01	5.27	4.66
650	...	4.57	7.29	7.53	...	6.30	5.53	4.90
675	...	4.80	7.62	7.89	...	6.58	5.79	5.14
700	...	5.03	7.95	8.26	...	6.88	6.05	5.39
725	...	5.26	8.28	8.64	...	7.17	6.31	5.60
750	...	5.50	8.62	9.02	...	7.47	6.57	5.85
775	...	5.74	8.96	9.40	...	7.76	6.84	6.10
800	...	5.98	9.30	9.78	...	8.06	7.10	6.35
825	...	6.22	9.64	10.17	...	8.35	...	6.59
850	...	6.47	9.99	10.57	...	8.66	...	6.85
875	...	6.72	10.33	10.96	...	8.95	...	7.09
900	...	6.97	10.68	11.35	...	9.26	...	7.35
925	...	7.23	11.02	11.75	...	9.56	...	7.64
950	...	7.50	11.37	12.16	...	9.87	...	7.86
975	...	7.76	11.71	12.57	...	10.18	...	8.11
1000	...	8.02	12.05	12.98	...	10.49	...	8.35
1025	12.40	13.39	...	10.80	...	...
1050	12.76	13.81	...	11.11	...	...
1075	13.11	14.23	...	11.42	...	...
1100	13.47	14.65	...	11.74	...	...
1125	12.05	...	...
1150	12.38	...	...
1175	12.69	...	...
1200	13.02	...	...
1225	13.36	...	...
1250	13.71	...	...
1275	14.04	...	...
1300	14.39	...	...
1325	14.74	...	...
1350	15.10	...	...
1375	15.44	...	...
1400	15.80	...	...
1425	16.16	...	...
1450	16.53	...	...
1475	16.88	...	...
1500	17.25	...	...

THERMAL EXPANSION DATA

575 °F - 1500 °F

ID. NO.

Error! AutoText entry not defined.

ISSUE

2

SHEET

4 of 4

DOC.NO.

BN-DS-C33