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TEST REPORT

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ASTM E119-00a Fire Tests of Building Construction and Materials Modified*

SMALL SCALE STEEL COLUMNS

Project No. 16539-125055

*Modified in that columns were less than the required 8-ft long for full-scale qualification

FIRE RESISTANCE TEST OF CONTEGO'S PASSIVE FIRE BARRIER LATEX OVER VARIOUS STRUCTURAL STEEL COLUMNS

July 8, 2005

Prepared for:

Contego International, Inc.
P.O. Box 49
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Abstract

Numerous steel “I” sections of various sizes were instrumented with thermocouples, clad with Contego’s Passive Fire Barrier Latex thin film intumescent coating, and tested to meet the requirements of ASTM E119-00a Standard Test Methods for Fire Tests of Building Construction and Materials for various fire endurance ratings as presented herein. The structural elements were all non-loadbearing, and 48” in length. The results of this testing were entered into a regression analysis table, following the methodology published by the Association of Structural Fire Protection Contractors and Manufactures Limited (ASFPCM) and Constructional Steel Research and Development Organization (Constrado), Part 4 "Fire Testing and Assessment Procedures, Typical Programmed Testing (Yellow Book). This summary correlates the size of the column, the thickness of the applied fire proofing and the time necessary to reach the limiting temperature as prescribed by the ASTM E119 procedure (1000°F average/1200°F single maximum limiting temperature).

Michael E. Dey
Manager, Fire Resistance Date: July 8, 2005

Reviewed and approved:

Deggary N. Priest
Chief Engineer and Laboratory Operations Manager Date: July 8, 2005

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INTRODUCTION[1]

The test specimen identification is as provided by the client and Intertek Testing Services NA, Inc. accepts no responsibility for any inaccuracies therein. Intertek Testing Services NA, Inc. did not select the specimen and has not verified the
composition, manufacturing techniques or quality assurance procedures

"The performance of walls, columns, floors, and other building members under fire exposure conditions is an item of major importance in securing constructions that are safe, and that are not a menace to neighboring structures nor to the public. Recognition of this is registered in the codes of many authorities, municipal and other. It is important to secure balance of the many units in a single building, and of buildings of like character and use in a community; and also to promote uniformity in requirements of various authorities throughout the country. To do this it is necessary that the fire-resistive properties of materials and assemblies be measured and specified according to a common standard expressed in terms that are applicable alike to a wide variety of materials, situations, and conditions of exposure.

Such a standard is found in the methods that follow. They prescribe a standard exposing fire of controlled extent and severity. Performance is defined as the period of resistance to standard exposure elapsing before the first critical point in behavior is observed. Results are reported in units in which field exposures can be judged and expressed.

The methods may be cited as the "Standard Fire Tests," and the performance or exposure shall be expressed as"2-h,""6-h,""1/2-h," etc.

When a factor of safety exceeding that inherent in the test conditions is desired, a proportional increase should be made in the specified time-classification period.

The ASTM E119 test procedure is identical or very similar to the following standard test methods:

UL 263
UBC 7-1
NFPA 251
ANSI A2.1

1. Scope

1.1 These methods are applicable to assemblies of masonry units and to composite assemblies of structural materials for buildings, including bearing and other walls and partitions, columns, girders, beams, slabs, and composite slab and beam assemblies for floors and roofs. They are

[1] American Society for Testing and Materials, 2000 Annual Book of Standards, ASTM E119-00a Standard Methods of FIRE TESTS OF BUILDING CONSTRUCTION AND MATERIALS.

also applicable to other assemblies and structural units that constitute permanent integral parts of a finished building.

1.2 It is the intent that classifications shall register performance during the period of exposure and shall not be construed as having determined suitability for use after fire exposure.

1.3 *This standard should be used to measure and describe the properties of materials, products, or assemblies in response to heat and flame under controlled laboratory conditions and should not be used to describe or appraise the fire hazard or fire risk of materials, products, or assemblies under actual fire conditions. However, results of this test may be used as elements of a fire risk assessment which takes into account all of the factors which are pertinent to an assessment of the fire hazard of a particular end use.*

1.4 The results of these tests are one factor in assessing fire performance of building construction and assemblies. These methods prescribe a standard fire exposure for comparing the performance of building construction assemblies. Application of these test results to predict the performance of actual building construction requires careful evaluation of test conditions.

2. Significance

2.1 This standard is intended to evaluate the duration for which the types of assemblies noted in 1.1 will contain a fire, or retain their structural integrity or exhibit both properties dependent upon the type of assembly involved during a predetermined test exposure.

2.2 The test exposes a specimen to a *standard* fire *exposure* controlled to achieve specified temperatures throughout a specified time period. In some instance, the *fire exposure* may be followed by the application of a *specified standard* fire hose stream. The exposure, however, may not be representative of all fire conditions which may vary with changes in the amount, nature and distribution of fire loading, ventilation, compartment size and configuration, and heat sink characteristics of the compartment. It does, however, provide a relative measure of fire performance of comparable assemblies under these specified fire exposure conditions. Any variation from the construction or conditions (that is, size, method of assembly, and materials) that are tested may substantially change the performance characteristics of the assembly.

2.3 The test standard provides for the following:

2.3.1 In walls, partitions and floor or roof assemblies:

2.3.1.1 Measurement of the transmission of heat.

2.3.1.2 Measurement of the transmission of hot gases through the assembly, sufficient to ignite cotton waste.

2.3.1.3 For load bearing elements, measurement of the load carrying ability of the *test specimen* during the test exposure.

2.3.2 For individual load bearing assemblies such as beams and columns: Measurement of the load carrying ability under the test exposure with some consideration for the end support

conditions (that is, restrained or not restrained).

2.4 The test standard does not provide the following:

2.4.1 Full information as to performance of assemblies constructed with components or lengths other than those tested.

2.4.2 Evaluation of the degree by which the assembly contributes to the fire hazard by generation of smoke, toxic gases, or other products of combustion.

2.4.3 Measurement of the degree of control or limitation of *the passage of* smoke or products of combustion through the assembly.

2.4.4 Simulation of the fire behavior of joints between building elements such as floor-wall or wall-wall, etc., connections.

2.4.5 Measurement of flame spread over surface of tested element.

2.4.6 The effect of fire endurance of conventional openings in the assembly, that is electrical receptacle outlets, plumbing pipe, etc., unless specifically provided for in the construction tested."

TEST PROCEDURE

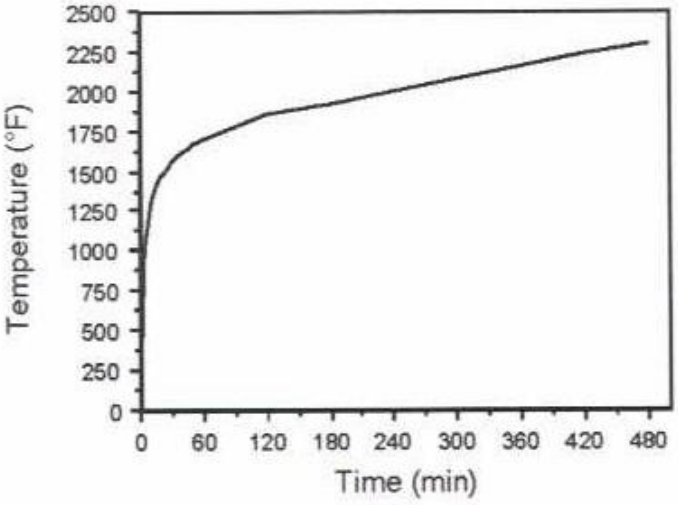
Test Furnace

The 12’ x 18’ x 7’ deep horizontal test furnace is designed to allow the test specimen to be uniformly exposed to the specified time-temperature conditions. It is fitted with 12 symmetrically-located premixed propane/air gas burners, located six feet below the top ledge of the furnace, and designed to allow an even heat flux distribution across the under surface of a horizontal test specimen. Furnace pressures may be maintained at any value from +0.05” W.C. to –0.05” W.C. at the exposed surface of the test article. The burners, when fully fired, will deliver 20 Mbtu/hr total heat input. The furnace consists of a structural steel frame, lined with sheet metal and insulated with a six-inch thick layer of ceramic fiber. One wall of the furnace contains a personnel door to allow access to the inside with the test article in place.

12’ x 18’ horizontal test furnace

The temperature within the furnace is determined to be the mathematical average of thermocouples located symmetrically within the furnace and positioned twelve inches away from the exposed face of the test specimen. The materials used in the construction of these thermocouples are those suggested in the test standard. During the performance of a fire exposure test, the furnace temperatures are recorded every 6 seconds and displayed for the furnace operator to allow control along the specified temperature curve.

The fire exposure is controlled to conform with the standard time-temperature curve shown in Figure 1, as determined by the table below:



Time (min)	Temperature (°F)
0	68
5	1000
10	1300
20	1462
30	1550
60	1700
90	1792
120	1850
180	1925
240	2000
300	2075
360	2150
420	2225
480	2300

Figure 1

The furnace interior temperature during a test is controlled such that the area under the time•temperature curve is within 10% of the corresponding area under the standard time•temperature curve for 1 hour or less tests, 7.5% for those less than 2 hours and 5% for those tests of 2 hours or more duration.

ALTERNATIVE TEST OF PROTECTION FOR STRUCTURAL STEEL COLUMNS

22. Application

22.1 This alternative test procedure is used to evaluate the protection of steel columns without application of design load, provided that the protection material is not required by design to function structurally in resisting loads.

23. Size and Characteristics of Specimen

23.1 The length of the protected column shall be at least 8 ft (2.4 m). The column shall be vertical during the fire exposure.

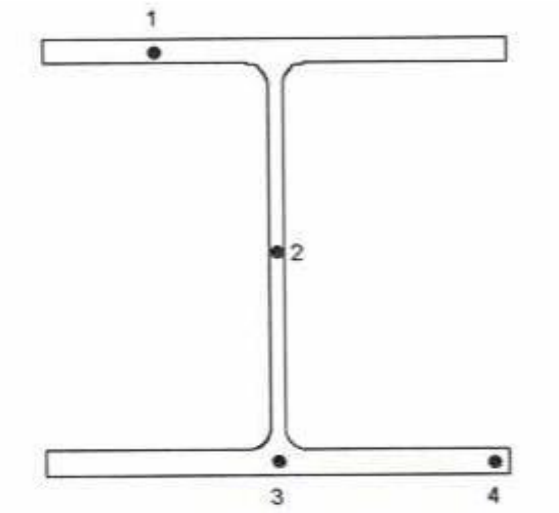
23.2 Restrain the applied protection material against longitudinal temperature expansion greater than that of the steel column with rigid steel plates or reinforced concrete attached to the ends of the steel column before the protection is applied. The size of the plates or amount of concrete shall provide direct bearing for the entire transverse area of the protection material.

23.3 Provide the ends of the specimen, including the means for restraint, with thermal insulation to limit direct heat transfer from the furnace.

24. Temperature Measurement

24.1 Measure the temperature of the steel with not fewer than three thermocouples at each of four levels. The upper and lower levels shall be 2 ft (0.6 m) from the ends of the steel column, and the two intermediate levels shall be equally spaced. For situations in which the protection material thickness is not uniform along the specimen length, at least one of the levels at which temperatures are measured shall include the point of minimum cover. Place the thermocouples at each level to measure temperatures of the component elements of the steel section.

Note: The temperatures at the interior of structural steel elements were monitored using 1.5 mm ø inconel stainless steel sheathed type K thermocouples inserted into appropriately sized holes drilled to the center of each section. Such thermocouples were located at the midheight of each column. The exact thermocouple locations are shown below.



25. Exposure to Fire

25.1 Throughout the fire endurance test expose the specimen to fire on all sides for its full length.

26. Conditions of Acceptance

26.1 Regard the test as successful if the transmission of heat through the protection during the period of fire exposure for which the protection during the period of fire exposure for which classification is desired does not raise the average (arithmetical) temperature of the steel at any one of the four levels above 1000°F (538°C), or does not raise the

temperature above 1200°F (649°C) at any one of the measured points.

Correction Factor

When the indicated resistance period is 1/2 h or over, determined by the failure criteria of the standard, a correction shall be applied for variation of the furnace exposure from that prescribed, where it will affect the classification. This is to be done by multiplying the indicated period by two thirds of the difference in area between the curve of average furnace temperature and the standard curve for the first three fourths of the period and dividing the product by the area between the standard curve and a base line of 68°F (20°C) for the same part of the indicated period, the latter area increased by 3240°F•min to compensate for the thermal lag of the furnace thermocouples during the first part of the test. For a fire exposure in the test higher than standard, the indicated resistance period shall be increased by the amount of the correction. For a fire exposure in the test lower than standard, the indicated resistance period shall be similarly decreased for fire exposure below standard. The correction is accomplished by mathematically adding the correction factor, *C*, to the indicated resistance period.

The correction can be expressed by the following equation:

$$C = \frac{2\,I\,(A - A_s)}{3\,(A_s + L)}$$

where:

C = correction in the same units as *I*,
I = indicated fire-resistance period,
A = area under the curve of indicated average furnace temperature for the first three fourths of the indicated period,
A_s = area under the standard furnace curve for the same part of the indicated period, and
L = lag correction in the same units as *A* and A_s (54°F•h or 30°C•h (3240°F•min or 1800°C•min))

TEST SPECIMEN CONSTRUCTION

The test specimen identification is as provided by the client and Intertek Testing Services NA, Inc. accepts no responsibility for any inaccuracies therein. Intertek Testing Services NA, Inc. did not select the specimen and has not verified the
composition, manufacturing techniques or quality assurance procedures

Five 4-ft. long “I” shaped steel sections were utilized in this test program. There were eight items in total, but three were used for research only and are not reported on here.

The five steel sections were purchased and instrumented by Laboratory personnel. Dan French of Contego International, Inc. applied the Passive Fire Barrier Latex coating at the Laboratory's facility. Laboratory personnel witnessed the application of material and verified the thickness of the fire protection material. The bottoms of each column were fitted with rigid steel as a means of restraint and the tops were butted against the insulated furnace lid.

Column ID

ID NUMBER	COLUMN SIZE	AVG. COATING THICKNESS (mils) (does not include 5 mils of primer)
3	W10 x 49	76
4	W12 x 106	57
5	W8 x 31	50
6	W8 x 31	68
7	W12 x 106	74

Thickness verification sheets can be found in Appendix A: Thickness Maps.

Preparation Of Test Articles

All columns were grit blasted to a surface cleanliness of SSPC 6 (commercial blast) with a minimum anchor pattern of 0.002" (2 mils). The sections were primed with a single component red alkyd primer to a dry film thickness of 0.005" (5 mils).

The Contego coating was mixed so as to remove any settled pigment from the bottom of the pail and re-disperse it into the material evenly. The material was then spray applied in as many passes as necessary to achieve the final thickness.

TEST RESULTS AND OBSERVATIONS

The test was conducted on June 23, 2005.

The test articles were placed into the Laboratory's large horizontal furnace and all thermocouples connected to the data acquisition system and their outputs verified. Photographs were taken, the furnace thermocouple positions checked, and the furnace was fired. The ambient temperature was 79F with a relative humidity of 82%. The furnace pressure was maintained so that the neutral pressure plane was at the top of the specimen.

The table indicates the time (in minutes) at which the indicated temperature (in °F) was reached.

ID NO.	COLUMN SIZE	HP/A	Time to 1000° F Avg.	Time to 1200° F Max	Thk. (mils)
3	W10 x 49	162	87	103	76
4	W12 x 106	93	92	107	57
5	W8 x 31	205	58	67	50
6	W8 x 31	205	70	82	68
7	W12 x 106	93	107	N/A*	74

Listings and plots of the furnace control temperatures and all specimen unexposed temperatures may be found in Appendix B: Thermocouple Data. Photographic documentation of the test has been included in Appendix C: Photographs.

*The maximum steel temperature did not exceed 1200 degrees during the 121-minute test.

During the test, the char layer started developing on the columns after approximately three minutes, and was fully developed by approximately thirty minutes. The char layer turned from black to white over time and seemed to remain sufficiently in place on the test articles that were visible through the viewing ports on the furnace. The furnace was extinguished after 2 hours and the insulated lid removed to allow the test items to cool.

In accordance with the E119 test standard, a calculation for any correction to the indicated fire resistance period was done. The correction factor was then mathematically added to the indicated fire resistance period, yielding the fire resistance period achieved by this specimen:

ITEM	DESCRIPTION	TEST VALUE
C	correction factor	0.00 min (0 seconds)
I	indicated fire-resistance period	121 min
A	area under the curve of indicated average furnace temperature for the first three fourths of the indicated period	132 726°F•min
As	area under the standard furnace curve for the same part of the indicated period	132 729°F•min
L	lag correction	3240°F•min
	FIRE RESISTANCE PERIOD ACHIEVED BY THESE SPECIMENS ==>	121

Note: The standard specifies that the fire resistance be determined to the nearest integral minute. Consequently, if the correction factor is less than 30 seconds, and the test specimen met the criteria for the full indicated fire resistance period, no correction is deemed necessary. That was the case for this project.

CONCLUSIONS

The test specimen identification is as provided by the client and Intertek Testing Services NA, Inc. accepts no responsibility for any inaccuracies therein. Intertek Testing Services NA, Inc. did not select the specimen and has not verified the
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BACKGROUND ON MULTIPLE LINEAR REGRESSION METHOD

Equation 1 describes the mathematical approach for determining the coefficients which cause the equation to fit the data, using standard statistical methods. Once these coefficients have been determined, and their degree of fit deemed adequate, Equation 2 is used to interpolate any values of thickness required to obtain a given fire resistance on a specific beam or column size.

$$t = C_0 + C_1 dX + C_2 \frac{dX}{Hp/A} \qquad \text{Eqn (1)}$$

Where:
t = Fire resistance time, min.
dX = Thickness of the cladding, mm
Hp = Heated perimeter of the structural steel item, m
A = Cross-sectional area of structural steel item, m^2
Hp/A = Heated perimeter over cross-sectional area, m^{-1}
C_0 = Coefficient 0
C_1 = Coefficient 1
C_2 = Coefficient 2
Rearranging Eqn (1) and solving for thickness yields Eqn (2), below:

$$dX = \frac{t - C_0}{\left(\frac{C2}{Hp/A} + C_1 \right)} \qquad \text{Eqn (2)}$$

r the coefficients using the data from the five columns tested in this program

yields the following (using a temperature criteria of 1000°F as this example):

STATISTICAL PROPERTY	CALCULATED VALUE
Coefficient0:	23.9978
Std Err of Y Est:	2.9064
R Squared:	0.9885
No. of Observations:	5
Degrees of Freedom:	2
Coefficient1:	12.4170
Std Err of Coef.:	5.8498
Coefficient2:	3077.6157
Std Err of Coef.:	296.0468
F statistic:	85.8243

Then, using these calculated coefficients, a table of fire endurance ratings as a function of steel size and Contego Passive Fire Barrier Latex intumescent coating thickness can be generated as shown on the following page.

Contego Fire Barrier Latex REGRESSION ANALYSIS

CRITICAL TEMPERATURE = 1000°F

Critical temp.:
1000F

Article Type: I-sections Columns/Beam
Test Standard: ASTM E119

		FIRE RESISTANCE TIME IN MINUTES							
Hp/A	W/D	60 min		75 min		90 min		107 min	
1/m	lb/ft/in	mm	mils	mm	mils	mm	mils	mm	mils
93	1.44	0.791	31	1.121	44	1.450	57	1.880	74
97	1.38	0.816	32	1.155	45	1.495	59		
101	1.32	0.839	33	1.189	47	1.539	61		
105	1.27	0.863	34	1.222	48	1.582	62		
109	1.23	0.886	35	1.255	49	1.624	64		
113	1.18	0.908	36	1.286	51	1.665	66		
117	1.14	0.930	37	1.317	52	1.705	67		
121	1.10	0.951	37	1.347	53	1.744	69		
125	1.07	0.972	38	1.377	54	1.782	70		
129	1.04	0.992	39	1.406	55	1.820	72		
133	1.01	1.013	40	1.434	56	1.856	73		
137	0.98	1.032	41	1.462	58	1.892	74		
141	0.95	1.051	41	1.489	59	1.927	76		
145	0.92	1.070	42	1.516	60	1.962	77		
149	0.90	1.089	43	1.542	61	1.996	79		
153	0.87	1.107	44	1.568	62	2.029	80		
157	0.85	1.124	44	1.593	63	2.061	81		
161	0.83	1.142	45	1.617	64	2.093	82		
165	0.81	1.159	46	1.642	65				
169	0.79	1.175	46	1.665	66				
173	0.77	1.192	47	1.688	66				
177	0.76	1.208	48	1.711	67				
181	0.74	1.224	48	1.734	68				
185	0.72	1.239	49	1.756	69				
189	0.71	1.254	49	1.777	70				
193	0.69	1.269	50	1.798	71				
197	0.68	1.284	51	1.819	72				
201	0.67	1.298	51	1.839	72				
205	0.65	1.313	52	1.859	73				

R-SQUARED = 0.988482

APPENDIX A

THICKNESS MAPS

75 mil W10x49

1	2	3	4	5	6	7	8	9	10	11	12
86	67	81	77	81	90	87	67	85	68	80	76
75	82	78	78	80	82	77	78	64	85	84	70
79	68	75	87	73	99	78	76	95	88	96	84
83	83	89	86	79	99	92	87	74	95	96	89
89	69	68	86	67	76	84	83	81	90	81	88
75	77		96	51	83	86	60		86		92
79			97			86			91		80
87			73			69			87		
66			97			70			84		
67									83		
									73		
									73		

Avg	79	74	78	86	72	88	81	75	80	84	87	83
St. Dev.	10											
Total Avg minus primer	81											
Contego dft	5											
	76											

75 mil W12x106

1	2	3	4	5	6	7	8	9	10	11	12
84	70	49	76	73	84	80	86	72	77	72	76
79	84	73	75	86	83	90	92	77	80	67	78
89	88	69	79	75	82	93	73	80	90	83	76
85	81	67	86	84	72	84	76	86	82	77	76
84	58	51	84	80	54	85		69	94	79	83
88	67		80			86			90		78
84			83			86			104		60
80			85			83			92		
67			93						96		
60			83						73		
			75						90		
			79								
			91								

Avg	80	75	62	82	80	75	86	82	77	88	76	75
St. Dev.	10											
Total Avg	79											
minus primer	5											
Contego dft	74											

75 mil W8x31

1	2	3	4	5	6	7	8	9	10	11	12
78	62	86	68	48	75	69	71	67	65	76	75
69	76	87	69	48	73	71	75	75	71	79	74
72	73	66	93	71	83	72	69	79	79	105	73
74	60	85	79	86	81	70	69	77	71	94	72
75		69	66	78	65	79	57	83	74	93	
73			86			65	54		76		
79			72			85			83		
65			71			57			57		
63			63			70			57		
71			71						74		
62			75								
66											

Avg	71	68	79	74	66	75	71	66	76	71	89	74
St. Dev.	10											
Total Avg minus primer	73											
Contego dft	5											
	68											

55 mil W8x31

1	2	3	4	5	6	7	8	9	10	11	12
58	56	48	51	61	62	62	61	78	45	68	57
66	62	76	48	52	55	68	43	56	60	58	49
55	50	49	50	64	59	51	50	46	53	64	59
66	52	62	57	49	62	55	50	47	66	46	48
65	46	64	47	50	49	59	46	52	62	50	53
62	41		64			54	40		56		41
60			54			56			59		
58			46			53			59		
49			58			55			53		
59			62			64			45		

Avg	60	51	60	54	55	57	58	48	56	56	57	51
St. Dev.	8											
Total Avg	55											
minus primer	5											
Contego dft	50											

55 mil W12x106

1	2	3	4	5	6	7	8	9	10	11	12
61	51	43	64	53	60	76	57	60	62	58	70
71	60	55	59	62	51	67	67	67	72	58	55
65	55	69	68	66	50	66	51	60	75	55	60
62	64	62	69	69	62	75	59	66	67	50	55
64	55	62	62	61	58	67	54	46	64		50
67	60		70		46	75	54		75		63
64			68		60	61	59		80		
66			73		44	76			75		
55			75			63			56		
66			54			53					
60						50					
59											

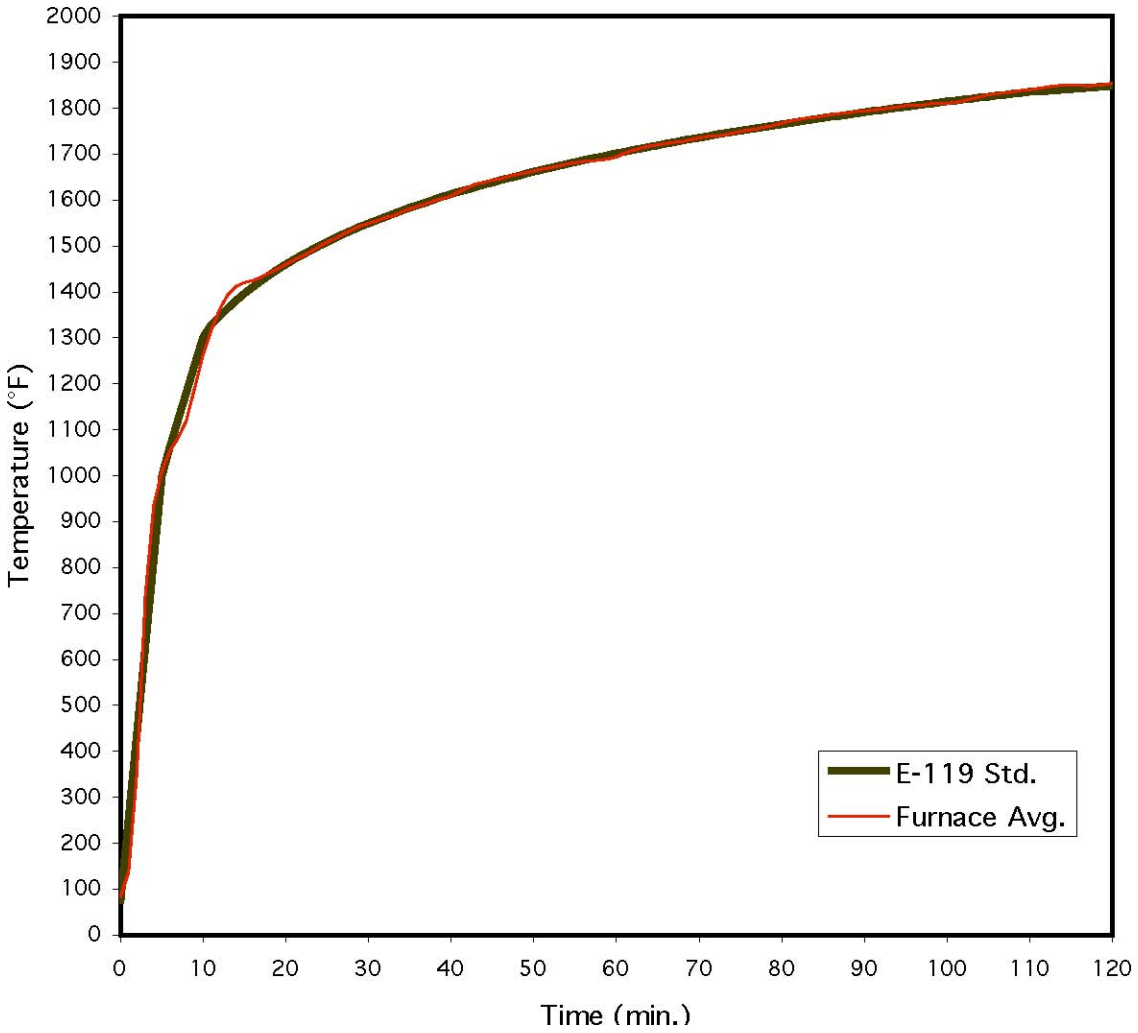
Avg	63	58	58	66	62	54	66	57	60	70	55	59

St. Dev.	8
Total Avg	62
minus primer	5
Contego dft	57

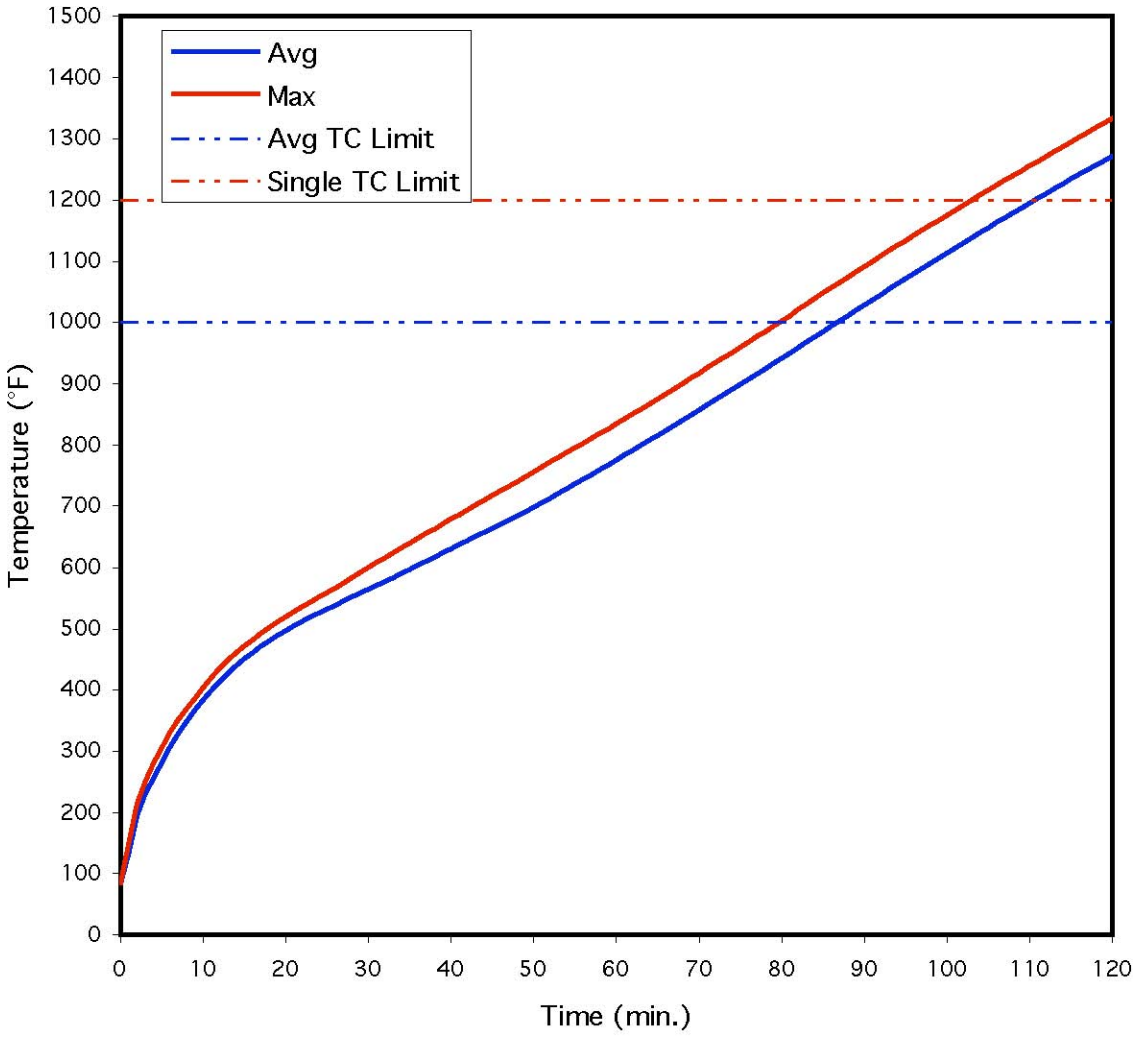
APPENDIX B

THERMOCOUPLE DATA

Contego International, Inc.
Project No. 16539-125055
Furnace Interior Temperatures



Contego International, Inc.
Project No. 16539-125055
W10 x 49 - 76 mils



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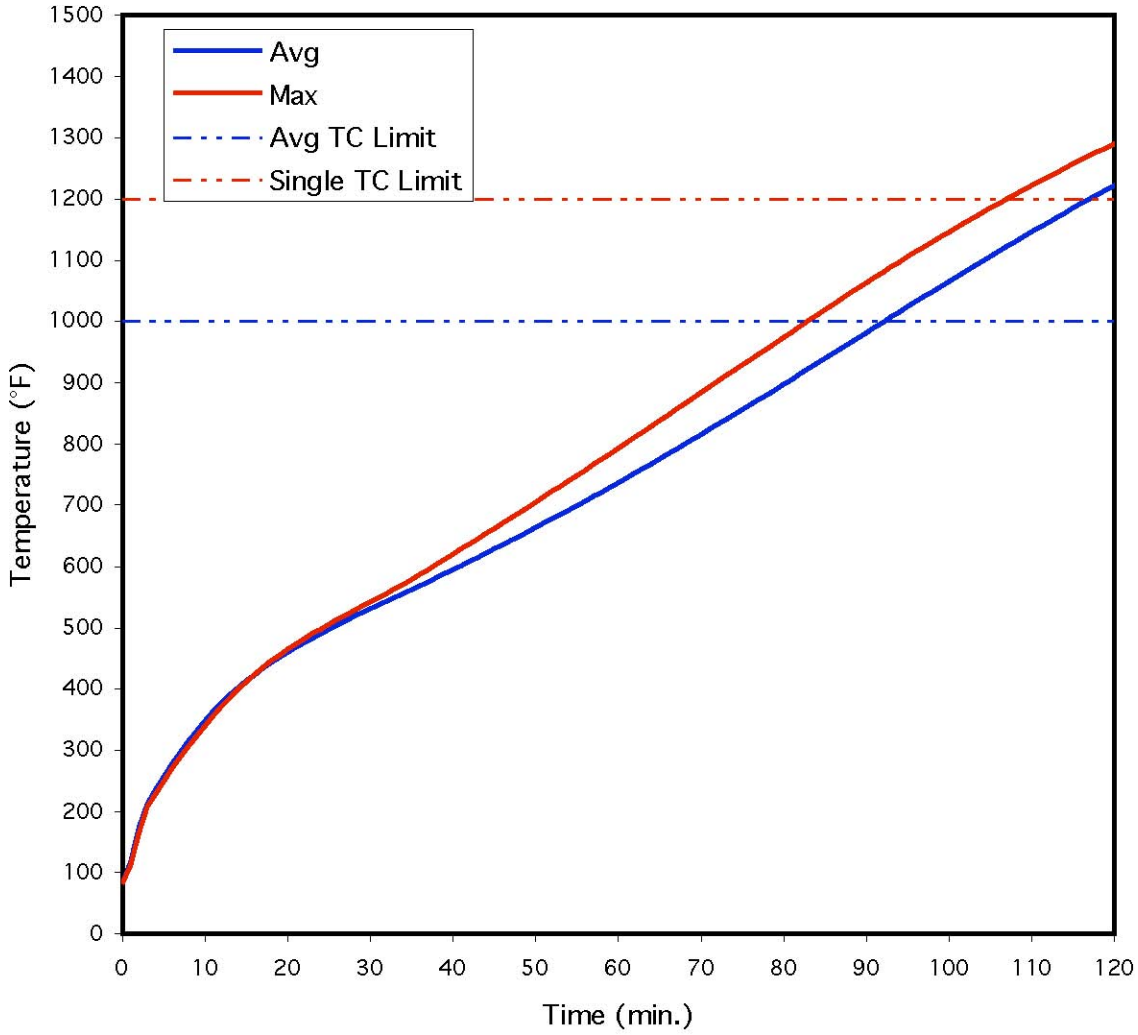
Contego International, Inc.
Project No. 16539-125055
W12 x 106 - 57 mils



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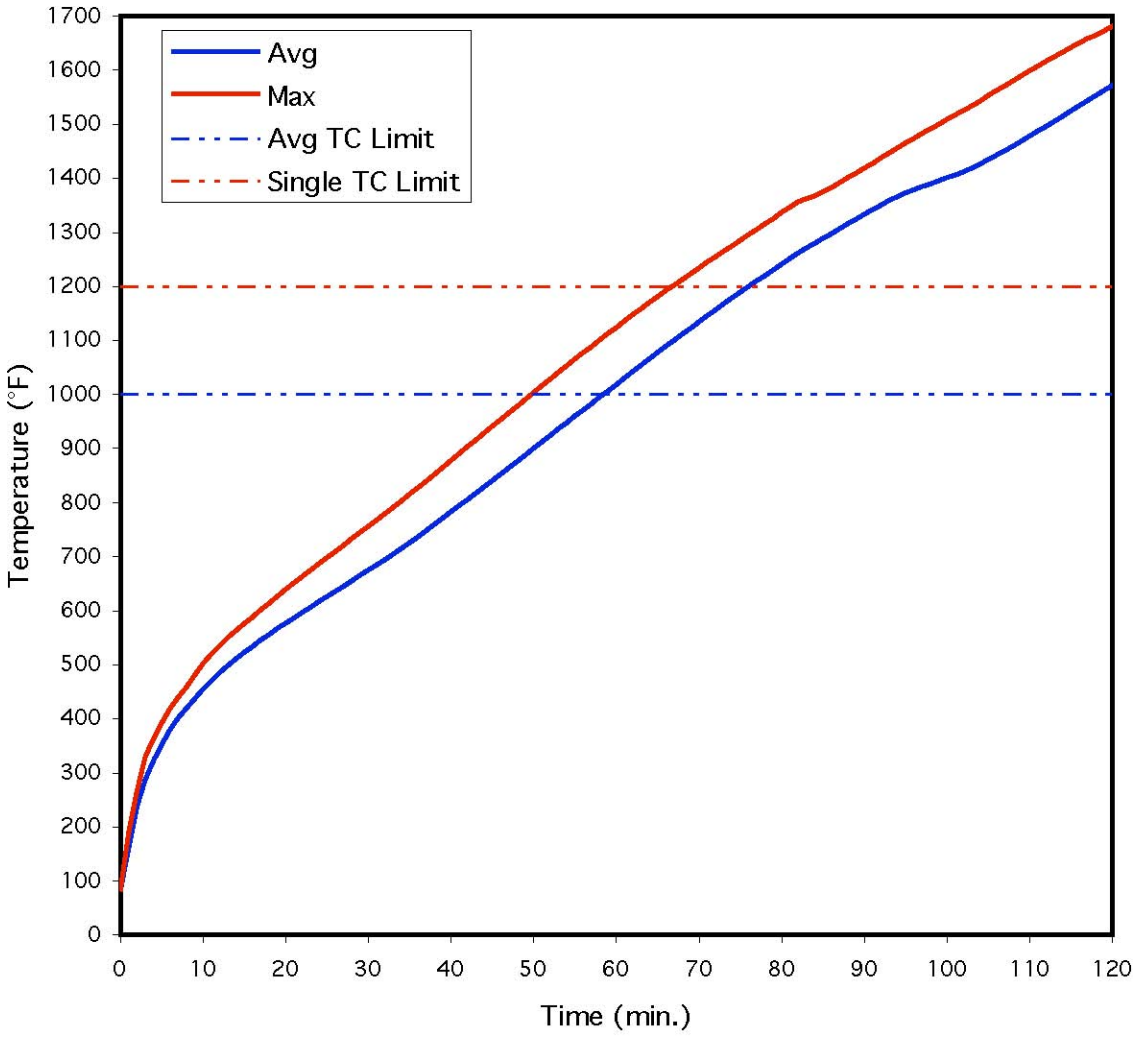
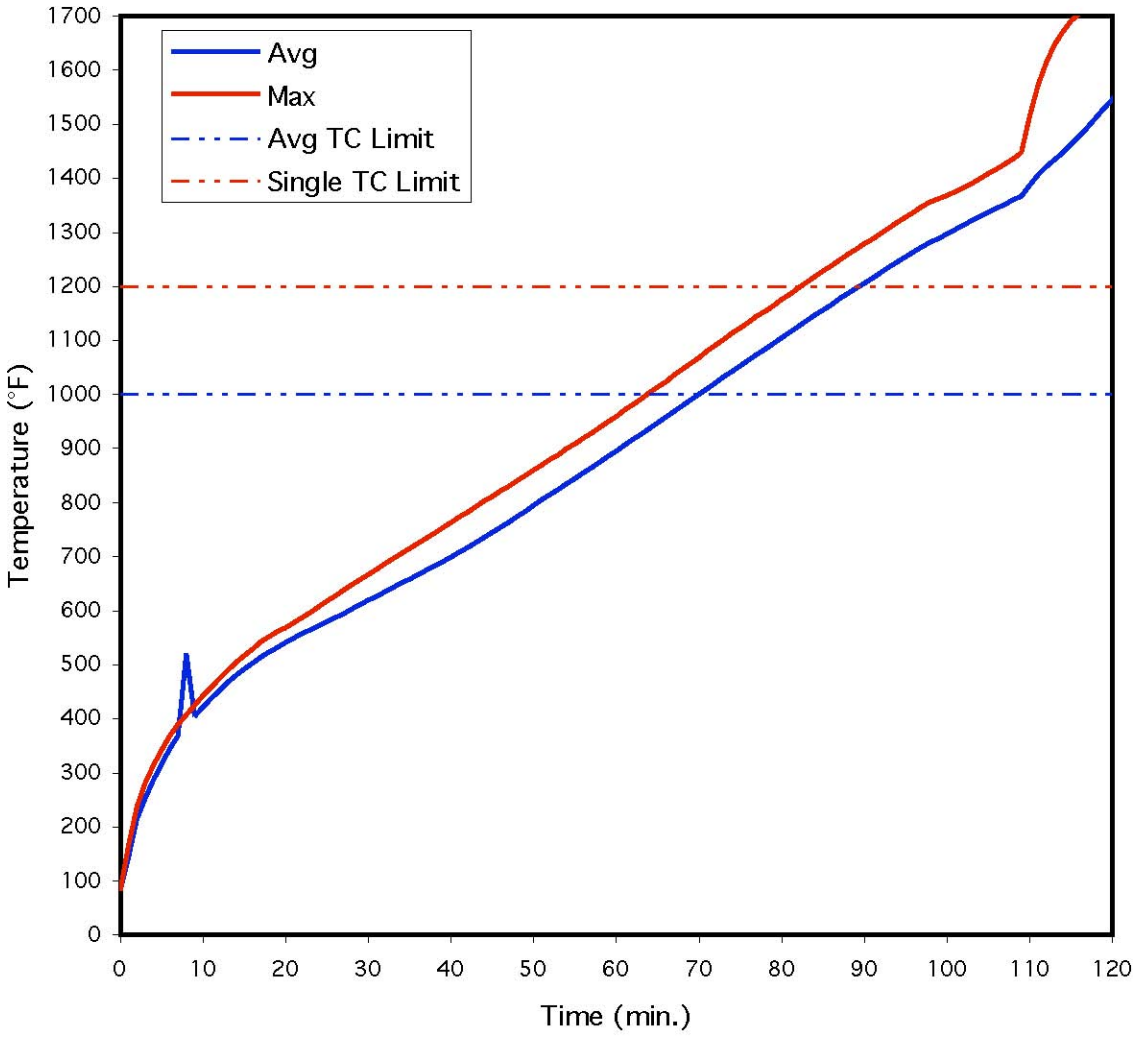
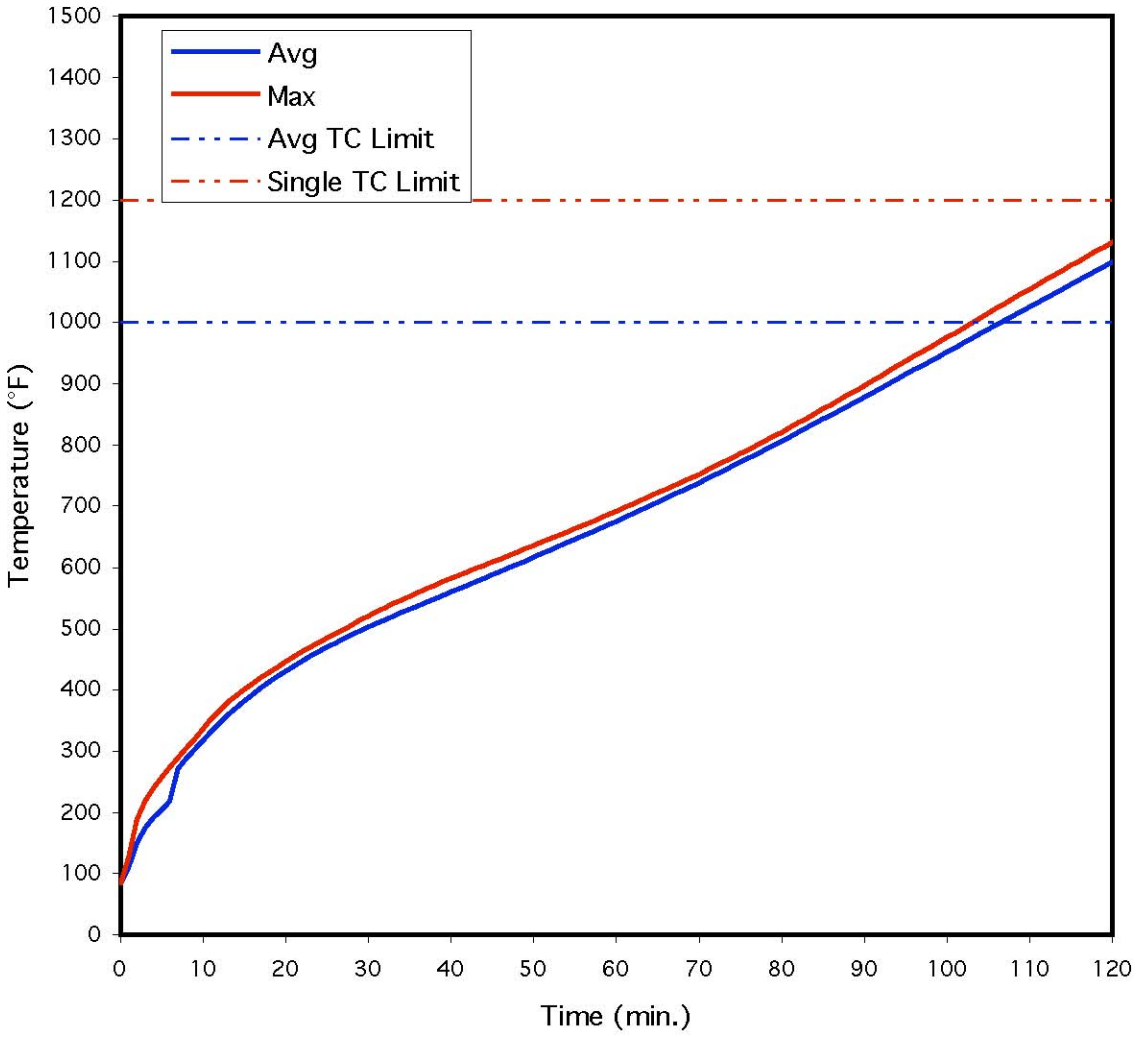
Contego International, Inc.
Project No. 16539-125055
W8 x 31 - 50 mils



Contego International, Inc.
Project No. 16539-125055
W8 x 31 - 68 mils



Contego International, Inc.
Project No. 16539-125055
W12 x 106 - 74 mils



Time (min)	E119 Std Average (°F)	Furnace Average (°F)	Integration of Furnace (°F•min)	Integration of E119 Std Average (°F•min)	Error (%)	Furnace Probe #1 (°F)	Furnace Probe #2 (°F)	Furnace Probe #3 (°F)
0	68	82	0	0	0.00	83	83	82
1	254	137	41	93	-55.70	129	128	167
2	441	356	219	372	-41.03	317	367	478
3	627	741	699	838	-16.48	666	748	884
4	814	933	1468	1490	-1.42	876	953	1046
5	1000	1010	2372	2328	1.90	963	1021	1095
6	1060	1053	3336	3290	1.39	1008	1057	1116
7	1120	1082	4335	4312	0.53	1039	1081	1132
8	1180	1120	5368	5394	-0.49	1076	1116	1161
9	1240	1191	6455	6536	-1.24	1146	1188	1228
10	1300	1261	7613	7738	-1.62	1219	1259	1294
11	1328	1316	8833	8984	-1.67	1279	1313	1344
12	1347	1361	10104	10252	-1.45	1327	1353	1388
13	1364	1394	11413	11539	-1.09	1359	1382	1421
14	1381	1412	12748	12843	-0.74	1380	1399	1437
15	1396	1420	14096	14163	-0.47	1391	1407	1443
16	1410	1425	15451	15497	-0.30	1398	1412	1446
17	1424	1432	16811	16846	-0.21	1405	1418	1452
18	1436	1441	18179	18207	-0.15	1415	1428	1461
19	1448	1450	19556	19581	-0.13	1426	1439	1470
20	1459	1459	20943	20967	-0.11	1436	1448	1477
21	1470	1468	22339	22363	-0.11	1445	1456	1484
22	1480	1477	23744	23770	-0.11	1455	1464	1493
23	1490	1486	25157	25187	-0.12	1465	1473	1502
24	1499	1498	26582	26614	-0.12	1477	1485	1514
25	1508	1508	28017	28049	-0.11	1487	1494	1524
26	1517	1516	29461	29494	-0.11	1496	1502	1533
27	1525	1526	30914	30947	-0.10	1505	1512	1542
28	1533	1535	32376	32408	-0.10	1514	1520	1550
29	1541	1542	33847	33877	-0.09	1522	1527	1558
30	1549	1548	35324	35353	-0.08	1527	1532	1564
31	1556	1555	36808	36837	-0.08	1533	1538	1570
32	1563	1561	38297	38327	-0.08	1540	1544	1576
33	1570	1565	39792	39825	-0.08	1542	1549	1582
34	1576	1573	41293	41329	-0.09	1549	1556	1590
35	1583	1580	42802	42840	-0.09	1556	1562	1596
36	1589	1586	44317	44357	-0.09	1562	1569	1602
37	1595	1592	45837	45880	-0.09	1567	1573	1608
38	1601	1598	47364	47409	-0.09	1573	1579	1615
39	1606	1603	48897	48944	-0.10	1577	1583	1620
40	1612	1608	50434	50485	-0.10	1583	1587	1627
41	1617	1618	51980	52032	-0.10	1592	1598	1637
42	1623	1627	53534	53583	-0.09	1599	1606	1646
43	1628	1634	55097	55140	-0.08	1606	1614	1654
44	1633	1638	56665	56702	-0.06	1611	1617	1657
45	1638	1643	58237	58269	-0.05	1615	1621	1661
46	1643	1647	59814	59841	-0.05	1619	1625	1666
47	1648	1651	61395	61418	-0.04	1625	1630	1670
48	1652	1655	62980	62999	-0.03	1629	1634	1675

Time (min)	E119 Std Average (°F)	Furnace Average (°F)	Integration of Furnace (°F•min)	Integration of E119 Std (°F•min)	Error (%)	Furnace Probe #1 (°F)	Furnace Probe #2 (°F)	Furnace Probe #3 (°F)
49	1657	1658	64569	64585	-0.02	1634	1637	1679
50	1661	1663	66162	66176	-0.02	1638	1641	1683
51	1666	1667	67759	67771	-0.02	1642	1645	1685
52	1670	1670	69359	69370	-0.01	1644	1648	1688
53	1674	1673	70963	70973	-0.01	1649	1651	1692
54	1678	1678	72571	72581	-0.01	1652	1656	1696
55	1682	1681	74182	74193	-0.01	1655	1658	1698
56	1686	1683	75796	75809	-0.02	1656	1661	1699
57	1690	1685	77412	77429	-0.02	1657	1664	1701
58	1694	1686	79030	79053	-0.03	1660	1664	1702
59	1698	1689	80650	80680	-0.04	1663	1667	1706
60	1701	1694	82274	82311	-0.04	1666	1672	1709
61	1705	1702	83903	83946	-0.05	1673	1679	1717
62	1709	1708	85540	85584	-0.05	1678	1685	1723
63	1712	1713	87182	87226	-0.05	1684	1690	1728
64	1716	1717	88829	88872	-0.05	1688	1695	1731
65	1719	1721	90480	90521	-0.04	1692	1698	1735
66	1722	1723	92134	92173	-0.04	1694	1699	1737
67	1726	1725	93790	93829	-0.04	1696	1703	1739
68	1729	1727	95448	95487	-0.04	1699	1705	1741
69	1732	1731	97110	97149	-0.04	1703	1708	1745
70	1735	1735	98774	98815	-0.04	1707	1712	1748
71	1738	1738	100443	100483	-0.04	1709	1714	1751
72	1742	1740	102113	102155	-0.04	1711	1717	1754
73	1745	1741	103785	103829	-0.04	1713	1718	1755
74	1748	1745	105460	105507	-0.04	1716	1723	1759
75	1751	1749	107139	107187	-0.04	1720	1725	1763
76	1753	1752	108822	108871	-0.04	1721	1729	1766
77	1756	1755	110507	110557	-0.05	1724	1732	1769
78	1759	1759	112196	112247	-0.05	1729	1735	1772
79	1762	1762	113888	113939	-0.04	1733	1738	1775
80	1765	1768	115585	115634	-0.04	1739	1745	1779
81	1768	1771	117287	117332	-0.04	1741	1748	1782
82	1770	1775	118992	119032	-0.03	1745	1751	1786
83	1773	1778	120700	120735	-0.03	1748	1755	1789
84	1776	1780	122411	122441	-0.02	1750	1757	1791
85	1778	1783	124124	124149	-0.02	1752	1760	1792
86	1781	1785	125840	125860	-0.02	1754	1763	1795
87	1783	1788	127558	127574	-0.01	1757	1765	1797
88	1786	1790	129279	129290	-0.01	1759	1767	1799
89	1788	1792	131001	131008	-0.01	1761	1769	1800
90	1791	1794	132726	132729	0.00	1764	1771	1802
91	1793	1796	134453	134453	0.00	1764	1773	1805
92	1796	1797	136181	136179	0.00	1766	1774	1807
93	1798	1800	137912	137907	0.00	1770	1776	1809
94	1800	1802	139645	139637	0.01	1772	1779	1812
95	1803	1805	141380	141370	0.01	1774	1781	1814
96	1805	1805	143117	143105	0.01	1774	1780	1815
97	1807	1807	144855	144843	0.01	1775	1782	1816

Time (min)	E119 Std Average (°F)	Furnace Average (°F)	Integration of Furnace Average (°F•min)	Integration of E119 Std Average (°F•min)	Error (%)	Furnace Probe #1 (°F)	Furnace Probe #2 (°F)	Furnace Probe #3 (°F)
98	1809	1808	146594	146583	0.01	1778	1784	1817
99	1812	1810	148335	148325	0.01	1778	1785	1819
100	1814	1811	150078	150069	0.01	1780	1786	1821
101	1816	1812	151821	151815	0.00	1781	1782	1821
102	1818	1816	153567	153564	0.00	1785	1786	1825
103	1820	1820	155317	155315	0.00	1790	1790	1830
104	1823	1824	157071	157068	0.00	1793	1795	1834
105	1825	1829	158829	158823	0.00	1798	1799	1838
106	1827	1831	160591	160580	0.01	1800	1801	1840
107	1829	1833	162355	162339	0.01	1802	1804	1842
108	1831	1836	164122	164100	0.01	1805	1806	1844
109	1833	1839	165891	165863	0.02	1808	1809	1847
110	1835	1840	167662	167628	0.02	1809	1811	1847
111	1836	1842	169436	169395	0.02	1811	1814	1849
112	1838	1845	171211	171164	0.03	1812	1817	1852
113	1839	1848	172989	172933	0.03	1816	1820	1854
114	1840	1850	174770	174704	0.04	1817	1823	1855
115	1841	1850	176552	176477	0.04	1817	1823	1856
116	1843	1849	178334	178250	0.05	1813	1822	1854
117	1844	1849	180115	180025	0.05	1811	1822	1853
118	1845	1850	181896	181801	0.05	1811	1823	1853
119	1846	1851	183678	183578	0.05	1813	1825	1856
120	1848	1853	185463	185357	0.06	1816	1827	1857
121	1849	1854	187248	187136	0.06	1818	1829	1858

Max Temp
Max Allowed

Furnace Probe	Furnace Probe	Furnace Probe	Furnace Probe	Furnace Probe	Furnace Probe	Furnace Probe	W10x49 Probe (76 mils)
Time (min)	#4 (°F)	#5 (°F)	#6 (°F)	#7 (°F)	#8 (°F)	#9 (°F)	#10 (°F)	Avg (°F)
0	81	82	82	82	bad tc	81	82	83
1	162	132	124	138	bad tc	150	149	133
2	449	335	306	328	bad tc	444	435	195
3	794	608	573	655	bad tc	857	880	231
4	967	828	770	872	bad tc	1046	1042	256
5	1031	944	873	970	bad tc	1108	1089	282
6	1066	1012	934	1027	bad tc	1139	1114	306
7	1091	1058	978	1064	bad tc	1160	1134	328
8	1128	1104	1023	1107	bad tc	1191	1170	348
9	1206	1174	1093	1183	bad tc	1255	1243	367
10	1281	1243	1167	1255	bad tc	1318	1312	384
11	1338	1298	1231	1310	bad tc	1371	1361	399
12	1386	1342	1283	1352	bad tc	1418	1402	414
13	1422	1378	1320	1381	bad tc	1450	1431	428
14	1438	1400	1344	1399	bad tc	1466	1449	440
15	1442	1408	1356	1408	bad tc	1467	1455	451
16	1447	1415	1364	1414	bad tc	1468	1459	461
17	1455	1422	1372	1422	bad tc	1474	1464	471
18	1464	1431	1381	1433	bad tc	1481	1472	480
19	1472	1440	1390	1443	bad tc	1488	1482	489
20	1484	1449	1400	1453	bad tc	1498	1490	497
21	1494	1458	1410	1462	bad tc	1507	1499	505
22	1501	1466	1420	1472	bad tc	1515	1508	512
23	1509	1475	1430	1480	bad tc	1527	1517	519
24	1520	1484	1443	1492	bad tc	1540	1529	526
25	1530	1494	1453	1502	bad tc	1550	1537	532
26	1539	1502	1462	1510	bad tc	1558	1546	539
27	1551	1510	1471	1518	bad tc	1569	1555	545
28	1563	1518	1480	1527	bad tc	1578	1563	552
29	1571	1525	1489	1534	bad tc	1585	1570	558
30	1579	1531	1497	1541	bad tc	1589	1575	565
31	1585	1536	1503	1547	bad tc	1598	1582	571
32	1592	1540	1509	1552	bad tc	1604	1588	578
33	1599	1545	1515	1557	bad tc	1606	1592	584
34	1609	1552	1522	1564	bad tc	1616	1598	591
35	1617	1559	1531	1571	bad tc	1622	1605	597
36	1625	1565	1536	1577	bad tc	1627	1610	604
37	1632	1571	1543	1582	bad tc	1633	1615	611
38	1642	1576	1550	1589	bad tc	1640	1622	617
39	1645	1580	1555	1592	bad tc	1645	1626	624
40	1652	1584	1561	1596	bad tc	1652	1632	631
41	1665	1593	1570	1606	bad tc	1661	1644	637
42	1675	1601	1578	1614	bad tc	1670	1653	644
43	1684	1607	1585	1620	bad tc	1678	1660	651
44	1688	1611	1590	1625	bad tc	1681	1663	658
45	1693	1617	1595	1630	bad tc	1685	1667	664
46	1692	1622	1600	1635	bad tc	1687	1673	671
47	1697	1626	1604	1638	bad tc	1693	1678	678
48	1700	1630	1609	1640	bad tc	1699	1681	684

Time (min)	Furnace Probe #4 (°F)	Furnace Probe #5 (°F)	Furnace Probe #6 (°F)	Furnace Probe #7 (°F)	Furnace Probe #8 (°F)	Furnace Probe #9 (°F)	Furnace Probe #10 (°F)	W10x49 (76 mils) Avg (°F)
49	1699	1632	1612	1644	bad tc	1703	1685	691
50	1705	1636	1617	1647	bad tc	1709	1691	699
51	1714	1640	1623	1651	bad tc	1712	1693	706
52	1716	1643	1625	1655	bad tc	1716	1696	713
53	1717	1646	1630	1657	bad tc	1719	1699	721
54	1725	1650	1634	1662	bad tc	1722	1703	729
55	1729	1654	1638	1665	bad tc	1726	1705	737
56	1733	1657	1641	1668	bad tc	1725	1707	745
57	1736	1660	1644	1671	bad tc	1727	1709	752
58	1734	1661	1644	1671	bad tc	1731	1711	760
59	1735	1663	1648	1674	bad tc	1733	1716	768
60	1746	1666	1652	1678	bad tc	1737	1719	776
61	1755	1673	1659	1684	bad tc	1748	1726	784
62	1761	1678	1666	1691	bad tc	1755	1732	792
63	1767	1684	1671	1697	bad tc	1759	1737	800
64	1770	1689	1675	1700	bad tc	1763	1743	808
65	1774	1692	1679	1704	bad tc	1765	1746	816
66	1780	1695	1682	1705	bad tc	1767	1748	824
67	1782	1698	1683	1707	bad tc	1770	1749	833
68	1784	1700	1686	1710	bad tc	1770	1751	841
69	1788	1702	1689	1713	bad tc	1774	1757	849
70	1792	1707	1693	1716	bad tc	1777	1760	858
71	1796	1710	1696	1718	bad tc	1783	1761	866
72	1798	1712	1698	1721	bad tc	1783	1764	874
73	1794	1712	1700	1722	bad tc	1787	1765	883
74	1802	1716	1704	1726	bad tc	1791	1771	890
75	1803	1718	1708	1730	bad tc	1796	1775	899
76	1807	1723	1712	1733	bad tc	1797	1777	908
77	1812	1727	1715	1735	bad tc	1801	1780	916
78	1817	1731	1719	1740	bad tc	1804	1783	924
79	1818	1733	1723	1743	bad tc	1808	1788	934
80	1827	1739	1726	1748	bad tc	1811	1794	942
81	1832	1744	1731	1751	bad tc	1816	1797	951
82	1833	1746	1735	1755	bad tc	1820	1801	959
83	1838	1750	1739	1758	bad tc	1823	1803	968
84	1837	1751	1741	1759	bad tc	1825	1805	977
85	1843	1755	1743	1762	bad tc	1827	1809	985
86	1846	1758	1746	1766	bad tc	1829	1810	994
87	1850	1760	1749	1768	bad tc	1831	1811	1002
88	1851	1764	1750	1769	bad tc	1832	1815	1011
89	1852	1766	1753	1771	bad tc	1835	1818	1020
90	1853	1767	1755	1773	bad tc	1837	1820	1029
91	1854	1768	1759	1776	bad tc	1841	1821	1037
92	1856	1770	1760	1777	bad tc	1843	1823	1046
93	1858	1773	1762	1779	bad tc	1844	1827	1054
94	1861	1776	1765	1782	bad tc	1844	1829	1063
95	1864	1780	1766	1784	bad tc	1847	1831	1071
96	1864	1781	1768	1785	bad tc	1847	1831	1080
97	1865	1783	1769	1787	bad tc	1850	1832	1088

	Furnace Probe	Furnace Probe	Furnace Probe	Furnace Probe	Furnace Probe	Furnace Probe	Furnace Probe	W10x49 (76 mils)
Time (min)	#4 (°F)	#5 (°F)	#6 (°F)	#7 (°F)	#8 (°F)	#9 (°F)	#10 (°F)	Avg (°F)
98	1867	1785	1772	1788	bad tc	1851	1834	1097
99	1869	1786	1773	1791	bad tc	1852	1835	1105
100	1868	1788	1775	1791	bad tc	1853	1837	1113
101	1869	1790	1777	1792	bad tc	1853	1839	1121
102	1875	1795	1780	1797	bad tc	1854	1845	1130
103	1881	1800	1784	1801	bad tc	1858	1849	1138
104	1884	1802	1789	1805	bad tc	1865	1851	1147
105	1889	1808	1792	1808	bad tc	1868	1858	1155
106	1892	1810	1795	1811	bad tc	1871	1858	1163
107	1893	1812	1798	1813	bad tc	1876	1860	1171
108	1895	1815	1801	1816	bad tc	1877	1862	1179
109	1898	1819	1804	1820	bad tc	1877	1867	1187
110	1900	1823	1806	1823	bad tc	1877	1867	1195
111	1900	1825	1807	1824	bad tc	1880	1868	1203
112	1904	1828	1809	1828	bad tc	1884	1869	1211
113	1906	1832	1811	1831	bad tc	1886	1873	1219
114	1908	1836	1815	1834	bad tc	1889	1874	1226
115	1907	1836	1815	1834	bad tc	1889	1874	1234
116	1906	1837	1816	1833	bad tc	1887	1873	1242
117	1906	1836	1817	1833	bad tc	1888	1873	1249
118	1906	1838	1818	1835	bad tc	1888	1875	1257
119	1908	1839	1820	1836	bad tc	1889	1876	1264
120	1908	1839	1822	1837	bad tc	1893	1878	1272
121	1907	1840	1825	1839	bad tc	1894	1879	1279
Max Temp								1279
Max Allowed								1000

	W10x49 (76 mils)	W10x49 (76 mils)	W10x49 (76 mils)	W10x49 (76 mils)	W12x106 (57 mils)	W12x106 (57 mils)	W12x106 (57 mils)	W12x106 (57 mils)
Time (min)	TC #29 (°F)	TC #30 (°F)	TC #31 (°F)	TC #32 (°F)	Avg (°F)	TC #33 (°F)	TC #34 (°F)	TC #35 (°F)
0	82	82	83	83	83	83	83	83
1	124	142	114	150	118	113	131	101
2	184	209	171	214	175	165	201	142
3	221	237	213	251	213	208	234	181
4	247	262	234	281	237	229	254	210
5	275	290	257	306	258	250	276	229
6	301	314	279	330	278	270	296	249
7	325	335	300	351	296	288	316	266
8	347	356	319	369	314	306	335	284
9	368	374	338	386	332	323	352	300
10	385	389	357	403	348	340	368	315
11	400	403	374	420	363	356	382	330
12	414	416	390	436	377	372	395	343
13	428	429	404	449	391	386	406	357
14	440	441	417	461	402	400	416	368
15	452	452	429	472	414	412	426	380
16	462	461	440	482	424	424	435	390
17	472	470	451	492	434	435	443	401
18	482	477	460	502	443	446	451	410
19	490	485	469	511	452	455	459	420
20	499	492	477	520	460	465	466	429
21	507	499	485	528	468	473	474	438
22	515	505	492	536	476	482	481	446
23	523	511	499	544	483	491	487	454
24	530	517	505	552	490	498	494	462
25	537	522	511	559	498	506	501	470
26	543	527	518	567	505	514	508	477
27	550	532	524	575	512	521	514	484
28	557	537	531	583	518	528	520	491
29	563	541	537	592	525	535	527	497
30	570	545	543	600	531	542	532	504
31	577	550	549	608	537	549	538	509
32	584	554	556	616	543	556	543	515
33	591	558	562	624	550	564	549	521
34	599	563	568	632	556	571	554	526
35	605	568	575	640	563	579	560	531
36	613	573	581	648	569	587	565	537
37	620	578	588	656	575	595	571	542
38	627	583	595	663	582	604	576	547
39	634	589	602	671	588	612	582	552
40	642	594	608	679	595	620	588	558
41	649	599	615	686	602	629	594	563
42	656	605	621	694	608	637	600	569
43	663	610	628	702	615	645	607	574
44	671	616	635	710	622	654	613	580
45	677	620	642	718	629	662	619	587
46	685	626	648	725	636	671	625	593
47	692	631	655	733	643	679	632	599
48	699	636	662	740	650	688	638	604

Time	W10x49 (76 mils) TC #29	W10x49 (76 mils) TC #30	W10x49 (76 mils) TC #31	W10x49 (76 mils) TC #32	W12x106 (57 mils) Avg	W12x106 (57 mils) TC #33	W12x106 (57 mils) TC #34	W12x106 (57 mils) TC #35
(min)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)
49	706	642	669	748	657	696	645	611
50	714	648	676	756	664	705	651	617
51	722	655	683	764	671	714	658	624
52	730	661	690	772	678	723	664	630
53	738	668	698	780	685	731	671	636
54	746	676	705	788	692	740	678	642
55	754	684	713	795	699	748	685	648
56	762	692	721	803	707	757	691	655
57	769	699	728	811	715	767	699	662
58	777	708	736	819	722	776	706	668
59	785	716	744	826	729	784	713	675
60	793	723	752	835	737	793	720	683
61	801	732	759	842	745	802	728	689
62	809	740	767	851	752	811	736	696
63	817	748	775	858	760	820	743	702
64	825	756	783	867	768	829	751	710
65	833	764	791	875	776	838	759	718
66	842	772	799	883	784	847	767	724
67	850	781	807	892	792	857	775	731
68	858	789	815	900	800	866	783	739
69	867	797	823	909	808	875	791	746
70	876	806	831	917	816	884	799	753
71	883	814	839	926	824	893	807	761
72	892	822	848	934	832	902	816	768
73	900	831	856	943	840	911	824	775
74	909	838	864	950	848	920	833	783
75	916	848	872	960	857	929	841	791
76	926	856	880	968	864	938	849	798
77	934	865	888	977	873	947	858	806
78	943	873	896	985	880	955	865	813
79	952	883	905	994	889	965	875	821
80	960	891	913	1002	898	974	884	829
81	969	900	922	1011	906	983	892	836
82	977	908	930	1021	914	992	902	844
83	986	917	938	1030	923	1001	910	852
84	995	925	947	1039	931	1010	920	860
85	1003	934	955	1048	940	1019	929	868
86	1012	943	964	1057	948	1028	937	876
87	1021	951	972	1065	957	1037	946	884
88	1030	960	981	1074	965	1046	955	892
89	1038	969	989	1083	974	1055	964	900
90	1048	978	998	1091	982	1063	973	908
91	1056	986	1006	1100	991	1072	982	917
92	1064	995	1015	1109	999	1080	991	925
93	1073	1004	1023	1117	1007	1089	1000	933
94	1082	1012	1031	1126	1016	1097	1009	941
95	1090	1021	1040	1133	1024	1106	1018	949
96	1099	1030	1048	1142	1033	1114	1027	958
97	1107	1038	1057	1151	1041	1122	1036	966

Time (min)	W10x49 TC #29 (°F)	W10x49 (76 mils) TC #30 (°F)	W10x49 (76 mils) TC #31 (°F)	W10x49 (76 mils) TC #32 (°F)	W10x49 (76 mils) Avg (°F)	W12x106 (57 mils) TC #33 (°F)	W12x106 (57 mils) TC #34 (°F)	W12x106 (57 mils) TC #35 (°F)
98	1116	1047	1065	1159	1049	1130	1044	974
99	1124	1055	1073	1167	1057	1138	1053	983
100	1132	1064	1082	1175	1066	1146	1062	991
101	1140	1072	1090	1183	1074	1154	1071	1000
102	1148	1081	1099	1192	1082	1162	1079	1008
103	1156	1089	1107	1200	1090	1170	1088	1016
104	1165	1098	1115	1208	1098	1177	1096	1024
105	1173	1106	1123	1216	1106	1185	1105	1033
106	1181	1115	1132	1224	1114	1192	1113	1041
107	1188	1123	1140	1232	1122	1200	1122	1050
108	1196	1131	1148	1240	1130	1207	1130	1058
109	1204	1140	1156	1247	1138	1215	1139	1066
110	1212	1148	1164	1256	1147	1222	1148	1075
111	1220	1156	1172	1263	1154	1229	1156	1083
112	1227	1164	1180	1271	1162	1236	1164	1091
113	1235	1172	1188	1279	1170	1243	1172	1099
114	1242	1180	1196	1287	1178	1250	1181	1107
115	1250	1188	1204	1294	1185	1257	1189	1116
116	1257	1196	1212	1302	1193	1264	1197	1124
117	1264	1203	1220	1310	1201	1271	1205	1132
118	1271	1211	1227	1318	1208	1277	1213	1140
119	1278	1219	1234	1325	1215	1283	1221	1147
120	1285	1226	1242	1333	1222	1290	1229	1155
121	1292	1234	1250	1340	1229	1296	1236	1163
Max Temp	1292	1234	1250	1340	1229	1296	1236	1163
Max Allowed	1200	1200	1200	1200	1000	1200	1200	1200

	W12x106	W8x31	W8x31	W8x31	W8x31	W8x31	W8x31	W8x31
	(57 mils)	(50 mils)	(50 mils)	(50 mils)	(50 mils)	(50 mils)	(68 mils)	(68 mils)
Time	TC #36	Avg	TC #37	TC #38	TC #39	TC #40	Avg	TC #41
(min)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)
0	83	82	82	82	82	82	83	83
1	128	161	148	166	140	190	145	139
2	192	238	228	239	217	267	216	211
3	227	288	278	283	259	330	253	250
4	253	323	314	317	298	364	288	288
5	275	353	343	345	330	393	318	319
6	295	380	370	372	358	418	345	346
7	313	401	394	393	379	439	368	369
8	332	419	411	409	397	459	520	389
9	351	437	429	423	416	481	405	406
10	369	455	445	438	434	502	422	425
11	385	471	460	452	451	520	438	441
12	399	486	474	466	467	536	453	456
13	413	499	487	477	482	551	468	469
14	424	512	499	488	496	564	481	481
15	436	524	511	499	509	577	492	492
16	446	535	520	509	521	589	504	503
17	455	546	530	519	532	602	514	512
18	464	556	539	529	542	614	523	522
19	472	567	550	539	552	627	532	530
20	479	577	559	547	562	640	541	539
21	487	587	568	556	571	652	550	547
22	494	597	578	564	582	663	558	555
23	501	607	587	573	592	675	565	562
24	507	617	597	581	602	687	573	570
25	514	627	607	588	612	699	580	577
26	521	636	617	595	622	710	587	585
27	527	646	626	603	632	722	595	593
28	533	655	635	610	643	733	603	601
29	540	665	645	618	653	745	611	609
30	546	675	654	626	663	756	619	617
31	552	685	664	634	674	768	627	624
32	559	695	674	641	685	779	636	633
33	566	705	683	650	695	791	643	640
34	572	715	693	659	706	803	651	648
35	580	726	703	669	717	816	659	656
36	585	737	713	679	728	828	668	665
37	592	748	724	690	739	840	675	672
38	600	760	736	700	751	853	683	681
39	607	771	746	712	762	865	691	689
40	613	783	756	723	773	878	700	697
41	620	795	768	734	785	891	708	706
42	627	806	778	745	797	904	716	714
43	634	818	789	757	809	916	726	723
44	640	830	801	769	820	929	735	733
45	647	842	812	780	832	942	745	743
46	654	853	823	791	844	954	755	752
47	661	865	835	803	856	967	765	762
48	668	877	846	815	868	979	775	772

Time (min)	W12x106 (57 mils) TC #36 (°F)	W8x31 (50 mils) Avg (°F)	W8x31 (50 mils) TC #37 (°F)	W8x31 (50 mils) TC #38 (°F)	W8x31 (50 mils) TC #39 (°F)	W8x31 (50 mils) TC #40 (°F)	W8x31 (68 mils) Avg (°F)	W8x31 (68 mils) TC #41 (°F)
49	674	889	857	826	880	991	785	782
50	681	901	869	838	892	1004	795	792
51	689	912	880	850	903	1016	805	802
52	695	924	892	862	915	1028	815	811
53	702	937	904	874	927	1041	825	821
54	709	948	915	886	939	1053	835	832
55	716	960	927	898	950	1066	845	841
56	723	972	939	909	962	1078	855	851
57	730	984	950	921	974	1089	865	861
58	737	996	962	934	985	1102	875	871
59	745	1008	974	945	998	1113	886	881
60	751	1019	986	957	1009	1124	896	891
61	759	1031	997	970	1021	1136	906	901
62	766	1043	1009	981	1033	1148	917	911
63	774	1054	1021	993	1044	1159	927	921
64	781	1066	1034	1005	1055	1171	937	931
65	789	1078	1046	1018	1066	1181	948	941
66	796	1090	1057	1029	1079	1193	958	952
67	803	1101	1069	1041	1089	1203	969	962
68	811	1112	1081	1053	1101	1213	980	972
69	819	1123	1093	1064	1112	1224	990	982
70	826	1135	1104	1076	1124	1235	1001	992
71	834	1146	1116	1088	1133	1245	1011	1002
72	841	1157	1127	1099	1146	1255	1022	1013
73	849	1168	1138	1111	1157	1265	1033	1023
74	857	1179	1149	1123	1167	1275	1043	1034
75	865	1189	1160	1134	1178	1285	1053	1044
76	872	1200	1171	1144	1189	1296	1064	1054
77	880	1211	1181	1156	1199	1306	1074	1064
78	888	1221	1192	1166	1209	1316	1084	1075
79	895	1231	1203	1177	1219	1326	1095	1085
80	903	1242	1213	1187	1230	1337	1105	1096
81	911	1252	1224	1198	1239	1347	1116	1107
82	919	1262	1235	1208	1249	1357	1126	1117
83	927	1271	1245	1219	1259	1362	1136	1127
84	935	1280	1255	1228	1269	1367	1147	1137
85	943	1289	1265	1238	1277	1375	1157	1147
86	951	1298	1274	1248	1286	1383	1166	1157
87	959	1307	1284	1258	1295	1392	1177	1168
88	967	1316	1294	1267	1303	1401	1187	1177
89	975	1325	1303	1276	1311	1410	1197	1187
90	983	1334	1312	1286	1320	1419	1207	1197
91	991	1342	1321	1294	1326	1428	1216	1207
92	999	1351	1329	1303	1333	1438	1226	1216
93	1007	1359	1337	1311	1340	1447	1235	1226
94	1015	1366	1343	1320	1345	1456	1245	1235
95	1023	1373	1349	1328	1350	1465	1254	1245
96	1031	1379	1354	1335	1354	1474	1264	1254
97	1039	1385	1358	1343	1356	1483	1273	1263

	W12x106	W8x31	W8x31	W8x31	W8x31	W8x31	W8x31	W8x31
	(57 mils)	(50 mils)	(50 mils)	(50 mils)	(50 mils)	(50 mils)	(68 mils)	(68 mils)
Time (min)	TC #36 (°F)	Avg (°F)	TC #37 (°F)	TC #38 (°F)	TC #39 (°F)	TC #40 (°F)	Avg (°F)	TC #41 (°F)
98	1047	1390	1361	1350	1358	1491	1282	1271
99	1055	1396	1367	1355	1361	1500	1290	1280
100	1063	1401	1373	1356	1366	1509	1298	1289
101	1070	1406	1379	1356	1372	1517	1306	1297
102	1078	1413	1386	1358	1380	1526	1314	1306
103	1086	1419	1393	1361	1387	1534	1322	1314
104	1094	1426	1400	1366	1395	1543	1330	1322
105	1102	1434	1408	1372	1404	1553	1338	1329
106	1110	1443	1416	1380	1413	1562	1345	1335
107	1117	1451	1425	1387	1422	1571	1352	1341
108	1125	1460	1433	1395	1431	1580	1360	1347
109	1133	1469	1442	1402	1441	1590	1367	1352
110	1141	1478	1451	1412	1451	1599	1388	1356
111	1148	1488	1460	1422	1460	1608	1406	1360
112	1156	1497	1469	1432	1469	1617	1421	1365
113	1164	1506	1478	1442	1479	1625	1435	1371
114	1172	1516	1487	1452	1489	1634	1448	1381
115	1179	1525	1496	1463	1498	1642	1462	1399
116	1186	1534	1505	1472	1508	1650	1477	1424
117	1194	1543	1514	1482	1519	1658	1494	1451
118	1201	1553	1524	1492	1530	1665	1511	1478
119	1208	1562	1533	1501	1541	1673	1529	1505
120	1215	1573	1544	1512	1553	1681	1546	1530
121	1222	1583	1555	1522	1566	1688	1564	1554
Max Temp	1222	1583	1555	1522	1566	1688	1564	1554
Max Allowed	1200	1000	1200	1200	1200	1200	1000	1200

Time (min)	W8x31 (68 mils) TC #42 (°F)	W8x31 (68 mils) TC #43 (°F)	W8x31 (68 mils) TC #44 (°F)	W12x106 (74 mils) Avg (°F)	W12x106 (74 mils) TC #45 (°F)	W12x106 (74 mils) TC #46 (°F)	W12x106 (74 mils) TC #47 (°F)	W12x106 (74 mils) TC #48 (°F)
0	83	83	83	82	83	83	80	83
1	149	126	167	111	107	128	80	129
2	217	196	238	151	151	189	80	182
3	248	233	282	176	190	220	80	214
4	282	265	315	193	214	240	80	236
5	314	296	343	205	228	258	80	255
6	342	323	369	218	246	274	80	273
7	367	347	390	272	263	290	245	290
8	386	896	407	288	279	305	261	307
9	403	385	425	303	294	320	276	323
10	418	402	443	318	308	337	290	337
11	433	418	459	333	323	353	304	350
12	447	434	475	346	338	367	317	363
13	461	449	491	359	352	380	330	375
14	474	462	505	371	365	391	343	386
15	485	474	518	383	377	401	355	397
16	495	486	530	393	388	411	367	407
17	504	497	542	403	399	420	377	417
18	512	507	552	413	409	429	388	426
19	520	518	561	422	419	437	397	435
20	528	528	569	431	428	446	406	444
21	537	537	578	440	437	455	414	452
22	544	545	588	448	446	463	422	460
23	550	552	597	455	454	470	430	467
24	554	559	608	463	462	478	437	474
25	558	567	618	470	470	485	445	481
26	562	574	628	477	477	492	451	486
27	568	582	638	484	484	499	458	493
28	574	590	648	490	491	506	464	499
29	580	598	658	497	497	514	471	505
30	586	607	667	503	503	521	477	511
31	592	615	677	509	509	528	482	516
32	598	624	687	515	515	534	488	521
33	604	632	696	521	521	541	493	527
34	610	641	706	527	527	547	499	533
35	616	649	715	532	532	553	504	538
36	622	658	725	538	538	559	510	544
37	627	666	734	544	544	565	515	550
38	633	675	744	549	550	571	520	555
39	639	683	753	554	555	577	524	561
40	646	692	763	560	562	582	529	567
41	653	700	773	565	568	587	533	573
42	660	709	782	571	574	593	538	579
43	669	718	793	577	580	599	543	586
44	678	727	803	582	587	603	547	592
45	688	737	812	588	593	609	552	598
46	698	746	822	594	599	614	557	604
47	709	756	831	600	605	620	562	611
48	720	767	841	605	612	625	567	617

Time (min)	W8x31 TC #42 (°F)	W8x31 (68 mils) TC #43 (°F)	W8x31 (68 mils) TC #44 (°F)	W12x106 (68 mils) Avg (°F)	W12x106 (74 mils) TC #45 (°F)	W12x106 (74 mils) TC #46 (°F)	W12x106 (74 mils) TC #47 (°F)	W12x106 (74 mils) TC #48 (°F)
49	730	776	851	611	618	631	572	622
50	741	786	860	617	624	636	578	628
51	752	796	870	623	631	642	583	635
52	762	806	880	628	637	647	588	641
53	773	815	889	634	643	652	594	647
54	784	825	900	640	650	658	600	653
55	794	835	909	646	656	664	605	659
56	804	845	919	652	662	669	611	665
57	815	856	929	658	669	674	616	671
58	825	866	939	664	675	680	622	677
59	836	876	950	670	682	687	628	683
60	846	886	960	676	689	692	633	689
61	857	896	971	682	695	698	639	696
62	868	906	981	688	702	704	645	702
63	878	917	992	694	708	710	650	709
64	888	927	1003	701	716	716	656	715
65	899	937	1014	707	723	722	662	721
66	910	947	1024	713	729	728	668	727
67	920	958	1036	720	736	734	675	734
68	931	968	1047	726	743	740	680	740
69	941	979	1058	732	749	746	687	746
70	952	989	1069	738	756	752	693	752
71	962	1000	1080	745	763	759	700	759
72	973	1010	1091	752	770	766	706	766
73	984	1021	1102	758	777	772	712	772
74	994	1031	1113	765	784	779	719	779
75	1005	1041	1123	772	792	786	725	785
76	1015	1051	1134	778	798	792	732	791
77	1026	1062	1145	785	805	800	738	798
78	1036	1071	1154	792	812	807	745	805
79	1046	1082	1165	799	820	814	751	812
80	1056	1092	1176	806	827	821	758	819
81	1066	1103	1186	814	834	829	765	826
82	1077	1113	1197	821	841	836	772	833
83	1087	1123	1207	828	849	843	779	839
84	1097	1134	1218	835	856	851	786	846
85	1107	1144	1229	842	863	859	793	853
86	1117	1153	1238	849	870	866	799	860
87	1127	1164	1249	856	878	874	806	867
88	1137	1174	1259	864	885	882	813	874
89	1147	1183	1269	871	892	889	820	881
90	1157	1193	1279	878	900	897	827	889
91	1166	1203	1288	886	907	905	835	895
92	1176	1213	1298	893	915	913	841	902
93	1185	1222	1308	900	922	921	849	909
94	1194	1231	1318	908	929	929	856	917
95	1203	1241	1328	915	937	937	863	924
96	1213	1250	1338	923	944	945	870	931
97	1222	1259	1348	930	951	952	877	938

	W8x31 (68 mils)	W8x31 (68 mils)	W8x31 (68 mils)	W12x106 (74 mils)	W12x106 (74 mils)	W12x106 (74 mils)	W12x106 (74 mils)	W12x106 (74 mils)
Time (min)	TC #42 (°F)	TC #43 (°F)	TC #44 (°F)	Avg (°F)	TC #45 (°F)	TC #46 (°F)	TC #47 (°F)	TC #48 (°F)
98	1230	1268	1357	937	959	960	884	945
99	1239	1277	1362	944	966	968	891	952
100	1248	1285	1368	952	974	976	899	959
101	1256	1294	1375	959	981	983	906	966
102	1265	1302	1383	967	989	991	913	973
103	1273	1310	1391	974	996	999	920	980
104	1281	1317	1399	982	1003	1007	928	988
105	1289	1324	1408	989	1010	1015	935	995
106	1296	1331	1417	996	1018	1023	942	1002
107	1304	1338	1426	1004	1025	1031	949	1009
108	1311	1344	1436	1011	1032	1039	957	1017
109	1319	1348	1448	1019	1039	1047	964	1024
110	1326	1353	1515	1026	1047	1054	971	1031
111	1335	1358	1572	1033	1054	1062	979	1038
112	1343	1362	1615	1041	1061	1070	986	1045
113	1351	1370	1648	1048	1068	1078	993	1052
114	1357	1384	1671	1055	1075	1085	1001	1059
115	1359	1400	1690	1062	1082	1093	1008	1066
116	1361	1419	1705	1069	1089	1100	1015	1073
117	1366	1439	1719	1077	1096	1108	1022	1080
118	1376	1460	1731	1084	1103	1116	1030	1087
119	1388	1480	1743	1091	1110	1123	1037	1094
120	1401	1501	1753	1098	1117	1131	1044	1101
121	1417	1523	1762	1106	1124	1138	1052	1108
Max Temp	1417	1523	1762	1106	1124	1138	1052	1108
Max Allowed	1200	1200	1200	1000	1200	1200	1200	1200

Time (min)	E119 Std Furnace Average (°F)	Integration of Furnace Average (°F)	Integration of E119 Std Average (°F•min)	Integration of Furnace Average (°F•min)	Error (%)	Furnace Probe #1 (°F)	Furnace Probe #2 (°F)	Furnace Probe #3 (°F)	Furnace Probe #4 (°F)
0	68	82	0	0	0.00	83	83	82	81
1	254	137	41	93	-55.70	129	128	167	162
2	441	356	219	372	-41.03	317	367	478	449
3	627	741	699	838	-16.48	666	748	884	794
4	814	933	1468	1490	-1.42	876	953	1046	967
5	1000	1010	2372	2328	1.90	963	1021	1095	1031
6	1060	1053	3336	3290	1.39	1008	1057	1116	1066
7	1120	1082	4335	4312	0.53	1039	1081	1132	1091
8	1180	1120	5368	5394	-0.49	1076	1116	1161	1128
9	1240	1191	6455	6536	-1.24	1146	1188	1228	1206
10	1300	1261	7613	7738	-1.62	1219	1259	1294	1281
11	1328	1316	8833	8984	-1.67	1279	1313	1344	1338
12	1347	1361	10104	10252	-1.45	1327	1353	1388	1386
13	1364	1394	11413	11539	-1.09	1359	1382	1421	1422
14	1381	1412	12748	12843	-0.74	1380	1399	1437	1438
15	1396	1420	14096	14163	-0.47	1391	1407	1443	1442
16	1410	1425	15451	15497	-0.30	1398	1412	1446	1447
17	1424	1432	16811	16846	-0.21	1405	1418	1452	1455
18	1436	1441	18179	18207	-0.15	1415	1428	1461	1464
19	1448	1450	19556	19581	-0.13	1426	1439	1470	1472
20	1459	1459	20943	20967	-0.11	1436	1448	1477	1484
21	1470	1468	22339	22363	-0.11	1445	1456	1484	1494
22	1480	1477	23744	23770	-0.11	1455	1464	1493	1501
23	1490	1486	25157	25187	-0.12	1465	1473	1502	1509
24	1499	1498	26582	26614	-0.12	1477	1485	1514	1520
25	1508	1508	28017	28049	-0.11	1487	1494	1524	1530
26	1517	1516	29461	29494	-0.11	1496	1502	1533	1539
27	1525	1526	30914	30947	-0.10	1505	1512	1542	1551
28	1533	1535	32376	32408	-0.10	1514	1520	1550	1563
29	1541	1542	33847	33877	-0.09	1522	1527	1558	1571
30	1549	1548	35324	35353	-0.08	1527	1532	1564	1579
31	1556	1555	36808	36837	-0.08	1533	1538	1570	1585
32	1563	1561	38297	38327	-0.08	1540	1544	1576	1592
33	1570	1565	39792	39825	-0.08	1542	1549	1582	1599
34	1576	1573	41293	41329	-0.09	1549	1556	1590	1609
35	1583	1580	42802	42840	-0.09	1556	1562	1596	1617
36	1589	1586	44317	44357	-0.09	1562	1569	1602	1625
37	1595	1592	45837	45880	-0.09	1567	1573	1608	1632
38	1601	1598	47364	47409	-0.09	1573	1579	1615	1642
39	1606	1603	48897	48944	-0.10	1577	1583	1620	1645
40	1612	1608	50434	50485	-0.10	1583	1587	1627	1652
41	1617	1618	51980	52032	-0.10	1592	1598	1637	1665
42	1623	1627	53534	53583	-0.09	1599	1606	1646	1675
43	1628	1634	55097	55140	-0.08	1606	1614	1654	1684
44	1633	1638	56665	56702	-0.06	1611	1617	1657	1688
45	1638	1643	58237	58269	-0.05	1615	1621	1661	1693
46	1643	1647	59814	59841	-0.05	1619	1625	1666	1692
47	1648	1651	61395	61418	-0.04	1625	1630	1670	1697

Time (min)	Integration E119 Std Average (°F)	Integration Furnace Average (°F)	Integration E119 Std Average (°F•min)	Integration Furnace Average (°F•min)	Error (%)	Furnace Probe #1 (°F)	Furnace Probe #2 (°F)	Furnace Probe #3 (°F)	Furnace Probe #4 (°F)
48	1652	1655	62980	62999	-0.03	1629	1634	1675	1700
49	1657	1658	64569	64585	-0.02	1634	1637	1679	1699
50	1661	1663	66162	66176	-0.02	1638	1641	1683	1705
51	1666	1667	67759	67771	-0.02	1642	1645	1685	1714
52	1670	1670	69359	69370	-0.01	1644	1648	1688	1716
53	1674	1673	70963	70973	-0.01	1649	1651	1692	1717
54	1678	1678	72571	72581	-0.01	1652	1656	1696	1725
55	1682	1681	74182	74193	-0.01	1655	1658	1698	1729
56	1686	1683	75796	75809	-0.02	1656	1661	1699	1733
57	1690	1685	77412	77429	-0.02	1657	1664	1701	1736
58	1694	1686	79030	79053	-0.03	1660	1664	1702	1734
59	1698	1689	80650	80680	-0.04	1663	1667	1706	1735
60	1701	1694	82274	82311	-0.04	1666	1672	1709	1746
61	1705	1702	83903	83946	-0.05	1673	1679	1717	1755
62	1709	1708	85540	85584	-0.05	1678	1685	1723	1761
63	1712	1713	87182	87226	-0.05	1684	1690	1728	1767
64	1716	1717	88829	88872	-0.05	1688	1695	1731	1770
65	1719	1721	90480	90521	-0.04	1692	1698	1735	1774
66	1722	1723	92134	92173	-0.04	1694	1699	1737	1780
67	1726	1725	93790	93829	-0.04	1696	1703	1739	1782
68	1729	1727	95448	95487	-0.04	1699	1705	1741	1784
69	1732	1731	97110	97149	-0.04	1703	1708	1745	1788
70	1735	1735	98774	98815	-0.04	1707	1712	1748	1792
71	1738	1738	100443	100483	-0.04	1709	1714	1751	1796
72	1742	1740	102113	102155	-0.04	1711	1717	1754	1798
73	1745	1741	103785	103829	-0.04	1713	1718	1755	1794
74	1748	1745	105460	105507	-0.04	1716	1723	1759	1802
75	1751	1749	107139	107187	-0.04	1720	1725	1763	1803
76	1753	1752	108822	108871	-0.04	1721	1729	1766	1807
77	1756	1755	110507	110557	-0.05	1724	1732	1769	1812
78	1759	1759	112196	112247	-0.05	1729	1735	1772	1817
79	1762	1762	113888	113939	-0.04	1733	1738	1775	1818
80	1765	1768	115585	115634	-0.04	1739	1745	1779	1827
81	1768	1771	117287	117332	-0.04	1741	1748	1782	1832
82	1770	1775	118992	119032	-0.03	1745	1751	1786	1833
83	1773	1778	120700	120735	-0.03	1748	1755	1789	1838
84	1776	1780	122411	122441	-0.02	1750	1757	1791	1837
85	1778	1783	124124	124149	-0.02	1752	1760	1792	1843
86	1781	1785	125840	125860	-0.02	1754	1763	1795	1846
87	1783	1788	127558	127574	-0.01	1757	1765	1797	1850
88	1786	1790	129279	129290	-0.01	1759	1767	1799	1851
89	1788	1792	131001	131008	-0.01	1761	1769	1800	1852
90	1791	1794	132726	132729	0.00	1764	1771	1802	1853
91	1793	1796	134453	134453	0.00	1764	1773	1805	1854
92	1796	1797	136181	136179	0.00	1766	1774	1807	1856
93	1798	1800	137912	137907	0.00	1770	1776	1809	1858
94	1800	1802	139645	139637	0.01	1772	1779	1812	1861
95	1803	1805	141380	141370	0.01	1774	1781	1814	1864

Time (min)	E119 Std Furnace Average (°F)	Furnace Average (°F)	Integration of Furnace Average (°F•min)	Integration of E119 Std Average (°F•min)	Error (%)	Furnace Probe #1 (°F)	Furnace Probe #2 (°F)	Furnace Probe #3 (°F)	Furnace Probe #4 (°F)
96	1805	1805	143117	143105	0.01	1774	1780	1815	1864
97	1807	1807	144855	144843	0.01	1775	1782	1816	1865
98	1809	1808	146594	146583	0.01	1778	1784	1817	1867
99	1812	1810	148335	148325	0.01	1778	1785	1819	1869
100	1814	1811	150078	150069	0.01	1780	1786	1821	1868
101	1816	1812	151821	151815	0.00	1781	1782	1821	1869
102	1818	1816	153567	153564	0.00	1785	1786	1825	1875
103	1820	1820	155317	155315	0.00	1790	1790	1830	1881
104	1823	1824	157071	157068	0.00	1793	1795	1834	1884
105	1825	1829	158829	158823	0.00	1798	1799	1838	1889
106	1827	1831	160591	160580	0.01	1800	1801	1840	1892
107	1829	1833	162355	162339	0.01	1802	1804	1842	1893
108	1831	1836	164122	164100	0.01	1805	1806	1844	1895
109	1833	1839	165891	165863	0.02	1808	1809	1847	1898
110	1835	1840	167662	167628	0.02	1809	1811	1847	1900
111	1836	1842	169436	169395	0.02	1811	1814	1849	1900
112	1838	1845	171211	171164	0.03	1812	1817	1852	1904
113	1839	1848	172989	172933	0.03	1816	1820	1854	1906
114	1840	1850	174770	174704	0.04	1817	1823	1855	1908
115	1841	1850	176552	176477	0.04	1817	1823	1856	1907
116	1843	1849	178334	178250	0.05	1813	1822	1854	1906
117	1844	1849	180115	180025	0.05	1811	1822	1853	1906
118	1845	1850	181896	181801	0.05	1811	1823	1853	1906
119	1846	1851	183678	183578	0.05	1813	1825	1856	1908
120	1848	1853	185463	185357	0.06	1816	1827	1857	1908
121	1849	1854	187248	187136	0.06	1818	1829	1858	1907

Max Temp
Max Allowed

E Time (min)	Furnace Probe #5 (°F)	Furnace Probe #6 (°F)	Furnace Probe #7 (°F)	Furnace Probe #8 (°F)	Furnace Probe #9 (°F)	Furnace Probe #10 (°F)	W10x49 (76 mils) Avg (°F)	W10x49 (76 mils) TC #29 (°F)	W10x49 (76 mils) TC #30 (°F)
0	82	82	82	bad tc	81	82	83	82	82
1	132	124	138	bad tc	150	149	133	124	142
2	335	306	328	bad tc	444	435	195	184	209
3	608	573	655	bad tc	857	880	231	221	237
4	828	770	872	bad tc	1046	1042	256	247	262
5	944	873	970	bad tc	1108	1089	282	275	290
6	1012	934	1027	bad tc	1139	1114	306	301	314
7	1058	978	1064	bad tc	1160	1134	328	325	335
8	1104	1023	1107	bad tc	1191	1170	348	347	356
9	1174	1093	1183	bad tc	1255	1243	367	368	374
10	1243	1167	1255	bad tc	1318	1312	384	385	389
11	1298	1231	1310	bad tc	1371	1361	399	400	403
12	1342	1283	1352	bad tc	1418	1402	414	414	416
13	1378	1320	1381	bad tc	1450	1431	428	428	429
14	1400	1344	1399	bad tc	1466	1449	440	440	441
15	1408	1356	1408	bad tc	1467	1455	451	452	452
16	1415	1364	1414	bad tc	1468	1459	461	462	461
17	1422	1372	1422	bad tc	1474	1464	471	472	470
18	1431	1381	1433	bad tc	1481	1472	480	482	477
19	1440	1390	1443	bad tc	1488	1482	489	490	485
20	1449	1400	1453	bad tc	1498	1490	497	499	492
21	1458	1410	1462	bad tc	1507	1499	505	507	499
22	1466	1420	1472	bad tc	1515	1508	512	515	505
23	1475	1430	1480	bad tc	1527	1517	519	523	511
24	1484	1443	1492	bad tc	1540	1529	526	530	517
25	1494	1453	1502	bad tc	1550	1537	532	537	522
26	1502	1462	1510	bad tc	1558	1546	539	543	527
27	1510	1471	1518	bad tc	1569	1555	545	550	532
28	1518	1480	1527	bad tc	1578	1563	552	557	537
29	1525	1489	1534	bad tc	1585	1570	558	563	541
30	1531	1497	1541	bad tc	1589	1575	565	570	545
31	1536	1503	1547	bad tc	1598	1582	571	577	550
32	1540	1509	1552	bad tc	1604	1588	578	584	554
33	1545	1515	1557	bad tc	1606	1592	584	591	558
34	1552	1522	1564	bad tc	1616	1598	591	599	563
35	1559	1531	1571	bad tc	1622	1605	597	605	568
36	1565	1536	1577	bad tc	1627	1610	604	613	573
37	1571	1543	1582	bad tc	1633	1615	611	620	578
38	1576	1550	1589	bad tc	1640	1622	617	627	583
39	1580	1555	1592	bad tc	1645	1626	624	634	589
40	1584	1561	1596	bad tc	1652	1632	631	642	594
41	1593	1570	1606	bad tc	1661	1644	637	649	599
42	1601	1578	1614	bad tc	1670	1653	644	656	605
43	1607	1585	1620	bad tc	1678	1660	651	663	610
44	1611	1590	1625	bad tc	1681	1663	658	671	616
45	1617	1595	1630	bad tc	1685	1667	664	677	620
46	1622	1600	1635	bad tc	1687	1673	671	685	626
47	1626	1604	1638	bad tc	1693	1678	678	692	631

E Time (min)	Furnace Probe #5 (°F)	Furnace Probe #6 (°F)	Furnace Probe #7 (°F)	Furnace Probe #8 (°F)	Furnace Probe #9 (°F)	Furnace Probe #10 (°F)	W10x49 (76 mils) Avg (°F)	W10x49 (76 mils) TC #29 (°F)	W10x49 (76 mils) TC #30 (°F)
48	1630	1609	1640	bad tc	1699	1681	684	699	636
49	1632	1612	1644	bad tc	1703	1685	691	706	642
50	1636	1617	1647	bad tc	1709	1691	699	714	648
51	1640	1623	1651	bad tc	1712	1693	706	722	655
52	1643	1625	1655	bad tc	1716	1696	713	730	661
53	1646	1630	1657	bad tc	1719	1699	721	738	668
54	1650	1634	1662	bad tc	1722	1703	729	746	676
55	1654	1638	1665	bad tc	1726	1705	737	754	684
56	1657	1641	1668	bad tc	1725	1707	745	762	692
57	1660	1644	1671	bad tc	1727	1709	752	769	699
58	1661	1644	1671	bad tc	1731	1711	760	777	708
59	1663	1648	1674	bad tc	1733	1716	768	785	716
60	1666	1652	1678	bad tc	1737	1719	776	793	723
61	1673	1659	1684	bad tc	1748	1726	784	801	732
62	1678	1666	1691	bad tc	1755	1732	792	809	740
63	1684	1671	1697	bad tc	1759	1737	800	817	748
64	1689	1675	1700	bad tc	1763	1743	808	825	756
65	1692	1679	1704	bad tc	1765	1746	816	833	764
66	1695	1682	1705	bad tc	1767	1748	824	842	772
67	1698	1683	1707	bad tc	1770	1749	833	850	781
68	1700	1686	1710	bad tc	1770	1751	841	858	789
69	1702	1689	1713	bad tc	1774	1757	849	867	797
70	1707	1693	1716	bad tc	1777	1760	858	876	806
71	1710	1696	1718	bad tc	1783	1761	866	883	814
72	1712	1698	1721	bad tc	1783	1764	874	892	822
73	1712	1700	1722	bad tc	1787	1765	883	900	831
74	1716	1704	1726	bad tc	1791	1771	890	909	838
75	1718	1708	1730	bad tc	1796	1775	899	916	848
76	1723	1712	1733	bad tc	1797	1777	908	926	856
77	1727	1715	1735	bad tc	1801	1780	916	934	865
78	1731	1719	1740	bad tc	1804	1783	924	943	873
79	1733	1723	1743	bad tc	1808	1788	934	952	883
80	1739	1726	1748	bad tc	1811	1794	942	960	891
81	1744	1731	1751	bad tc	1816	1797	951	969	900
82	1746	1735	1755	bad tc	1820	1801	959	977	908
83	1750	1739	1758	bad tc	1823	1803	968	986	917
84	1751	1741	1759	bad tc	1825	1805	977	995	925
85	1755	1743	1762	bad tc	1827	1809	985	1003	934
86	1758	1746	1766	bad tc	1829	1810	994	1012	943
87	1760	1749	1768	bad tc	1831	1811	1002	1021	951
88	1764	1750	1769	bad tc	1832	1815	1011	1030	960
89	1766	1753	1771	bad tc	1835	1818	1020	1038	969
90	1767	1755	1773	bad tc	1837	1820	1029	1048	978
91	1768	1759	1776	bad tc	1841	1821	1037	1056	986
92	1770	1760	1777	bad tc	1843	1823	1046	1064	995
93	1773	1762	1779	bad tc	1844	1827	1054	1073	1004
94	1776	1765	1782	bad tc	1844	1829	1063	1082	1012
95	1780	1766	1784	bad tc	1847	1831	1071	1090	1021

E Time (min)	Furnace Probe #5 (°F)	Furnace Probe #6 (°F)	Furnace Probe #7 (°F)	Furnace Probe #8 (°F)	Furnace Probe #9 (°F)	Furnace Probe #10 (°F)	W10x49 (76 mils) Avg (°F)	W10x49 (76 mils) TC #29 (°F)	W10x49 (76 mils) TC #30 (°F)
96	1781	1768	1785	bad tc	1847	1831	1080	1099	1030
97	1783	1769	1787	bad tc	1850	1832	1088	1107	1038
98	1785	1772	1788	bad tc	1851	1834	1097	1116	1047
99	1786	1773	1791	bad tc	1852	1835	1105	1124	1055
100	1788	1775	1791	bad tc	1853	1837	1113	1132	1064
101	1790	1777	1792	bad tc	1853	1839	1121	1140	1072
102	1795	1780	1797	bad tc	1854	1845	1130	1148	1081
103	1800	1784	1801	bad tc	1858	1849	1138	1156	1089
104	1802	1789	1805	bad tc	1865	1851	1147	1165	1098
105	1808	1792	1808	bad tc	1868	1858	1155	1173	1106
106	1810	1795	1811	bad tc	1871	1858	1163	1181	1115
107	1812	1798	1813	bad tc	1876	1860	1171	1188	1123
108	1815	1801	1816	bad tc	1877	1862	1179	1196	1131
109	1819	1804	1820	bad tc	1877	1867	1187	1204	1140
110	1823	1806	1823	bad tc	1877	1867	1195	1212	1148
111	1825	1807	1824	bad tc	1880	1868	1203	1220	1156
112	1828	1809	1828	bad tc	1884	1869	1211	1227	1164
113	1832	1811	1831	bad tc	1886	1873	1219	1235	1172
114	1836	1815	1834	bad tc	1889	1874	1226	1242	1180
115	1836	1815	1834	bad tc	1889	1874	1234	1250	1188
116	1837	1816	1833	bad tc	1887	1873	1242	1257	1196
117	1836	1817	1833	bad tc	1888	1873	1249	1264	1203
118	1838	1818	1835	bad tc	1888	1875	1257	1271	1211
119	1839	1820	1836	bad tc	1889	1876	1264	1278	1219
120	1839	1822	1837	bad tc	1893	1878	1272	1285	1226
121	1840	1825	1839	bad tc	1894	1879	1279	1292	1234
Max Temp							1279	1292	1234
Max Allowed							1000	1200	1200

Time	W10x49 E(76 mils) TC #31	W10x49 (76 mils) TC #32	W12x106 (57 mils) Avg	W12x106 (57 mils) TC #33	W12x106 (57 mils) TC #34	W12x106 (57 mils) TC #35	W12x106 (57 mils) TC #36	W8x31 (50 mils) Avg	W8x31 (50 mils) TC #37
(min)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)
0	83	83	83	83	83	83	83	82	82
1	114	150	118	113	131	101	128	161	148
2	171	214	175	165	201	142	192	238	228
3	213	251	213	208	234	181	227	288	278
4	234	281	237	229	254	210	253	323	314
5	257	306	258	250	276	229	275	353	343
6	279	330	278	270	296	249	295	380	370
7	300	351	296	288	316	266	313	401	394
8	319	369	314	306	335	284	332	419	411
9	338	386	332	323	352	300	351	437	429
10	357	403	348	340	368	315	369	455	445
11	374	420	363	356	382	330	385	471	460
12	390	436	377	372	395	343	399	486	474
13	404	449	391	386	406	357	413	499	487
14	417	461	402	400	416	368	424	512	499
15	429	472	414	412	426	380	436	524	511
16	440	482	424	424	435	390	446	535	520
17	451	492	434	435	443	401	455	546	530
18	460	502	443	446	451	410	464	556	539
19	469	511	452	455	459	420	472	567	550
20	477	520	460	465	466	429	479	577	559
21	485	528	468	473	474	438	487	587	568
22	492	536	476	482	481	446	494	597	578
23	499	544	483	491	487	454	501	607	587
24	505	552	490	498	494	462	507	617	597
25	511	559	498	506	501	470	514	627	607
26	518	567	505	514	508	477	521	636	617
27	524	575	512	521	514	484	527	646	626
28	531	583	518	528	520	491	533	655	635
29	537	592	525	535	527	497	540	665	645
30	543	600	531	542	532	504	546	675	654
31	549	608	537	549	538	509	552	685	664
32	556	616	543	556	543	515	559	695	674
33	562	624	550	564	549	521	566	705	683
34	568	632	556	571	554	526	572	715	693
35	575	640	563	579	560	531	580	726	703
36	581	648	569	587	565	537	585	737	713
37	588	656	575	595	571	542	592	748	724
38	595	663	582	604	576	547	600	760	736
39	602	671	588	612	582	552	607	771	746
40	608	679	595	620	588	558	613	783	756
41	615	686	602	629	594	563	620	795	768
42	621	694	608	637	600	569	627	806	778
43	628	702	615	645	607	574	634	818	789
44	635	710	622	654	613	580	640	830	801
45	642	718	629	662	619	587	647	842	812
46	648	725	636	671	625	593	654	853	823
47	655	733	643	679	632	599	661	865	835

Time (min)	W10x49 E(76 mils) TC #31 (°F)	W10x49 (76 mils) TC #32 (°F)	W12x106 (57 mils) Avg (°F)	W12x106 (57 mils) TC #33 (°F)	W12x106 (57 mils) TC #34 (°F)	W12x106 (57 mils) TC #35 (°F)	W12x106 (57 mils) TC #36 (°F)	W8x31 (50 mils) Avg (°F)	W8x31 (50 mils) TC #37 (°F)
48	662	740	650	688	638	604	668	877	846
49	669	748	657	696	645	611	674	889	857
50	676	756	664	705	651	617	681	901	869
51	683	764	671	714	658	624	689	912	880
52	690	772	678	723	664	630	695	924	892
53	698	780	685	731	671	636	702	937	904
54	705	788	692	740	678	642	709	948	915
55	713	795	699	748	685	648	716	960	927
56	721	803	707	757	691	655	723	972	939
57	728	811	715	767	699	662	730	984	950
58	736	819	722	776	706	668	737	996	962
59	744	826	729	784	713	675	745	1008	974
60	752	835	737	793	720	683	751	1019	986
61	759	842	745	802	728	689	759	1031	997
62	767	851	752	811	736	696	766	1043	1009
63	775	858	760	820	743	702	774	1054	1021
64	783	867	768	829	751	710	781	1066	1034
65	791	875	776	838	759	718	789	1078	1046
66	799	883	784	847	767	724	796	1090	1057
67	807	892	792	857	775	731	803	1101	1069
68	815	900	800	866	783	739	811	1112	1081
69	823	909	808	875	791	746	819	1123	1093
70	831	917	816	884	799	753	826	1135	1104
71	839	926	824	893	807	761	834	1146	1116
72	848	934	832	902	816	768	841	1157	1127
73	856	943	840	911	824	775	849	1168	1138
74	864	950	848	920	833	783	857	1179	1149
75	872	960	857	929	841	791	865	1189	1160
76	880	968	864	938	849	798	872	1200	1171
77	888	977	873	947	858	806	880	1211	1181
78	896	985	880	955	865	813	888	1221	1192
79	905	994	889	965	875	821	895	1231	1203
80	913	1002	898	974	884	829	903	1242	1213
81	922	1011	906	983	892	836	911	1252	1224
82	930	1021	914	992	902	844	919	1262	1235
83	938	1030	923	1001	910	852	927	1271	1245
84	947	1039	931	1010	920	860	935	1280	1255
85	955	1048	940	1019	929	868	943	1289	1265
86	964	1057	948	1028	937	876	951	1298	1274
87	972	1065	957	1037	946	884	959	1307	1284
88	981	1074	965	1046	955	892	967	1316	1294
89	989	1083	974	1055	964	900	975	1325	1303
90	998	1091	982	1063	973	908	983	1334	1312
91	1006	1100	991	1072	982	917	991	1342	1321
92	1015	1109	999	1080	991	925	999	1351	1329
93	1023	1117	1007	1089	1000	933	1007	1359	1337
94	1031	1126	1016	1097	1009	941	1015	1366	1343
95	1040	1133	1024	1106	1018	949	1023	1373	1349

	W10x49 E(76 mils)	W10x49 (76 mils)	W12x106 (57 mils)	W12x106 (57 mils)	W12x106 (57 mils)	W12x106 (57 mils)	W12x106 (57 mils)	W8x31 (50 mils)	W8x31 (50 mils)
Time	**TC #31**	**TC #32**	**Avg**	**TC #33**	**TC #34**	**TC #35**	**TC #36**	**Avg**	**TC #37**
(min)	**(°F)**	**(°F)**	**(°F)**	**(°F)**	**(°F)**	**(°F)**	**(°F)**	**(°F)**	**(°F)**
96	1048	1142	1033	1114	1027	958	1031	1379	1354
97	1057	1151	1041	1122	1036	966	1039	1385	1358
98	1065	1159	1049	1130	1044	974	1047	1390	1361
99	1073	1167	1057	1138	1053	983	1055	1396	1367
100	1082	1175	1066	1146	1062	991	1063	1401	1373
101	1090	1183	1074	1154	1071	1000	1070	1406	1379
102	1099	1192	1082	1162	1079	1008	1078	1413	1386
103	1107	1200	1090	1170	1088	1016	1086	1419	1393
104	1115	1208	1098	1177	1096	1024	1094	1426	1400
105	1123	1216	1106	1185	1105	1033	1102	1434	1408
106	1132	1224	1114	1192	1113	1041	1110	1443	1416
107	1140	1232	1122	1200	1122	1050	1117	1451	1425
108	1148	1240	1130	1207	1130	1058	1125	1460	1433
109	1156	1247	1138	1215	1139	1066	1133	1469	1442
110	1164	1256	1147	1222	1148	1075	1141	1478	1451
111	1172	1263	1154	1229	1156	1083	1148	1488	1460
112	1180	1271	1162	1236	1164	1091	1156	1497	1469
113	1188	1279	1170	1243	1172	1099	1164	1506	1478
114	1196	1287	1178	1250	1181	1107	1172	1516	1487
115	1204	1294	1185	1257	1189	1116	1179	1525	1496
116	1212	1302	1193	1264	1197	1124	1186	1534	1505
117	1220	1310	1201	1271	1205	1132	1194	1543	1514
118	1227	1318	1208	1277	1213	1140	1201	1553	1524
119	1234	1325	1215	1283	1221	1147	1208	1562	1533
120	1242	1333	1222	1290	1229	1155	1215	1573	1544
121	1250	1340	1229	1296	1236	1163	1222	1583	1555
Max Temp	1250	1340	1229	1296	1236	1163	1222	1583	1555
Max Allowed	1200	1200	1000	1200	1200	1200	1200	1000	1200

Time (min)	W8x31 E(50 mils) TC #38 (°F)	W8x31 (50 mils) TC #39 (°F)	W8x31 (50 mils) TC #40 (°F)	W8x31 (68 mils) Avg (°F)	W8x31 (68 mils) TC #41 (°F)	W8x31 (68 mils) TC #42 (°F)	W8x31 (68 mils) TC #43 (°F)	W8x31 (68 mils) TC #44 (°F)	W12x106 (74 mils) Avg (°F)
0	82	82	82	83	83	83	83	83	82
1	166	140	190	145	139	149	126	167	111
2	239	217	267	216	211	217	196	238	151
3	283	259	330	253	250	248	233	282	176
4	317	298	364	288	288	282	265	315	193
5	345	330	393	318	319	314	296	343	205
6	372	358	418	345	346	342	323	369	218
7	393	379	439	368	369	367	347	390	272
8	409	397	459	520	389	386	896	407	288
9	423	416	481	405	406	403	385	425	303
10	438	434	502	422	425	418	402	443	318
11	452	451	520	438	441	433	418	459	333
12	466	467	536	453	456	447	434	475	346
13	477	482	551	468	469	461	449	491	359
14	488	496	564	481	481	474	462	505	371
15	499	509	577	492	492	485	474	518	383
16	509	521	589	504	503	495	486	530	393
17	519	532	602	514	512	504	497	542	403
18	529	542	614	523	522	512	507	552	413
19	539	552	627	532	530	520	518	561	422
20	547	562	640	541	539	528	528	569	431
21	556	571	652	550	547	537	537	578	440
22	564	582	663	558	555	544	545	588	448
23	573	592	675	565	562	550	552	597	455
24	581	602	687	573	570	554	559	608	463
25	588	612	699	580	577	558	567	618	470
26	595	622	710	587	585	562	574	628	477
27	603	632	722	595	593	568	582	638	484
28	610	643	733	603	601	574	590	648	490
29	618	653	745	611	609	580	598	658	497
30	626	663	756	619	617	586	607	667	503
31	634	674	768	627	624	592	615	677	509
32	641	685	779	636	633	598	624	687	515
33	650	695	791	643	640	604	632	696	521
34	659	706	803	651	648	610	641	706	527
35	669	717	816	659	656	616	649	715	532
36	679	728	828	668	665	622	658	725	538
37	690	739	840	675	672	627	666	734	544
38	700	751	853	683	681	633	675	744	549
39	712	762	865	691	689	639	683	753	554
40	723	773	878	700	697	646	692	763	560
41	734	785	891	708	706	653	700	773	565
42	745	797	904	716	714	660	709	782	571
43	757	809	916	726	723	669	718	793	577
44	769	820	929	735	733	678	727	803	582
45	780	832	942	745	743	688	737	812	588
46	791	844	954	755	752	698	746	822	594
47	803	856	967	765	762	709	756	831	600

Time (min)	W8x31 E(50 mils) TC #38 (°F)	W8x31 (50 mils) TC #39 (°F)	W8x31 (50 mils) TC #40 (°F)	W8x31 (68 mils) Avg (°F)	W8x31 (68 mils) TC #41 (°F)	W8x31 (68 mils) TC #42 (°F)	W8x31 (68 mils) TC #43 (°F)	W8x31 (68 mils) TC #44 (°F)	W12x106 (74 mils) Avg (°F)
48	815	868	979	775	772	720	767	841	605
49	826	880	991	785	782	730	776	851	611
50	838	892	1004	795	792	741	786	860	617
51	850	903	1016	805	802	752	796	870	623
52	862	915	1028	815	811	762	806	880	628
53	874	927	1041	825	821	773	815	889	634
54	886	939	1053	835	832	784	825	900	640
55	898	950	1066	845	841	794	835	909	646
56	909	962	1078	855	851	804	845	919	652
57	921	974	1089	865	861	815	856	929	658
58	934	985	1102	875	871	825	866	939	664
59	945	998	1113	886	881	836	876	950	670
60	957	1009	1124	896	891	846	886	960	676
61	970	1021	1136	906	901	857	896	971	682
62	981	1033	1148	917	911	868	906	981	688
63	993	1044	1159	927	921	878	917	992	694
64	1005	1055	1171	937	931	888	927	1003	701
65	1018	1066	1181	948	941	899	937	1014	707
66	1029	1079	1193	958	952	910	947	1024	713
67	1041	1089	1203	969	962	920	958	1036	720
68	1053	1101	1213	980	972	931	968	1047	726
69	1064	1112	1224	990	982	941	979	1058	732
70	1076	1124	1235	1001	992	952	989	1069	738
71	1088	1133	1245	1011	1002	962	1000	1080	745
72	1099	1146	1255	1022	1013	973	1010	1091	752
73	1111	1157	1265	1033	1023	984	1021	1102	758
74	1123	1167	1275	1043	1034	994	1031	1113	765
75	1134	1178	1285	1053	1044	1005	1041	1123	772
76	1144	1189	1296	1064	1054	1015	1051	1134	778
77	1156	1199	1306	1074	1064	1026	1062	1145	785
78	1166	1209	1316	1084	1075	1036	1071	1154	792
79	1177	1219	1326	1095	1085	1046	1082	1165	799
80	1187	1230	1337	1105	1096	1056	1092	1176	806
81	1198	1239	1347	1116	1107	1066	1103	1186	814
82	1208	1249	1357	1126	1117	1077	1113	1197	821
83	1219	1259	1362	1136	1127	1087	1123	1207	828
84	1228	1269	1367	1147	1137	1097	1134	1218	835
85	1238	1277	1375	1157	1147	1107	1144	1229	842
86	1248	1286	1383	1166	1157	1117	1153	1238	849
87	1258	1295	1392	1177	1168	1127	1164	1249	856
88	1267	1303	1401	1187	1177	1137	1174	1259	864
89	1276	1311	1410	1197	1187	1147	1183	1269	871
90	1286	1320	1419	1207	1197	1157	1193	1279	878
91	1294	1326	1428	1216	1207	1166	1203	1288	886
92	1303	1333	1438	1226	1216	1176	1213	1298	893
93	1311	1340	1447	1235	1226	1185	1222	1308	900
94	1320	1345	1456	1245	1235	1194	1231	1318	908
95	1328	1350	1465	1254	1245	1203	1241	1328	915

Time (min)	W8x31 E(50 mils) TC #38 (°F)	W8x31 (50 mils) TC #39 (°F)	W8x31 (50 mils) TC #40 (°F)	W8x31 (68 mils) Avg (°F)	W8x31 (68 mils) TC #41 (°F)	W8x31 (68 mils) TC #42 (°F)	W8x31 (68 mils) TC #43 (°F)	W8x31 (68 mils) TC #44 (°F)	W12x106 (74 mils) Avg (°F)
96	1335	1354	1474	1264	1254	1213	1250	1338	923
97	1343	1356	1483	1273	1263	1222	1259	1348	930
98	1350	1358	1491	1282	1271	1230	1268	1357	937
99	1355	1361	1500	1290	1280	1239	1277	1362	944
100	1356	1366	1509	1298	1289	1248	1285	1368	952
101	1356	1372	1517	1306	1297	1256	1294	1375	959
102	1358	1380	1526	1314	1306	1265	1302	1383	967
103	1361	1387	1534	1322	1314	1273	1310	1391	974
104	1366	1395	1543	1330	1322	1281	1317	1399	982
105	1372	1404	1553	1338	1329	1289	1324	1408	989
106	1380	1413	1562	1345	1335	1296	1331	1417	996
107	1387	1422	1571	1352	1341	1304	1338	1426	1004
108	1395	1431	1580	1360	1347	1311	1344	1436	1011
109	1402	1441	1590	1367	1352	1319	1348	1448	1019
110	1412	1451	1599	1388	1356	1326	1353	1515	1026
111	1422	1460	1608	1406	1360	1335	1358	1572	1033
112	1432	1469	1617	1421	1365	1343	1362	1615	1041
113	1442	1479	1625	1435	1371	1351	1370	1648	1048
114	1452	1489	1634	1448	1381	1357	1384	1671	1055
115	1463	1498	1642	1462	1399	1359	1400	1690	1062
116	1472	1508	1650	1477	1424	1361	1419	1705	1069
117	1482	1519	1658	1494	1451	1366	1439	1719	1077
118	1492	1530	1665	1511	1478	1376	1460	1731	1084
119	1501	1541	1673	1529	1505	1388	1480	1743	1091
120	1512	1553	1681	1546	1530	1401	1501	1753	1098
121	1522	1566	1688	1564	1554	1417	1523	1762	1106
Max Temp	1522	1566	1688	1564	1554	1417	1523	1762	1106
Max Allowed	1200	1200	1200	1000	1200	1200	1200	1200	1000

Time (min)	W12x106 E(74 mils) TC #45 (°F)	W12x106 (74 mils) TC #46 (°F)	W12x106 (74 mils) TC #47 (°F)	W12x106 (74 mils) TC #48 (°F)
0	83	83	80	83
1	107	128	80	129
2	151	189	80	182
3	190	220	80	214
4	214	240	80	236
5	228	258	80	255
6	246	274	80	273
7	263	290	245	290
8	279	305	261	307
9	294	320	276	323
10	308	337	290	337
11	323	353	304	350
12	338	367	317	363
13	352	380	330	375
14	365	391	343	386
15	377	401	355	397
16	388	411	367	407
17	399	420	377	417
18	409	429	388	426
19	419	437	397	435
20	428	446	406	444
21	437	455	414	452
22	446	463	422	460
23	454	470	430	467
24	462	478	437	474
25	470	485	445	481
26	477	492	451	486
27	484	499	458	493
28	491	506	464	499
29	497	514	471	505
30	503	521	477	511
31	509	528	482	516
32	515	534	488	521
33	521	541	493	527
34	527	547	499	533
35	532	553	504	538
36	538	559	510	544
37	544	565	515	550
38	550	571	520	555
39	555	577	524	561
40	562	582	529	567
41	568	587	533	573
42	574	593	538	579
43	580	599	543	586
44	587	603	547	592
45	593	609	552	598
46	599	614	557	604
47	605	620	562	611

Time (min)	W12x106 E(74 mils) TC #45 (°F)	W12x106 (74 mils) TC #46 (°F)	W12x106 (74 mils) TC #47 (°F)	W12x106 (74 mils) TC #48 (°F)
48	612	625	567	617
49	618	631	572	622
50	624	636	578	628
51	631	642	583	635
52	637	647	588	641
53	643	652	594	647
54	650	658	600	653
55	656	664	605	659
56	662	669	611	665
57	669	674	616	671
58	675	680	622	677
59	682	687	628	683
60	689	692	633	689
61	695	698	639	696
62	702	704	645	702
63	708	710	650	709
64	716	716	656	715
65	723	722	662	721
66	729	728	668	727
67	736	734	675	734
68	743	740	680	740
69	749	746	687	746
70	756	752	693	752
71	763	759	700	759
72	770	766	706	766
73	777	772	712	772
74	784	779	719	779
75	792	786	725	785
76	798	792	732	791
77	805	800	738	798
78	812	807	745	805
79	820	814	751	812
80	827	821	758	819
81	834	829	765	826
82	841	836	772	833
83	849	843	779	839
84	856	851	786	846
85	863	859	793	853
86	870	866	799	860
87	878	874	806	867
88	885	882	813	874
89	892	889	820	881
90	900	897	827	889
91	907	905	835	895
92	915	913	841	902
93	922	921	849	909
94	929	929	856	917
95	937	937	863	924

Time (min)	W12x106 E(74 mils) TC #45 (°F)	W12x106 (74 mils) TC #46 (°F)	W12x106 (74 mils) TC #47 (°F)	W12x106 (74 mils) TC #48 (°F)
96	944	945	870	931
97	951	952	877	938
98	959	960	884	945
99	966	968	891	952
100	974	976	899	959
101	981	983	906	966
102	989	991	913	973
103	996	999	920	980
104	1003	1007	928	988
105	1010	1015	935	995
106	1018	1023	942	1002
107	1025	1031	949	1009
108	1032	1039	957	1017
109	1039	1047	964	1024
110	1047	1054	971	1031
111	1054	1062	979	1038
112	1061	1070	986	1045
113	1068	1078	993	1052
114	1075	1085	1001	1059
115	1082	1093	1008	1066
116	1089	1100	1015	1073
117	1096	1108	1022	1080
118	1103	1116	1030	1087
119	1110	1123	1037	1094
120	1117	1131	1044	1101
121	1124	1138	1052	1108
Max Temp	1124	1138	1052	1108
Max Allowed	1200	1200	1200	1200

APPENDIX C

PHOTOGRAPHS

Blasted steel

Red alkyd primer

Primer applied at 5 mils

Columns ready to spray

Contego Passive Fire Barrier Latex Thin Film Intumescent

Applying the coating

Columns loaded into the furnace

Columns loaded into the furnace

Columns loaded into the furnace

Columns loaded into the furnace

Column tops insulated with ceramic blanket and pressed against the furnace lid

Start of test

Char forming (W8x31 in center of picture)

Char forming (W8x31 in center of picture)

Furnace extinguished after 2 hours of exposure

Photo taken through personnel door immediately after the test

Post test

Post test