

# TEST REPORT



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ORIGINAL ISSUE DATE: February 27, 2017  
REVISED DATE: N/A

**EVALUATION CENTER**  
16015 Shady Falls Road  
Elmendorf, TX 78112  
Phone: (210) 635-8100  
Fax: (210) 635-8101  
[www.intertek.com](http://www.intertek.com)

## **RENDERED TO**

**CastleRock Building Products, Inc.**  
**P.O. Box 1258**  
**Meridian, ID 83680**

PRODUCT EVALUATED: ICAP Cladding  
EVALUATION PROPERTY: Flame Spread

**Report of Testing ICAP Cladding for compliance with the applicable requirements of the following criteria: NFPA 285, Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components, 2012 Edition.**

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## 2 Introduction

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Intertek Testing Services NA, Inc. (Intertek) has conducted testing for CastleRock Building Products, Inc., on ICAP Cladding, to evaluate its flame spread. Testing was conducted in accordance with, following the standard methods of **NFPA 285, Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components, 2012 Edition**. This evaluation took place February 17, 2017.

## 3 Test Samples

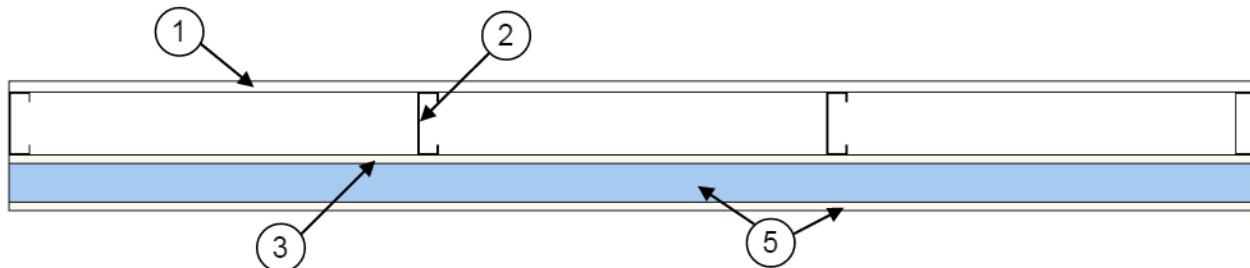
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### 3.1. SAMPLE SELECTION

Samples were randomly selected on February 1, 2017 by Intertek representative Curt Nadeau, at the CastleRock Building Products, Inc. manufacturing facility, located at 5617 East Cleveland Blvd, Caldwell, ID 83606. Samples of the CastleRock Building Products, Inc. ICAP Cladding (Intertek Sample ID Nos. [SAT1702091150-001, SAT1702141643-001]) were received at the Evaluation Center on February 9 and 14, 2017. The subject test specimen is a traceable sample selected from the manufacturer's facility. Intertek selected the specimen and has verified the composition, manufacturing techniques and quality assurance procedures.

### 3.2. SAMPLE AND ASSEMBLY DESCRIPTION

The 18 ft high × 14 ft wide ISMA test wall was constructed of metal studs, gypsum board interior cladding and foam insulation panels.



1. Interior Cladding – One layer of 4 ft × 10 ft × 5/8 in. thick Type X gypsum board installed with the long dimension perpendicular to the studs, fastened to the framing with #6 × 1-1/4 in. self-drilling, zinc-plated Bugle head screws spaced 8 in. on center (oc) around the perimeter and 12 in. oc in the field; joints and fasteners received a Level 2 finish.
2. Studs – 3-5/8 in., 20 GA galvanized steel studs, 24 in. oc, secured with #8 × 1/2 in. long, modified truss head framing screws to 20 GA top and bottom track.
3. Exterior Cladding – One layer of 4 ft × 8 ft × 1/2 in. Extremegreen Magnesium Oxide Board (MgO) installed with the long dimension perpendicular to the studs, fastened with

#10 × 2-1/4 in. Simpson CBSDQ self-drilling sheathing to CFS screws spaced 8 in. oc around the perimeter and in the field.

4. Weather Resistive Barrier (Not Shown) – One layer of Tremco® EXOAir weather resistive barrier installed in accordance with the manufacturer's specifications.
5. Window Flashing (Not Shown) – 24 GA window flashing installed directly to the exterior cladding solely on the top portion of the window opening.
6. Window Trim (Not Shown) – 2-3/4 in. thick wide window trim composed of a number of layers of MgO board installed around window opening using #9 × 3 in., Type 17 point fasteners spaced 16 in. oc, corners mitered and sealed with Dow 1199 sealant.
7. Panel System - CastleRock Building Products, Inc. ICAP Cladding containing max 2-1/4 in. EPS ASTM C578 Type XV foam sheathed with 1/2 in. Extremegreen MgO board adhered to the exterior face. Panels secured to exterior cladding with Type 17 point fasteners screws and washers through top of panel at 16 in. oc. Panels above the window were secured Type 17 point fasteners and washers with alternating Z-clips (1 in. wide with 2-1/4 in. long leg, 1 in. long leg, and 1/4 in. long leg), and J-clips (1 in. wide with 2-1/4 in. long leg, 1 in. long leg, and 1/4 in. long leg) each spaced 24 in. oc, and with vertical seams staggered two-thirds of the window's width (52 in. in this case) above the window opening. All joints up to 96 in. above the window area were sealed with Dow 790 sealant.

## 4 Testing and Evaluation Methods

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### 4.1. INSTRUMENTATION

Fifty-four (54), 24 GA, Type K, fiberglass jacketed thermocouples were installed in compliance with the standard (see Appendix A) and one (1) 24 GA, Type K, fiberglass jacketed thermocouple was installed to measure clip temperatures just above with window opening. The output of the thermocouples was monitored by a 100-channel Yokogawa, Inc., Darwin Data Acquisition Unit. The computer was programmed to scan and save data every 15 seconds. Following the test, those files were imported into MS Excel for tabular and graphical display (presented in Appendix B).

The Maximum TC Limits, established by the initial thermocouple temperatures and the test standard, are presented in Table 1 below:

**Table 1.** Acceptance criteria for maximum allowed temperatures

Location	TC #s	Maximum Allowed Temperature
Exterior Surface	11, 14 - 17	1000°F
Insulation	18, 19, 28, 31 - 40	750°F
2 <sup>nd</sup> floor Interior Surface	49 - 54	500°F rise

## 4.2. TEST STANDARD

Testing was conducted in accordance with the applicable requirements of, and following the standard methods of **NFPA 285, Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components, 2012 Edition**.

The assembly was secured to the test laboratory's Intermediate-Scale, Multi-story Test Apparatus (ISMA), with ceramic fiber insulation installed between the assembly and the furnace to create an effective seal. The window burner was centered on the vertical centerline of the window, 9 in. below the top of the opening, and with the longitudinal centerline of the burner 3 in. from the plane of the exterior wall, consistent with the standard and the calibration of the test apparatus. The assembly was tested using commercial grade propane gas at the flow rates determined during the calibration of the apparatus (See Appendix B).

# 5 Testing and Evaluation Results

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## 5.1. RESULTS AND OBSERVATIONS

The test was initiated on February 17, 2017. Les Cullen from CastleRock Building Products, Inc. was present to witness the test. The ambient temperature at the time of the test was 63 °F and the humidity was 70 % R.H.

**Table 2.** Observations made during the test

Time (min:sec)	Observation(s)
0:00	The test was initiated at 9:36 a.m.
0:30	Smoke out window; flashing tape melting; TC 20 bad
1:20	Room flashover; flames out window
2:50	Heavy soot deposition
5:00	Window burner lit
6:30	Slight popping sounds
10:00	All exposed flashing tape consumed; continued soot deposition
12:00	Window flashing significantly warped
15:00	Flame tips at 5 ft; no other changes
17:30	Vertical seam just above 2 ft mark bowing
20:00	Flame tips at 5.5 ft; slight steaming on perimeter of assembly
28:00	Foam drippings; slight flaming just above window
30:00	Gas off; no flaming visible on sample; observation period starts
35:00	Continued dripping of foam
40:00	Test terminated

**Table 3.** Observations made during the test on the second story

Time (min:sec)	Observations from the 2 <sup>nd</sup> Floor Room
0:00	Start time: 8:33 a.m.
6:27	Smoke coming from bottom middle angle
19:21	Smoke coming from bottom left angle
20:02	Smoke coming from bottom right angle
25:11	Smoke coming out stronger on left side
30:00	Test terminated

Flames on the exterior panels were within the established limit during the test (10 ft above the top of the window and 5 ft on either side of the assembly centerline). None of the thermocouples exceeded their maximum limits. Assembly drawings, test data, and photographs are documented in the Appendices of this report.

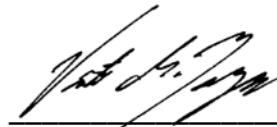
## 6 Conclusion

Intertek Testing Services NA, Inc. (Intertek) has conducted testing for CastleRock Building Products, Inc., on ICAP Cladding, to evaluate its flame spread. Testing was conducted in accordance with, following the standard methods of **NFPA 285, Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components, 2012 Edition**. This evaluation took place February 17, 2017.

Based on the data from this test, the assembly met the conditions of acceptance of the above mentioned standard.

### INTERTEK TESTING SERVICES NA, INC.

Tested and  
Reported by:   
Jan-Michael Cabrera, M.S.  
Project Engineer, Fire Resistance

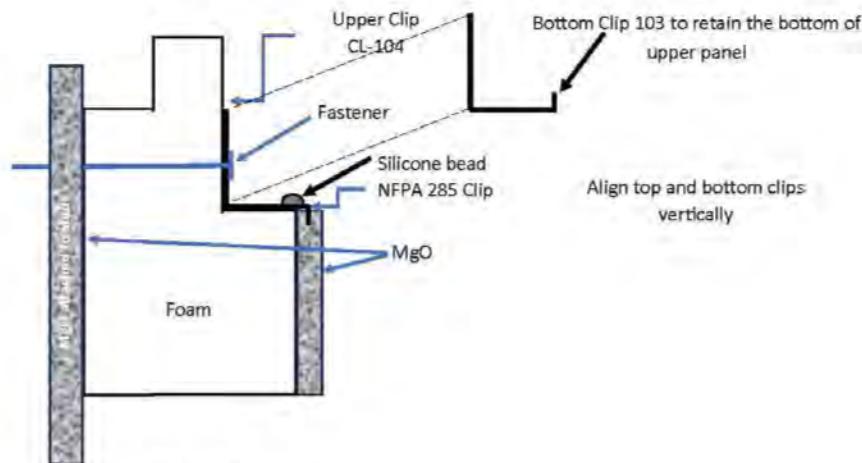
Reviewed by:   
Victor M. Burgos  
Engineering Team Leader, Fire Resistance

## **APPENDIX A**

### Assembly Drawings

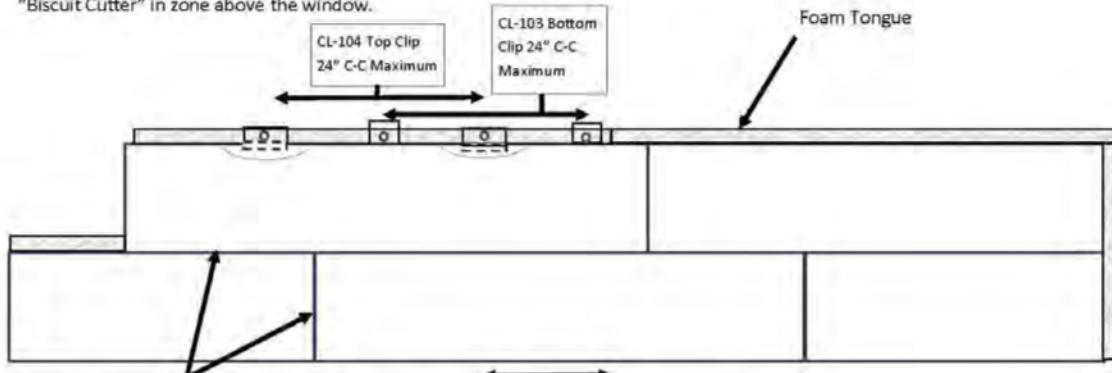
### Illustration "C"

Required in area above windows—(window width by 72" high) ICAP NFPA 285  
Securement Clip: Part# CL-103 (panel top) and CL-104 (panel bottom) Thickness: .050" minimum  
Material: Galv. Mild Steel, Stainless Steel, Aluminum  
Note: Notch 3/8" deep by .050 into MgO board with a "Biscuit Cutter" tool.



#### Zone above Window Example:

Staggered Location using pre-notched or  
"Biscuit Cutter" in zone above the window.



1/8" bead of Dow 1199 or 790 Silicone  
on edges of the MgO board where it  
joins the EPS.Foam on top and right  
hand end of each panel up to 72" above  
the window. See Illustration above.

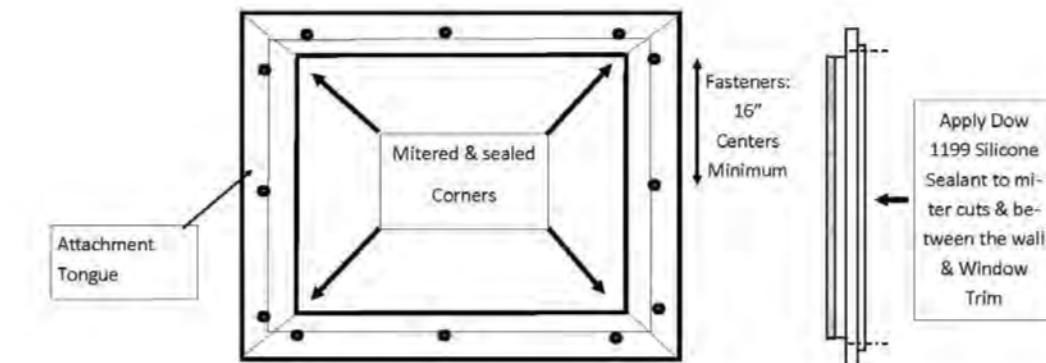
Alternate clips, 1 up & next one down  
as illustrated with 24" maximum  
between Top Clips and 24" between  
bottom Clips.

## Window Trim Part #TR-100 Front View

### Illustration "D"

#### **Window Trim Parts List:**

For NFPA 285 compliance, after installing the MgO sheathing and Tremco Air/Water Barrier per instructions over the structures exterior sheathing surfaces and allowing to cure, install ICAP Window Trim (Part# TR-100) entirely around the opening with the tongue attachment flange protruding tongue away from the window opening. Trim sections interlock if longer spans are required. Miter cut and fit corners, seal joints and to the wall watertight with ICAP/Dow 1199 silicone sealant to prevent moisture penetration into the wall. Attachment to the wall and screw locations are shown on Table "A". Screw spacing is minimum of 16" on center into the metal studs.



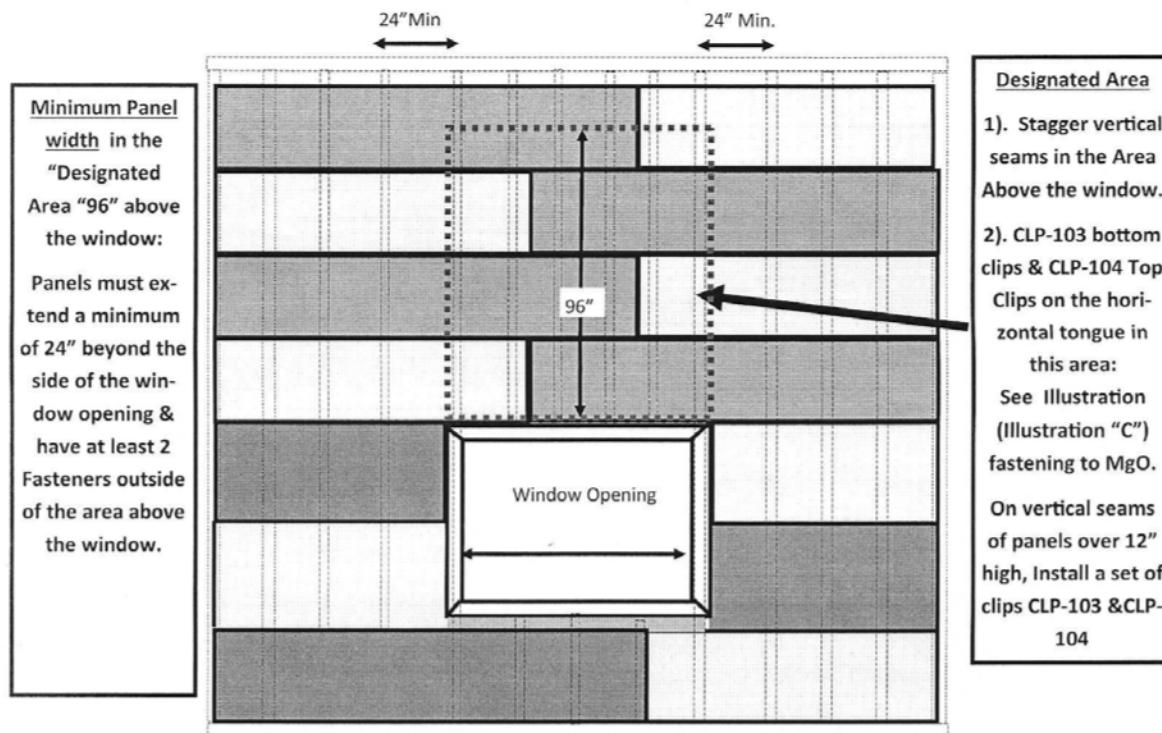
Miter cut, fit and seal with ICAP/Dow 1199 silicone and corners.

## NFPA 285 Compliance Illustration "F"

Min. Panel Width in designated area:

### Example:

Stagger splices above the window opening



### Required:

Sheathing: For NFPA 285 compliance, 1/2" ExtremeGreen MgO board.

Seam Location: In the area 72" high area above the window opening, all panels must extend completely across the window opening & 24" beyond each side of the window and have a minimum of 2 fasteners outside of the area above the window.

Vertical Seams: All panels in the area up to 72" above the window must be staggered as shown in the Illustration above. ICAP metal edge clips #CLP-103 & CLP-104 are required in the area above the window opening to attach the panels to the MgO board. See Illustration "C"

Engineering Assistance: Contact ICAP-USA by phone at 208.895.8557 or by email at [icap.engineering@gmail.com](mailto:icap.engineering@gmail.com) if you have questions or need assistance designing or installing the product to meet NFPA 285 requirements and our engineering department will assist.

Minimum panel height: 5"

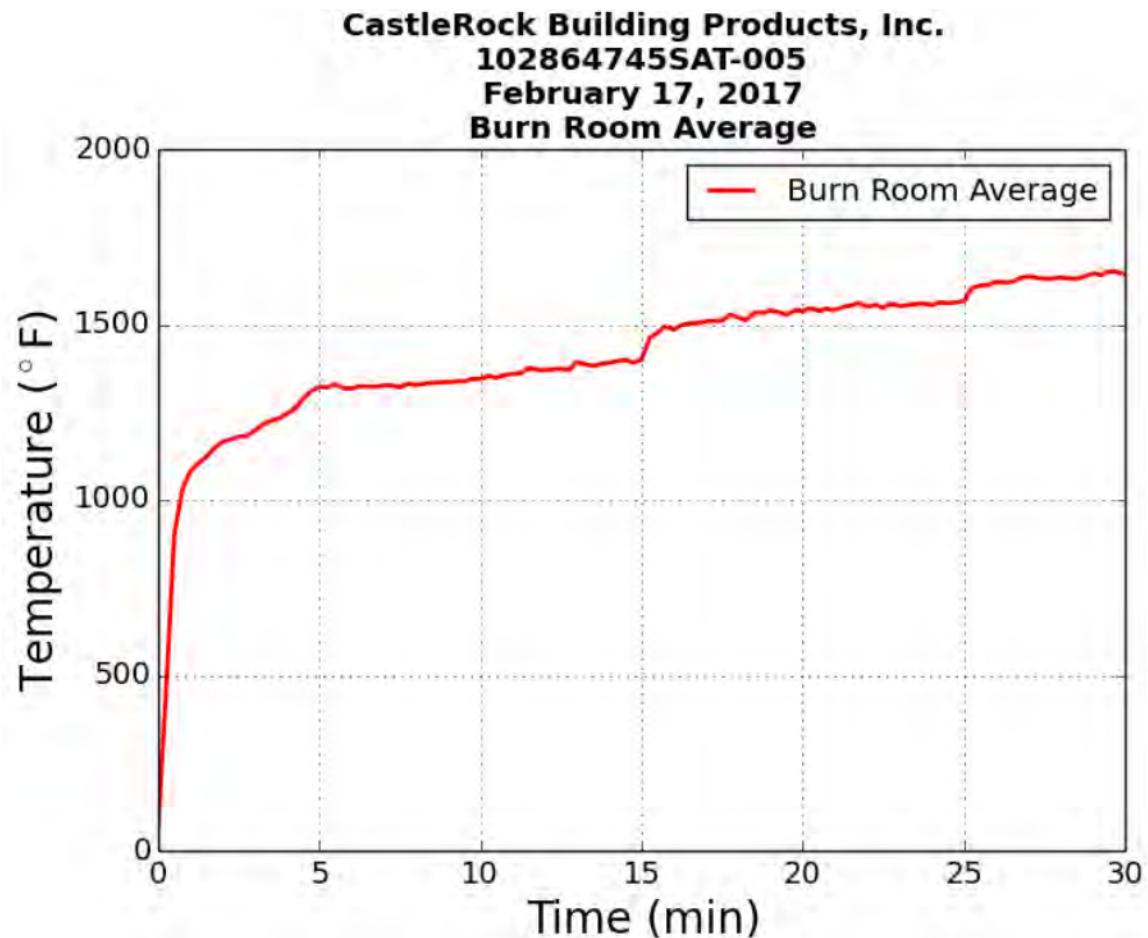
Minimum panel width: 32"

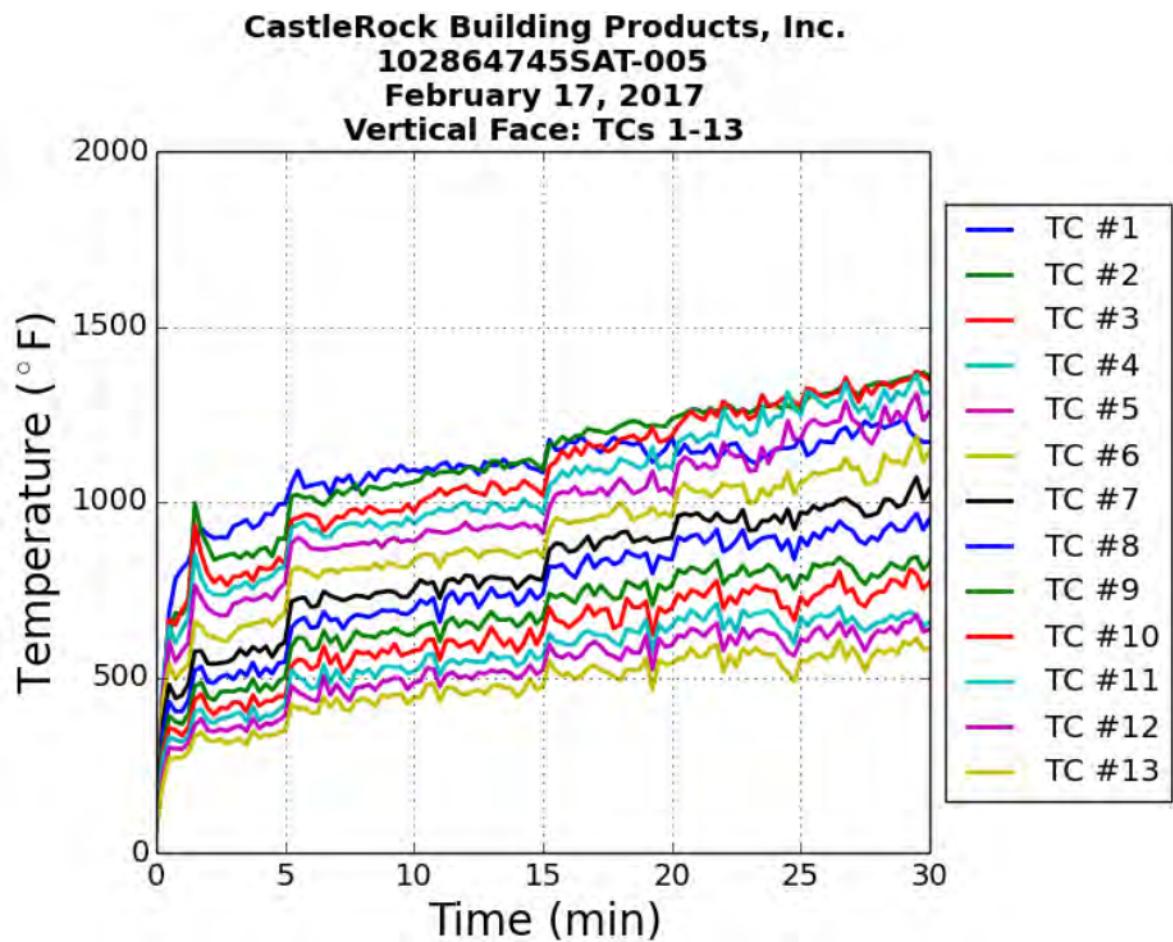
Maximum panel height: 24"

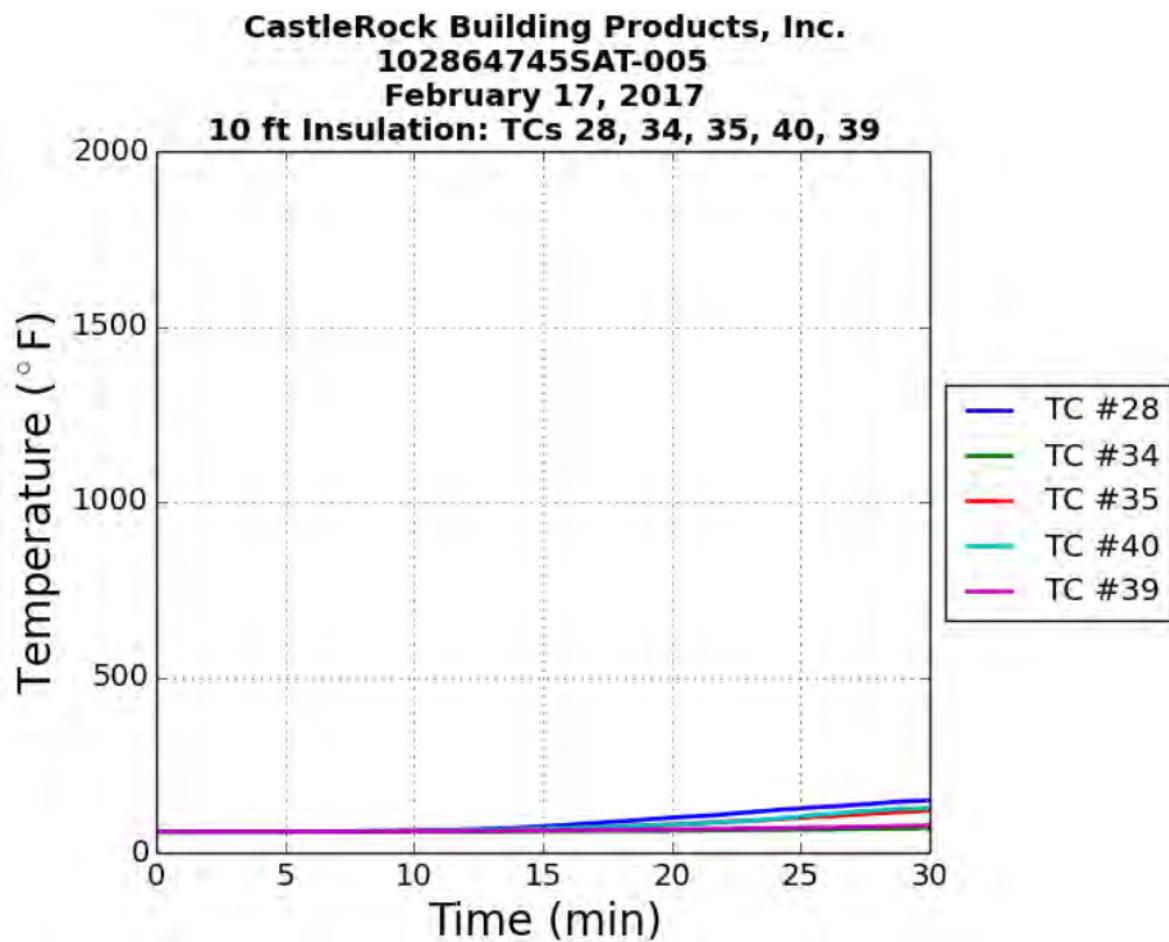
Maximum panel width: 144"

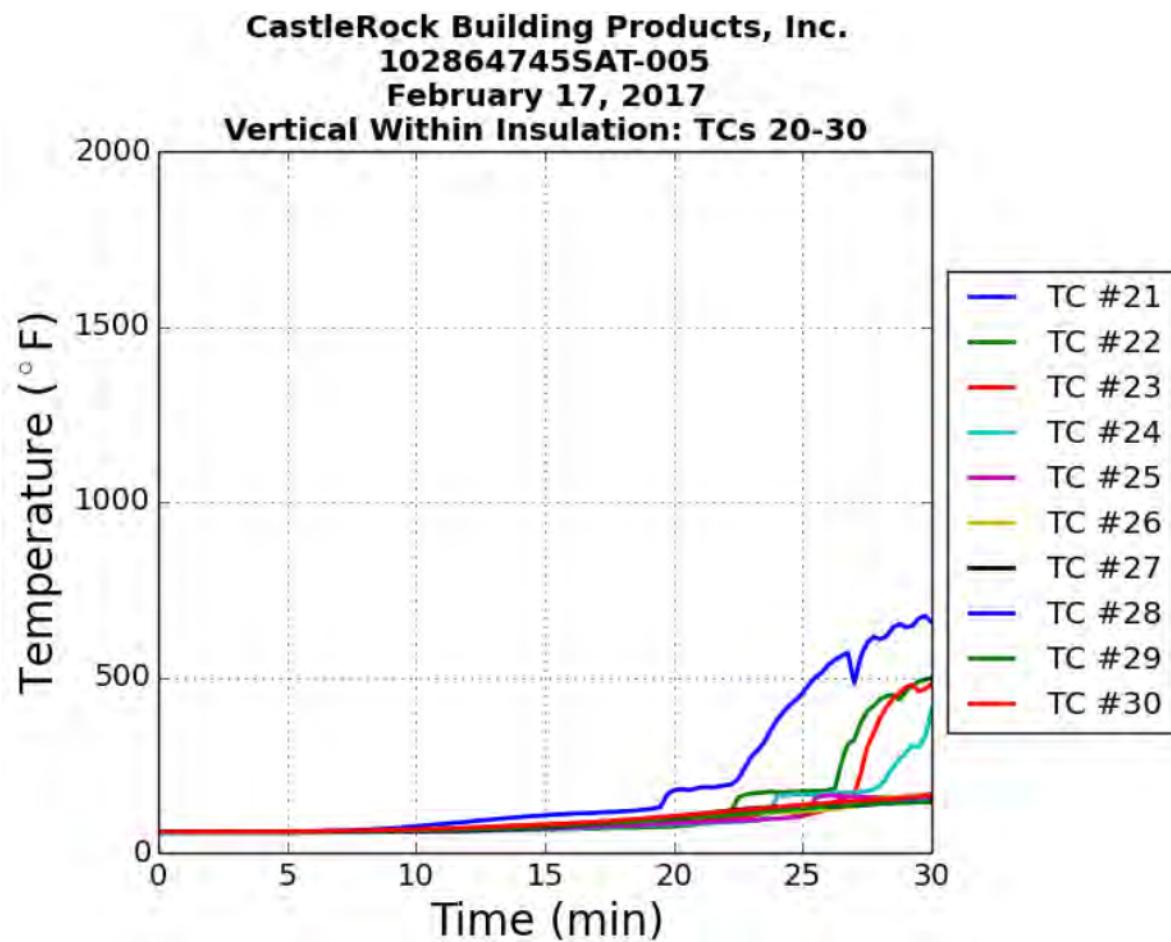
## APPENDIX B

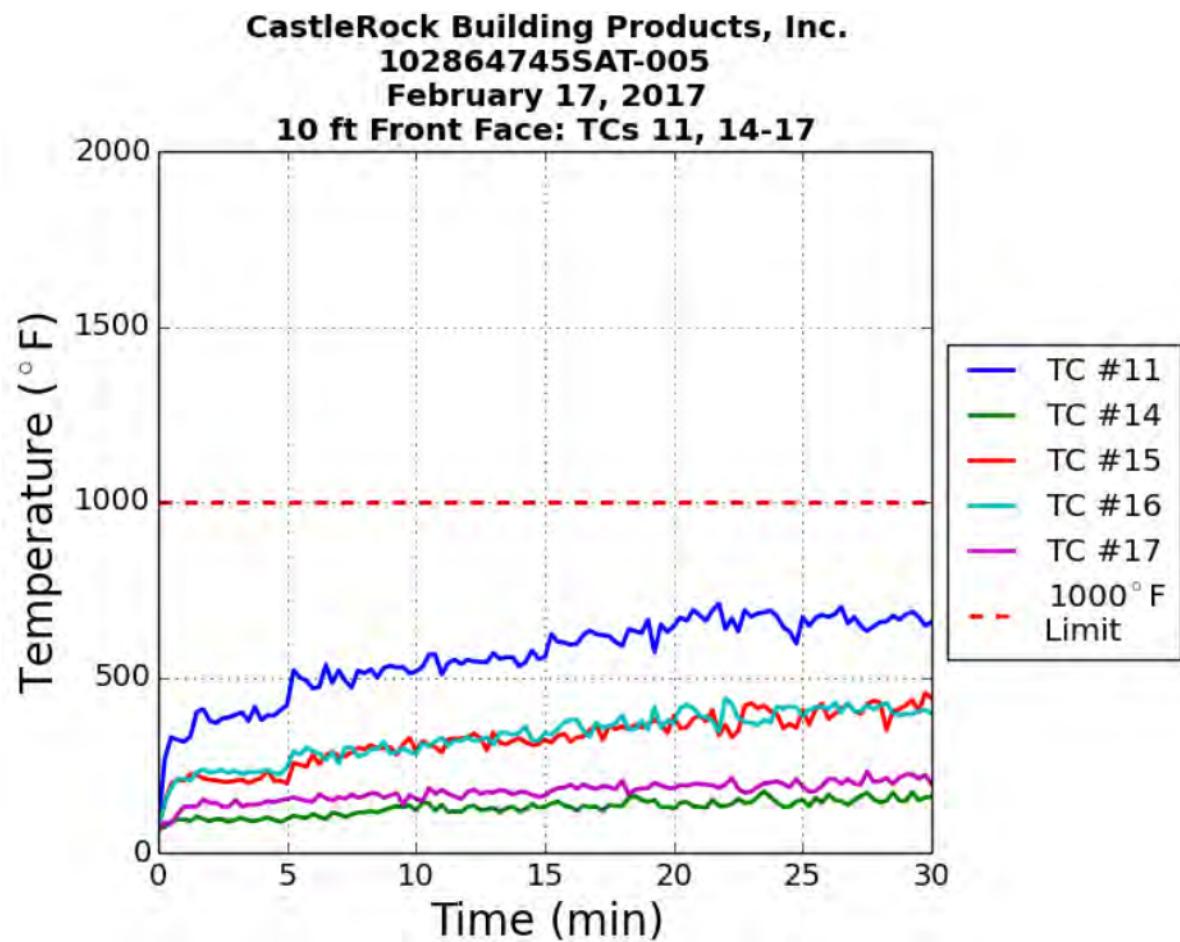
### Test Data



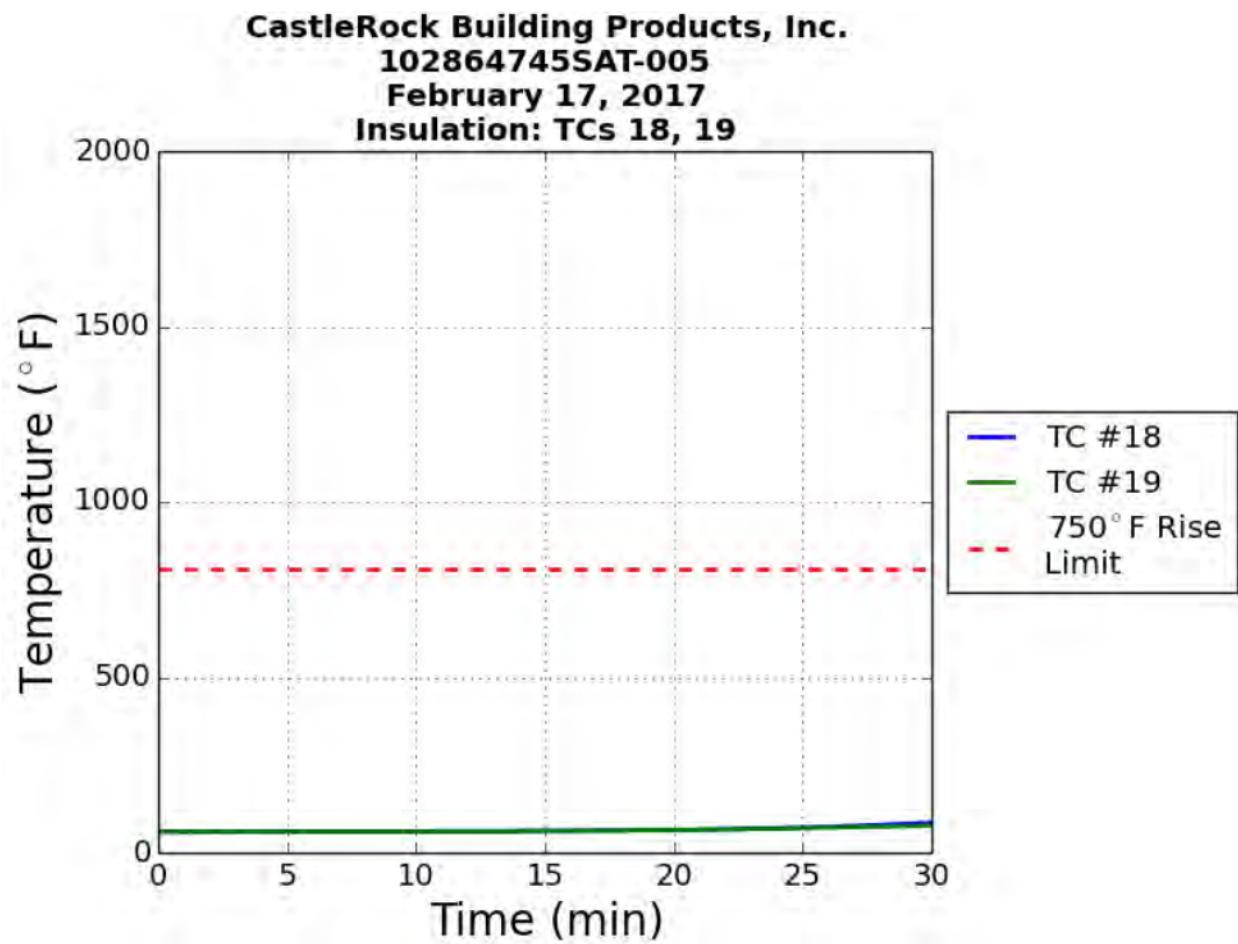


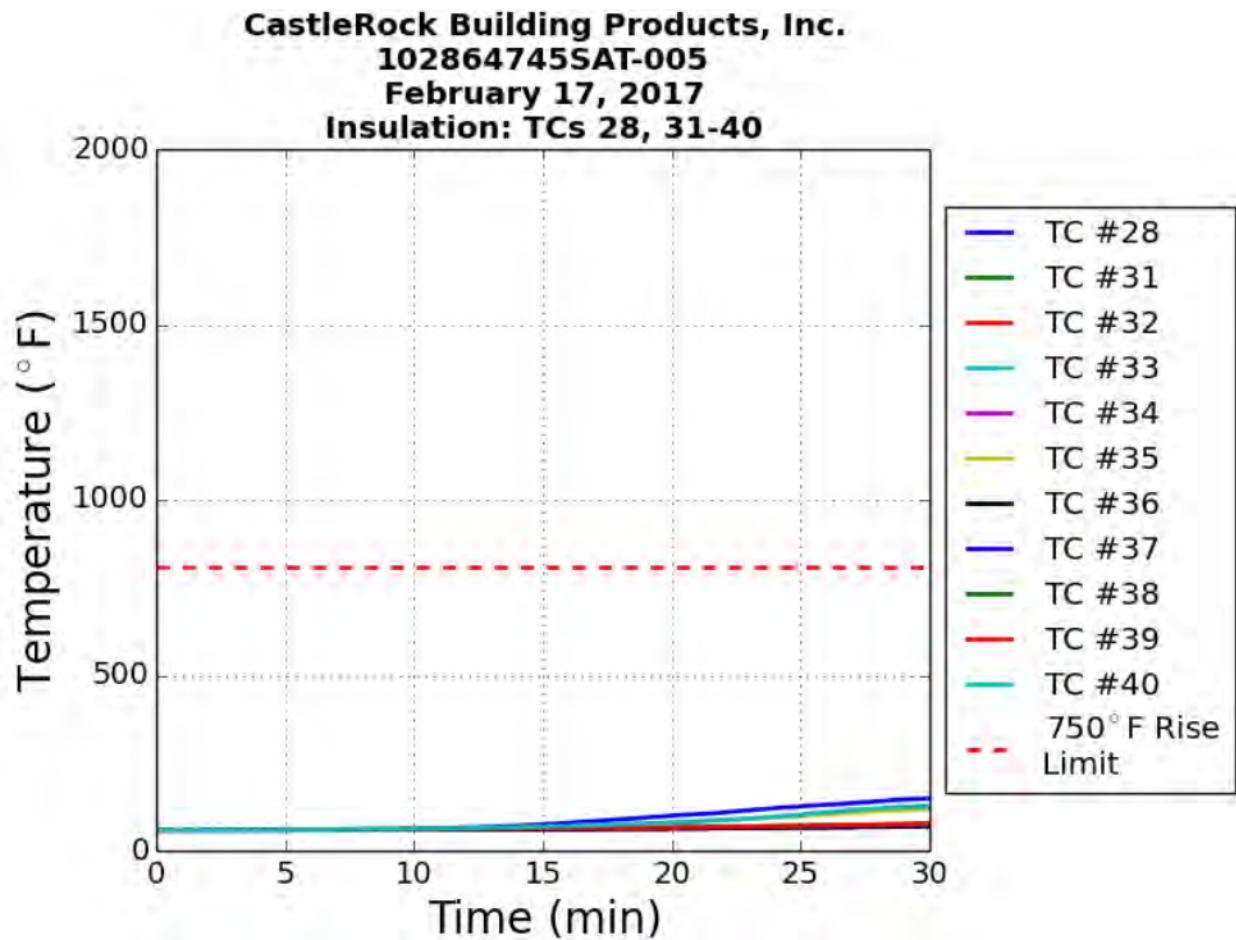


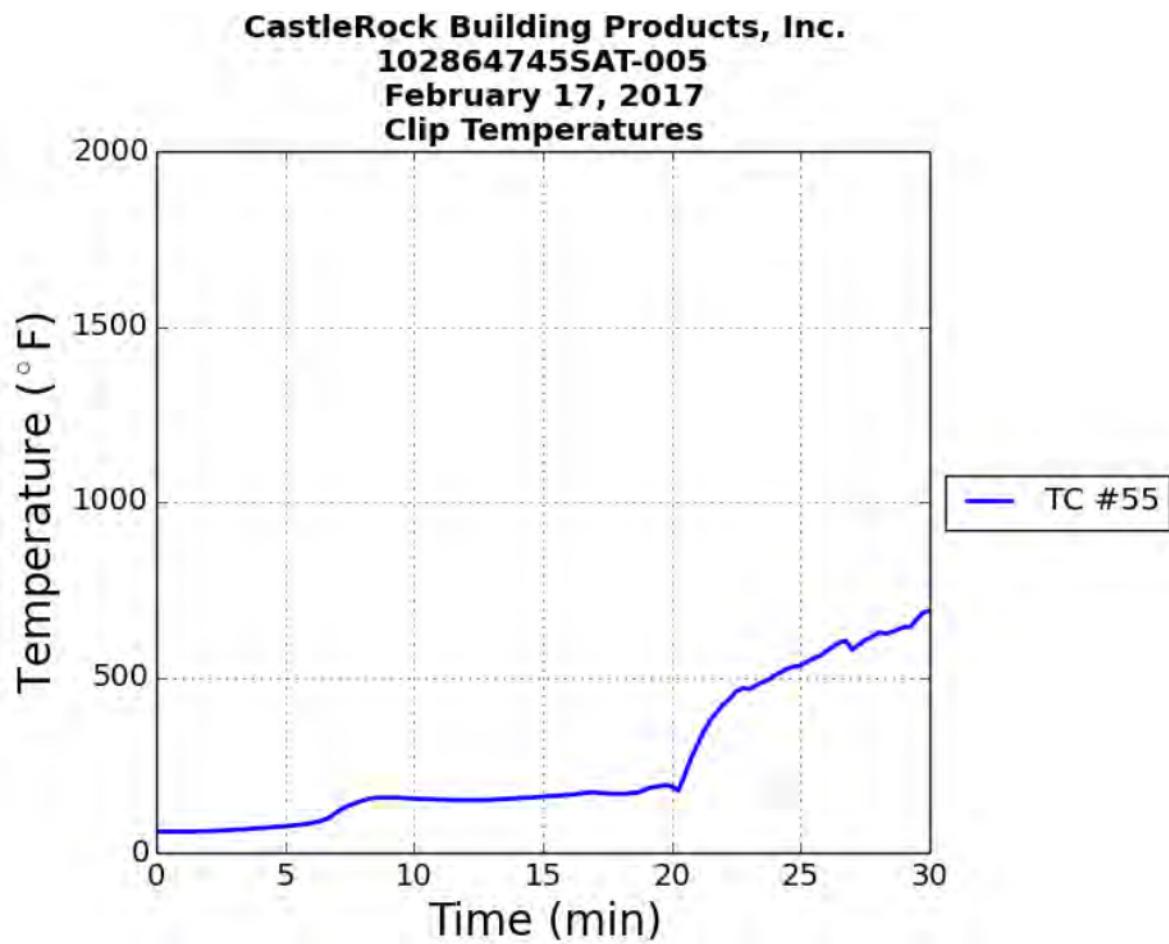


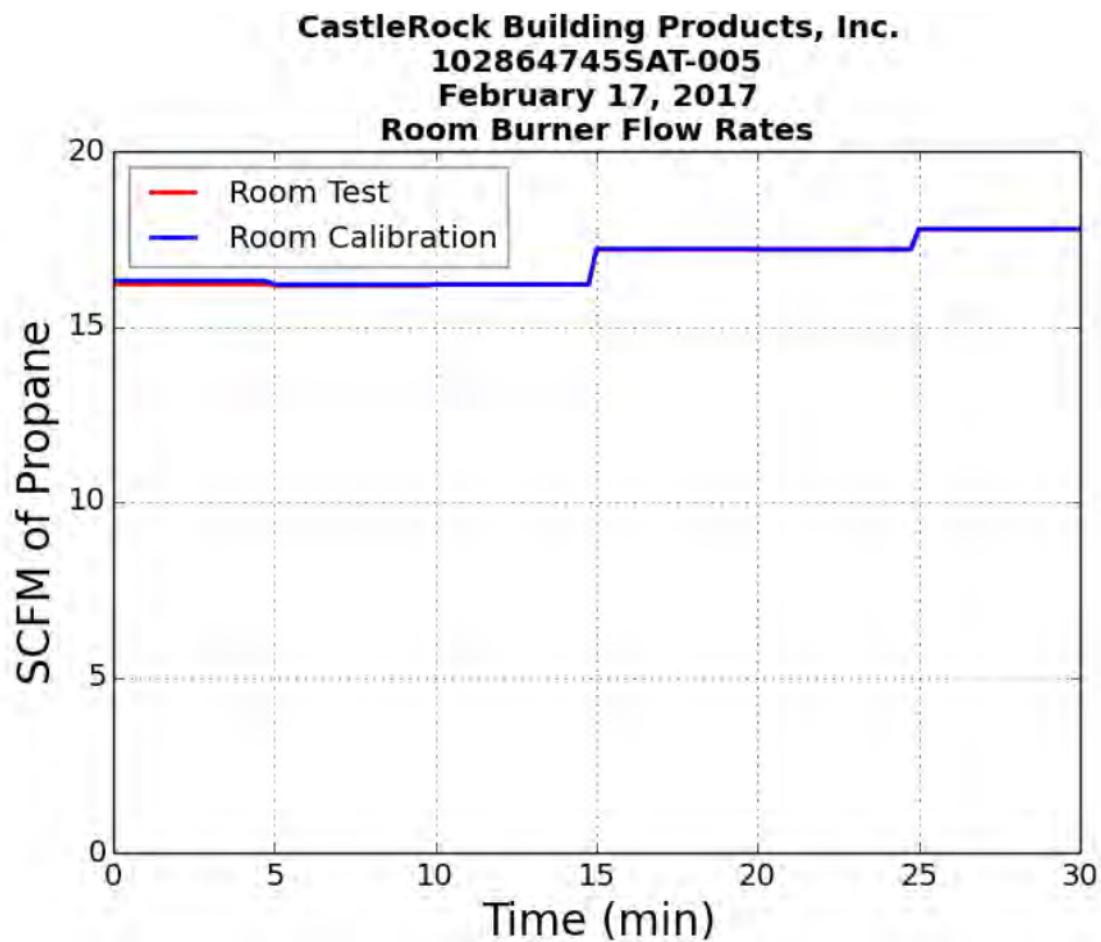


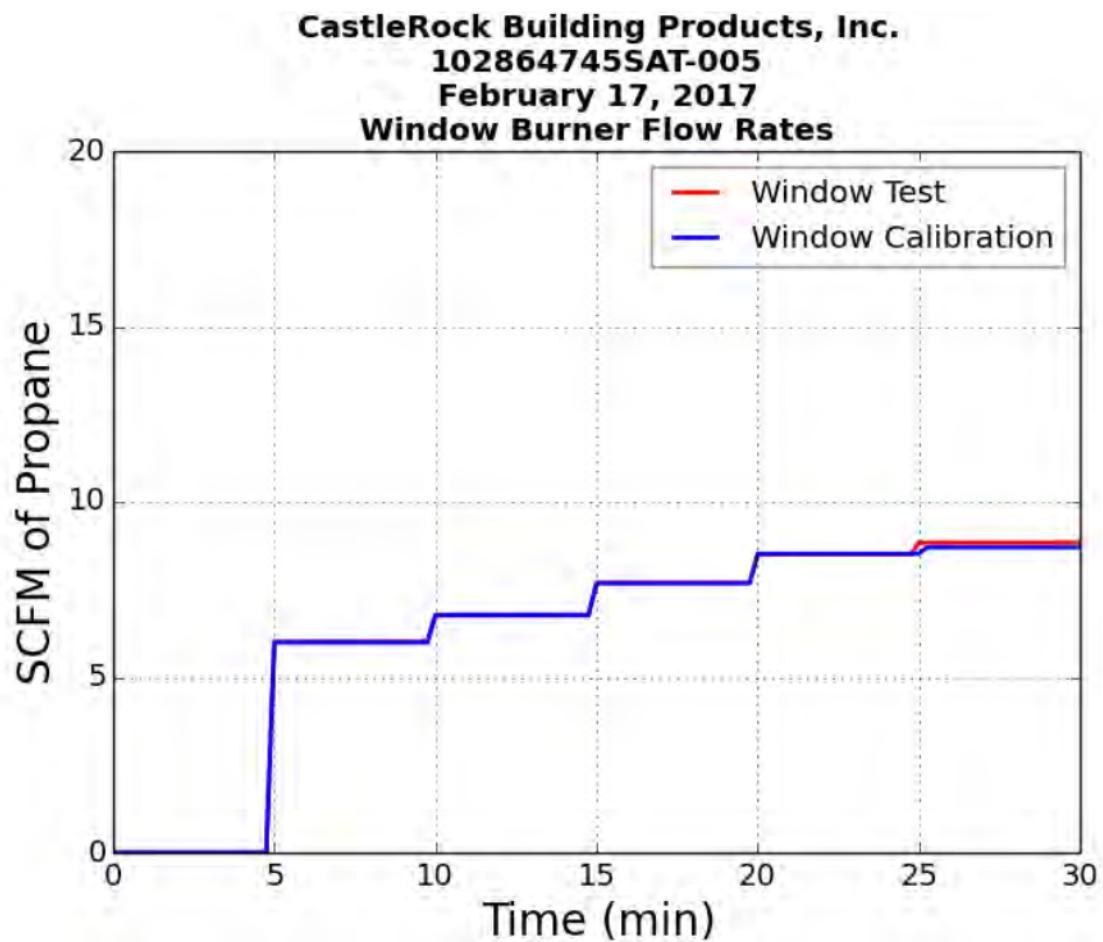












CastleRock Building Products, Inc.

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17 February 2017

Time (min)	Room	Burn												Pass/Fail												
		TC #1 (°F)	TC #2 (°F)	TC #3 (°F)	TC #4 (°F)	TC #5 (°F)	TC #6 (°F)	TC #7 (°F)	TC #8 (°F)	TC #9 (°F)	TC #10 (°F)	TC #11 (°F)	TC #12 (°F)	TC #13 (°F)	TC #14 (°F)	TC #15 (°F)	TC #16 (°F)	TC #17 (°F)	TC #18 (°F)	TC #19 (°F)	TC #20 (°F)	Pass/ Fail	Pass/ Fail	Pass/ Fail	Pass/ Fail	Pass/ Fail
0	73	66	66	66	65	65	65	65	66	66	66	67	67	66	66	66	65	66	59	59	59	bad				
0.25	462	415	373	441	475	453	428	365	298	279	265	220	192	73	143	143	85	59	59	59	59	bad				
0.5	900	584	620	665	644	600	538	479	430	389	356	329	299	268	90	195	185	84	59	59	59	bad				
0.75	1029	781	694	650	599	545	494	440	403	374	349	322	297	270	94	210	209	109	59	59	59	bad				
1	1082	809	680	693	635	574	520	449	403	366	334	316	295	269	95	205	211	131	59	60	bad					
1.25	1103	830	709	719	670	599	536	481	435	396	358	332	313	288	90	223	206	131	59	59	59	bad				
1.5	1123	888	997	933	851	762	658	574	520	476	436	401	364	331	103	222	229	132	59	60	bad					
1.75	1148	925	913	851	782	726	644	575	530	485	452	409	381	343	96	212	238	152	59	60	bad					
2	1166	907	875	796	746	696	618	539	487	444	412	375	349	322	90	208	228	142	59	60	bad					
2.25	1172	897	834	770	737	683	615	538	484	435	394	370	345	318	96	206	232	142	60	60	bad					
2.5	1180	869	843	787	734	676	605	541	501	458	413	383	352	323	95	202	235	131	59	60	bad					
2.75	1182	898	845	761	736	677	604	543	508	461	411	386	347	310	98	202	228	131	59	60	bad					
3	1199	931	852	787	758	710	626	553	494	459	429	393	357	320	94	205	234	150	59	60	bad					
3.25	1215	938	840	788	758	715	646	579	519	467	428	400	362	324	100	208	223	132	60	60	bad					
3.5	1226	945	856	800	772	726	646	563	505	461	402	375	347	307	91	198	230	137	59	60	bad					
3.75	1232	925	843	776	752	719	654	587	542	494	449	416	383	347	90	206	230	137	60	60	bad					
4	1246	937	864	813	776	725	655	573	503	459	419	378	354	329	95	213	232	140	59	60	bad					
4.25	1260	966	870	808	780	737	667	588	526	480	432	392	369	335	101	235	236	147	59	60	bad					
4.5	1289	964	845	811	789	722	645	558	511	464	433	391	366	334	93	205	226	144	59	60	bad					
4.75	1310	993	895	840	809	751	671	580	540	487	446	407	378	341	88	205	225	150	59	60	bad					
5	1322	995	894	822	815	770	682	602	544	501	445	421	390	348	96	197	244	153	60	60	bad					
5.25	1321	1052	1017	949	926	881	808	716	642	589	532	520	475	424	106	255	288	158	60	60	bad					
5.5	1330	1081	1020	954	936	899	811	724	661	614	551	500	458	409	101	251	280	152	60	60	bad					
5.75	1318	1041	1011	964	942	887	807	728	670	610	546	490	448	413	99	245	300	148	60	60	bad					
6	1317	1047	1015	962	919	867	796	703	641	578	523	468	437	399	110	279	290	145	60	60	bad					
6.25	1324	1051	1001	954	919	866	783	703	644	588	532	473	433	397	102	252	283	166	60	60	bad					
6.5	1323	1055	990	918	900	864	801	745	687	633	588	535	502	444	96	277	264	155	60	60	bad					
6.75	1323	1023	1010	937	901	867	808	733	662	598	539	484	449	414	114	287	286	149	60	60	bad					
7	1326	1068	1033	958	924	868	799	726	667	617	565	520	481	441	110	275	253	158	60	60	bad					
7.25	1327	1058	1020	955	935	877	809	719	639	575	515	491	453	410	102	275	299	154	60	60	bad					
7.5	1321	1076	1035	976	938	877	807	726	666	603	538	471	434	405	109	286	300	165	60	60	bad					
7.75	1331	1036	1050	979	939	879	809	733	678	632	574	519	470	431	115	299	275	157	60	60	bad					
8	1328	1058	1020	967	930	884	812	731	676	619	568	512	473	440	115	295	279	161	60	60	bad					
8.25	1331	1083	1044	987	948	880	808	726	671	617	571	523	479	434	118	307	294	170	60	60	bad					
8.5	1334	1063	1041	977	936	890	824	740	680	630	554	499	464	418	115	298	296	168	60	60	bad					
8.75	1335	1090	1036	967	924	871	809	743	691	629	579	527	487	449	121	299	316	157	60	60	bad					
9	1336	1093	1041	975	937	891	828	746	689	626	569	533	490	455	128	301	283	165	60	60	bad					
9.25	1338	1086	1052	975	941	898	822	743	691	640	595	528	499	450	133	279	296	169	60	60	bad					
9.5	1338	1104	1047	973	932	885	814	729	682	628	562	529	495	454	130	309	298	138	60	60	bad					
9.75	1345	1087	1053	993	955	891	814	729	680	620	568	511	466	423	135	327	287	164	60	60	bad					
10	1345	1092	1056	972	937	888	833	752	703	652	575	517	485	444	120	292	282	154	60	60	bad					
10.25	1354	1081	1063	999	953	901	849	777	720	643	579	529	480	442	142	318	312	147	60	60	bad					
10.5	1348	1098	1089	1012	967	920	852	767	709	651	606	564	526	479	141	307	303	184	60	60	bad					
10.75	1356	1090	1075	1020	968	916	847	771	726	656	608	565	523	482	120	302	317	168	61	61	bad					
11	1359	1106	1085	1038	981	914	816	726	658	603	550	508	475	430	137	286	328	179	61	61	bad					
11.25	1361	1113	1085	1020	974	911	847	774	726	658	605	541	507	470	118	323	304	168	61	61	bad					
11.5	1377	1089	1088	1034	978	918	854	781	744	670	606	550	514	471	118	325	320	160	61	61	bad					
11.75	1371	1107	1081	1038	992	924	857	769	711	644	587	538	498	457	116	326	319	153	61	61	bad					
12	1370	1101	1096	1046	998	949	891	791	736	660	595	550	504	449	131	328	330	173	61	61	bad					
12.25	1372	1100	1081	1031	976	920	860	787	738	658	603	545	499	459	136	340	318	179	61	61	bad					
12.5	1374	1078	1092	1026	975	919	840	755	709	644	572	532	496	444	118	327	342	173	62	61	bad					
12.75	1370	111																								

CastleRock Building Products, Inc.

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17 February 2017

Time (min)	Room (°F)	Pass/ Fail										Pass/ Fail									
		TC #1 (°F)	TC #2 (°F)	TC #3 (°F)	TC #4 (°F)	TC #5 (°F)	TC #6 (°F)	TC #7 (°F)	TC #8 (°F)	TC #9 (°F)	TC #10 (°F)	TC #11 (°F)	TC #12 (°F)	TC #13 (°F)	TC #14 (°F)	TC #15 (°F)	TC #16 (°F)	TC #17 (°F)	TC #18 (°F)	TC #19 (°F)	TC #20 (°F)
18	1520	1170	1217	1179	1123	1067	997	912	830	727	650	590	549	491	133	360	391	206	63	63	bad
18.25	1513	1169	1225	1183	1115	1046	978	916	860	774	724	637	585	523	156	352	351	165	64	63	bad
18.5	1534	1163	1231	1190	1107	1024	947	887	849	764	700	632	570	520	162	365	352	180	64	64	bad
18.75	1533	1169	1227	1175	1096	1031	960	891	843	753	699	626	570	521	150	357	376	183	64	64	bad
19	1540	1188	1215	1189	1106	1042	964	899	854	774	717	664	619	554	145	366	351	184	64	64	bad
19.25	1535	1113	1219	1212	1157	1087	983	886	796	706	621	571	521	465	150	379	416	199	64	64	bad
19.5	1528	1134	1217	1172	1095	1032	962	891	846	764	698	651	610	549	129	368	356	192	65	64	bad
19.75	1540	1150	1215	1175	1104	1040	969	895	838	750	685	629	587	536	131	341	377	185	65	64	bad
20	1538	1184	1237	1188	1096	1021	958	897	836	761	697	646	591	539	125	360	368	183	65	65	bad
20.25	1547	1135	1244	1217	1171	1107	1033	960	900	806	738	671	620	554	142	355	413	193	65	65	bad
20.5	1539	1163	1252	1238	1183	1127	1050	966	890	797	721	661	615	554	145	357	421	191	65	65	bad
20.75	1545	1140	1265	1258	1193	1117	1035	962	903	814	749	692	639	582	132	382	413	196	65	65	bad
21	1541	1142	1264	1242	1171	1094	1028	968	907	807	742	677	632	560	131	391	390	196	66	65	bad
21.25	1550	1141	1252	1234	1181	1108	1033	952	882	796	729	661	617	560	127	375	387	194	66	66	bad
21.5	1554	1164	1268	1262	1195	1096	1015	945	896	814	754	691	639	585	152	406	375	192	66	66	bad
21.75	1562	1128	1257	1244	1186	1102	1029	968	922	834	775	710	658	594	133	334	364	185	67	66	bad
22	1550	1137	1264	1287	1262	1169	1052	948	858	766	696	637	577	516	133	365	440	194	67	66	bad
22.25	1557	1164	1275	1271	1229	1139	1044	942	869	789	731	668	619	563	138	330	425	213	67	67	bad
22.5	1547	1167	1258	1246	1209	1129	1045	946	890	793	710	631	593	530	153	347	383	182	68	67	bad
22.75	1550	1137	1264	1264	1218	1133	1051	977	920	819	749	691	639	581	142	419	374	171	68	67	bad
23	1552	1119	1254	1238	1190	1088	997	919	867	789	739	673	611	566	143	426	370	174	68	68	bad
23.25	1555	1110	1264	1246	1157	1090	1001	920	884	801	761	682	632	584	159	412	364	187	69	68	bad
23.5	1559	1126	1271	1305	1267	1156	1039	946	896	805	751	683	636	570	175	419	378	198	69	68	bad
23.75	1580	1134	1273	1274	1218	1111	1016	946	900	821	748	690	625	564	159	403	371	200	69	68	bad
24	1555	1150	1279	1276	1243	1150	1044	962	903	807	746	674	623	566	143	395	417	203	70	69	bad
24.25	1563	1152	1266	1292	1243	1156	1041	940	863	775	698	643	600	533	130	355	410	196	70	69	bad
24.5	1561	1153	1276	1304	1314	1231	1083	979	892	791	700	630	572	513	131	367	417	186	71	69	bad
24.75	1567	1174	1284	1284	1267	1178	1025	923	837	751	661	596	562	488	146	356	415	210	71	70	bad
25	1567	1181	1271	1277	1247	1180	1055	970	899	794	729	672	608	550	151	407	389	188	72	70	bad
25.25	1604	1132	1293	1325	1315	1220	1065	967	976	780	706	647	603	545	132	365	408	174	72	70	bad
25.5	1611	1144	1307	1318	1304	1235	1084	989	911	823	732	670	631	561	156	408	414	176	73	71	bad
25.75	1613	1174	1305	1303	1285	1222	1079	977	896	815	741	678	643	568	143	425	416	190	73	71	bad
26	1622	1171	1310	1300	1270	1219	1085	990	925	823	759	672	613	553	165	382	410	210	74	72	bad
26.25	1620	1170	1311	1311	1286	1228	1093	992	917	823	761	680	625	565	150	386	428	209	74	72	bad
26.5	1621	1202	1325	1313	1288	1230	1092	1006	945	842	802	701	658	608	147	411	400	196	75	72	bad
26.75	1633	1213	1338	1354	1340	1285	1124	1010	928	826	741	653	618	552	136	425	427	210	76	73	bad
27	1637	1183	1320	1319	1284	1234	1094	996	919	815	752	672	645	584	150	404	403	197	76	73	bad
27.25	1633	1205	1304	1285	1256	1223	1068	985	891	784	713	646	609	557	162	395	403	194	77	73	bad
27.5	1631	1230	1329	1328	1275	1184	1052	959	880	765	702	632	576	519	171	424	421	231	78	74	bad
27.75	1631	1215	1334	1307	1237	1166	1052	962	901	793	732	645	613	560	152	433	408	202	78	74	bad
28	1654	1222	1342	1332	1276	1201	1069	969	891	785	743	657	633	578	144	428	420	204	79	74	bad
28.25	1632	1211	1334	1342	1320	1272	1136	1007	921	802	745	659	629	569	148	350	427	213	80	74	bad
28.5	1630	1219	1339	1326	1284	1225	1114	1006	939	826	778	676	644	581	171	403	399	196	81	75	bad
28.75	1637	1225	1347	1341	1315	1259	1118	986	919	815	774	664	624	568	148	410	392	214	81	75	bad
29	1645	1240	1352	1346	1302	1232	1104	994	919	808	758	679	657	601	147	420	396	223	82	76	bad
29.25	1641	1194	1357	1350	1338	1278	1148	1084	944	837	808	887	657	593	173	436	395	223	83	76	bad
29.5	1651	1182	1360	1372	1364	1309	1187	1070	967	864	793	672	679	613	149	401	404	211	84	76	bad
29.75	1651	1171	1370	1361	1310	1232	1115	1008	921	806	751	647	630	580	157	455	407	222	84	77	bad
30	1641	1171	1357	1348	1311	1258	1145	1036	951	829	771	658	637	583	161	440	397	195	85	85	bad
<b>Max Temp</b>		1240	1370	1372	1364	1309	1187	1070	967	844	808	710	679	613	175	455	440	231	85	85	bad
<b>Max Allowed</b>											1000	1000	1000	1000	1000	1000	1000	1000	809	809	

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Time (min)	TC #21 (°F)	Pass/ Fail						Pass/ Fail						Pass/ Fail						Pass/ Fail					
		TC #22 (°F)	TC #23 (°F)	TC #24 (°F)	TC #25 (°F)	TC #26 (°F)	TC #27 (°F)	TC #28 (°F)	TC #29 (°F)	TC #30 (°F)	TC #31 (°F)	TC #32 (°F)	TC #33 (°F)	TC #34 (°F)	TC #35 (°F)	TC #36 (°F)	TC #37 (°F)	TC #38 (°F)	TC #39 (°F)	TC #40 (°F)	TC #41 (°F)	TC #42 (°F)	TC #43 (°F)		
0	60	59	59	59	59	59	59	59	59	60	60	60	60	59	59	59	59	59	59	59	59	59	59	59	
0.25	60	59	59	59	59	59	59	59	59	60	60	60	60	59	59	59	59	59	59	59	59	59	59	59	
0.5	60	59	60	59	59	59	59	59	59	60	60	60	60	59	59	59	59	59	59	59	59	59	59	59	
0.75	60	59	60	59	59	59	59	59	59	60	60	60	61	60	60	60	60	60	60	60	60	60	59	59	
1	60	59	59	59	59	59	59	59	59	60	60	60	61	60	60	60	60	60	60	60	60	60	60	59	
1.25	60	59	59	59	59	59	59	59	59	60	60	60	61	60	60	60	60	60	60	60	60	60	60	59	
1.5	60	59	59	59	59	59	59	59	59	60	60	60	61	60	60	60	60	60	60	60	60	60	60	59	
1.75	60	60	60	59	59	59	59	59	59	60	60	60	61	60	60	60	60	60	60	60	60	60	60	59	
2	60	59	60	59	59	59	59	59	59	60	60	60	61	60	60	60	60	59	59	59	59	59	59	59	
2.25	60	60	60	59	59	59	59	59	59	60	60	60	61	60	60	60	60	60	60	60	60	60	60	59	
2.5	60	60	60	59	59	59	59	59	59	60	60	60	60	59	59	59	59	59	59	59	59	59	59	59	
2.75	60	60	60	59	59	59	59	59	59	60	60	60	61	60	60	60	60	60	60	60	60	60	60	59	
3	60	60	60	59	59	59	59	59	59	60	60	60	60	60	60	60	60	59	60	60	60	60	60	59	
3.25	60	59	60	59	59	59	59	59	59	60	60	60	60	60	60	60	60	60	60	60	60	60	60	59	
3.5	60	60	60	59	59	59	59	59	59	60	60	60	61	60	60	60	60	60	60	60	60	60	60	59	
3.75	60	60	60	59	59	59	59	59	59	60	60	60	60	60	60	60	60	60	60	60	60	60	60	59	
4	60	60	60	59	59	59	59	59	59	60	60	60	61	60	60	60	60	60	60	60	60	60	60	59	
4.25	60	60	60	59	59	59	59	59	59	60	60	60	60	60	60	60	60	60	60	60	60	60	60	59	
4.5	60	59	60	59	59	59	59	59	59	60	60	60	60	60	60	60	60	60	60	60	60	60	60	59	
4.75	60	60	60	59	59	59	59	59	59	60	60	60	61	60	60	60	60	60	60	60	60	60	60	59	
5	60	60	60	59	59	59	59	59	59	60	60	60	61	60	60	60	60	60	60	60	60	60	60	59	
5.25	60	60	60	59	59	59	59	59	59	60	60	60	61	60	60	60	60	60	60	60	60	60	60	59	
5.5	60	59	60	59	59	59	59	59	59	60	60	60	61	60	60	60	60	60	60	60	60	60	60	59	
5.75	61	60	60	59	59	59	59	59	59	61	60	60	61	60	60	60	60	60	60	60	60	60	60	59	
6	61	60	60	59	59	59	59	59	59	60	60	60	61	60	60	60	60	60	60	60	60	60	60	59	
6.25	61	60	60	59	59	59	59	59	59	60	60	60	61	60	60	60	60	60	60	60	60	60	60	59	
6.5	62	60	60	59	59	59	59	59	59	60	60	60	62	60	61	60	60	60	60	60	60	60	60	59	
6.75	62	60	60	59	59	59	59	59	59	60	60	60	62	60	61	60	60	60	60	60	60	60	60	59	
7	62	60	60	59	59	59	59	59	59	60	60	60	62	60	61	60	60	60	60	60	60	60	60	59	
7.25	63	60	60	59	59	59	59	59	59	60	60	60	62	60	61	60	60	60	60	60	60	60	60	59	
7.5	64	60	60	59	59	59	59	59	59	60	60	60	63	60	61	60	60	60	60	60	60	60	60	59	
7.75	64	60	60	59	59	59	59	59	59	60	60	60	61	63	60	61	60	61	60	61	60	61	60	59	
8	65	60	61	59	59	59	59	59	59	60	61	61	63	60	61	61	60	61	60	61	61	60	61	59	
8.25	66	60	61	60	59	59	59	59	59	61	61	61	64	60	61	61	61	61	61	61	61	61	61	59	
8.5	67	60	61	60	60	59	59	59	59	61	61	61	64	60	61	61	61	61	61	61	61	61	61	59	
8.75	68	60	61	60	60	59	59	59	59	61	61	61	64	60	61	61	61	61	61	61	61	61	61	59	
9	69	60	61	60	60	59	59	59	59	61	61	62	65	60	61	61	61	60	61	61	61	61	61	59	
9.25	71	60	62	60	60	62	61	62	62	65	65	65	66	60	61	61	60	61	61	61	61	61	61	59	
9.5	72	61	62	60	60	62	61	62	62	66	66	66	66	60	61	61	60	62	60	61	61	60	61	59	
9.75	74	61	62	60	60	62	61	62	63	66	66	66	66	61	61	61	60	62	60	61	61	60	61	59	
10	75	61	63	61	61	63	63	63	63	67	67	67	67	60	61	61	60	62	60	61	61	60	61	59	
10.25	77	61	63	61	61	63	61	63	63	67	67	67	67	60	61	61	60	62	60	61	61	60	61	59	
10.5	79	61	64	61	61	63	62	63	64	68	68	68	68	60	61	61	60	62	60	61	61	60	61	59	
10.75	80	61	64	61	61	64	62	64	64	68	68	68	68	60	61	61	60	62	60	61	61	60	61	59	
11	82	61	65	61	61	64	62	64	64	69	69	69	69	60	62	61	60	63	60	61	61	60	61	59	
11.25	83	61	66	62	62	64	62	64	65	69	69	69	69	60	62	61	60	63	60	61	61	60	61	59	
11.5	85	62	67	62	62	65	63	65	65	70	70	70	70	60	62	61	60	63	60	61	61	60	61	59	
11.75	86	62	68	62	62	66	63	65	66	70	70	70	70	61	62	61	60	63	60	61	61	60	61	59	
12	88	62	69	63	63	66	63	66	66	71	71	71	71	60	62	61	60	64	60	61	61	60	61	59	
12.25	90	62	70	63	63	67	64	66	67	72	72	72	72	60	62	61	60	64	60	61	61	60	61	59	
12.5	92	63	71	63	64	68	64	67	67	72	72	72	72	60	62	61	60	64	60	61	61	60	61	59	
12.75	93	63	72	64	64	69	65	68	68	73	73	73	73	60	62	61	60	65	60	61	61	60	61	59	
13	95	63	74	64	65	69	66	66	68	74	74	74	74	61	62	62	60	65	60	61	61	60	61	59	
13.25	97	64	75	64	65	70	67	69	69	74	74	74	74	61	62	62	60	65	60	61	61	60	61	59	
13.5	98	64	76	65	66	71	67	70	70	75	75	75	75	61	62	62	61	66	60	61	61	60	61		

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Time (min)	TC #21 (°F)	TC #22 (°F)	TC #23 (°F)	TC #24 (°F)	TC #25 (°F)	TC #26 (°F)	TC #27 (°F)	TC #28 (°F)	TC #29 (°F)	TC #30 (°F)	TC #31 (°F)	Pass/ Fail	Pass/ Fail	Pass/ Fail	Pass/ Fail	Pass/ Fail	Pass/ Fail
18	118	71	90	75	77	87	88	89	95	93	62	64	63	62	75	62	
18.25	119	71	90	76	77	88	89	90	87	94	62	64	63	62	75	62	
18.5	120	72	91	77	78	89	91	92	89	96	62	65	63	62	76	62	
18.75	122	72	91	77	79	90	92	93	90	97	62	65	64	62	77	62	
19	124	73	92	78	80	92	94	94	91	99	62	65	64	62	78	62	
19.25	126	73	92	79	81	93	96	96	92	100	62	65	64	62	78	62	
19.5	132	74	93	80	82	94	98	97	94	102	62	65	64	62	79	62	
19.75	166	74	93	80	83	95	100	98	95	103	63	65	64	62	80	62	
20	178	75	94	81	84	97	102	100	96	105	63	65	64	63	81	63	
20.25	181	76	95	82	84	98	104	101	97	106	63	65	64	63	81	63	
20.5	179	77	95	82	85	99	106	102	99	108	63	66	65	63	82	63	
20.75	180	79	96	83	86	101	108	103	100	109	63	66	65	63	83	63	
21	186	82	97	94	87	102	110	104	102	111	63	66	65	63	84	63	
21.25	187	85	98	94	88	104	112	105	103	112	63	66	65	63	85	63	
21.5	186	89	98	85	88	105	115	106	104	114	64	67	65	64	85	64	
21.75	189	93	99	86	89	106	117	107	105	115	64	67	65	64	87	64	
22	192	102	100	96	90	107	119	109	107	117	64	67	65	64	88	64	
22.25	195	120	101	87	90	108	121	111	108	119	64	67	65	64	89	64	
22.5	211	158	102	88	91	109	123	112	110	121	64	67	66	64	89	64	
22.75	242	165	103	89	92	110	124	114	111	122	64	67	66	64	90	64	
23	273	168	105	91	93	111	126	115	113	124	65	68	66	65	92	65	
23.25	292	170	107	92	93	112	128	117	114	125	65	68	66	65	92	65	
23.5	314	172	116	96	95	113	128	118	116	127	65	68	66	65	93	65	
23.75	348	174	125	116	96	113	129	120	118	129	65	68	67	65	94	65	
24	378	173	131	162	97	115	130	121	119	130	65	68	67	65	95	65	
24.25	401	172	126	163	98	115	130	123	121	132	65	69	67	65	96	65	
24.5	421	173	116	165	100	116	131	124	123	134	66	69	67	65	97	65	
24.75	456	174	108	166	101	117	131	125	125	135	66	69	67	66	98	66	
25	455	176	108	166	105	118	132	126	127	137	66	69	67	66	99	66	
25.25	480	175	109	166	117	119	132	128	128	138	66	69	68	66	100	66	
25.5	500	176	114	166	156	121	133	129	130	140	66	70	68	66	102	66	
25.75	514	176	119	168	162	122	133	130	131	141	66	70	68	66	102	66	
26	535	178	128	168	163	123	133	131	132	142	67	70	68	66	103	66	
26.25	549	183	142	169	163	125	134	132	133	144	67	70	68	67	104	67	
26.5	561	256	154	171	162	127	134	133	134	145	67	71	69	67	106	67	
26.75	570	310	160	171	161	129	135	134	135	146	67	71	69	67	107	67	
27	483	321	167	171	160	131	136	136	137	148	67	71	69	67	108	67	
27.25	559	371	225	173	159	135	136	137	138	149	68	71	69	68	109	68	
27.5	599	403	301	176	158	143	137	138	139	150	68	72	69	68	110	68	
27.75	615	419	340	179	158	150	138	139	139	151	68	72	69	68	111	68	
28	608	438	384	193	157	156	139	141	140	152	68	72	70	68	112	68	
28.25	617	447	415	213	159	159	141	142	141	153	68	72	70	68	113	68	
28.5	642	450	440	244	158	158	142	144	141	154	69	73	70	69	114	69	
28.75	652	436	455	266	159	159	144	145	142	155	69	73	70	69	115	69	
29	643	460	472	285	160	160	144	146	142	157	69	73	71	69	116	69	
29.25	646	476	479	305	162	161	144	147	143	158	69	73	71	69	117	69	
29.5	668	489	460	302	163	162	144	147	144	159	70	74	71	69	118	69	
29.75	675	493	466	330	165	161	144	148	144	161	70	74	71	70	119	70	
30	657	498	482	409	167	162	144	149	145	162	70	74	71	70	120	70	
<b>Max Temp</b>	<b>675</b>	<b>498</b>	<b>482</b>	<b>409</b>	<b>167</b>	<b>162</b>	<b>144</b>	<b>149</b>	<b>145</b>	<b>162</b>	<b>70</b>	<b>74</b>	<b>71</b>	<b>70</b>	<b>120</b>	<b>70</b>	
<b>Max Allowed</b>											<b>809</b>	<b>810</b>	<b>810</b>	<b>809</b>	<b>809</b>	<b>809</b>	

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Time (min)	Pass/ Fail								Pass/ Fail										
	TC #37	TC #38	TC #39	TC #40	TC #41	TC #42	TC #43	TC #44	TC #45	TC #46	TC #47	TC #48	TC #49	TC #50	TC #51	TC #52	TC #53	TC #54	TC #55
	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	(°F)	
0	59	59	60	60	72	75	71	73	73	73	72	70	62	62	62	62	63	62	60
0.25	59	59	60	60	508	517	543	386	354	400	427	439	62	62	62	63	62	60	
0.5	59	59	60	60	985	1023	1019	761	713	795	859	846	62	62	62	63	62	60	
0.75	59	60	60	60	1099	1144	1101	910	891	956	987	978	52	62	62	63	63	60	
1	59	60	60	60	1130	1209	1111	975	996	1017	1043	1045	62	62	62	62	62	60	
1.25	59	60	60	60	1171	1214	1109	1001	1022	1038	1065	1076	62	62	62	63	62	60	
1.5	59	60	60	60	1190	1251	1115	1019	1089	1071	1163	1180	62	62	62	63	62	60	
1.75	59	60	60	60	1201	1287	1152	1042	1059	1248	1183	1219	62	62	62	63	62	61	
2	59	59	60	60	1217	1306	1167	1052	1087	1193	1147	1168	62	62	62	63	62	61	
2.25	59	60	60	60	1233	1303	1168	1059	1099	1167	1145	1168	62	62	62	63	62	60	
2.5	59	59	60	60	1252	1291	1175	1071	1113	1159	1162	1188	62	62	62	63	62	60	
2.75	59	60	60	60	1203	1322	1192	1084	1111	1180	1170	1181	62	62	62	63	62	64	
3	59	60	60	60	1255	1321	1203	1090	1127	1188	1181	1207	62	62	62	63	62	65	
3.25	59	60	60	60	1289	1328	1213	1099	1148	1203	1197	1209	62	62	62	63	62	66	
3.5	59	60	60	60	1262	1368	1322	1113	1155	1224	1205	1223	62	62	62	63	62	67	
3.75	59	60	60	60	1287	1364	1227	1114	1167	1232	1213	1232	62	62	62	63	62	69	
4	59	60	60	60	1318	1352	1257	1131	1173	1249	1236	1248	62	62	62	63	62	70	
4.25	59	60	60	60	1332	1375	1274	1140	1176	1263	1250	1264	62	62	62	63	62	71	
4.5	59	60	60	60	1363	1417	1287	1168	1209	1275	1256	1276	62	62	62	63	62	73	
4.75	59	60	60	60	1377	1446	1327	1183	1215	1282	1283	1297	62	62	62	63	62	74	
5	59	60	60	60	1403	1453	1346	1183	1221	1322	1294	1306	62	62	62	63	62	75	
5.25	60	60	60	60	1389	1471	1341	1182	1222	1327	1291	1312	62	62	62	63	62	77	
5.5	60	60	60	60	1402	1470	1336	1190	1232	1333	1293	1322	62	62	62	63	62	79	
5.75	60	60	60	60	1397	1433	1339	1188	1233	1326	1329	1306	62	62	62	63	62	81	
6	60	60	60	60	1411	1398	1339	1203	1238	1314	1286	1293	62	62	62	63	62	84	
6.25	60	60	60	60	1388	1439	1349	1206	1236	1321	1283	1291	62	62	62	63	62	88	
6.5	60	60	60	60	1403	1425	1338	1209	1238	1321	1283	1294	62	62	62	63	62	93	
6.75	60	60	60	60	1429	1404	1358	1214	1231	1316	1288	1283	62	62	62	63	62	101	
7	60	60	60	61	1404	1430	1352	1215	1228	1318	1284	1293	62	62	62	63	62	116	
7.25	60	60	60	61	1436	1413	1336	1223	1226	1321	1284	1285	62	62	62	63	62	126	
7.5	60	60	60	61	1397	1427	1334	1218	1231	1316	1272	1292	62	62	62	63	62	135	
7.75	60	60	60	61	1420	1430	1348	1225	1321	1321	1279	1294	62	62	62	63	62	142	
8	60	60	60	61	1427	1409	1349	1219	1236	1321	1292	1293	62	62	62	63	62	148	
8.25	60	60	60	61	1410	1429	1354	1222	1228	1331	1302	1307	63	62	62	63	62	154	
8.5	60	60	61	62	1415	1430	1359	1222	1250	1326	1294	1307	63	63	62	64	62	156	
8.75	60	60	60	61	1403	1443	1354	1226	1249	1321	1297	1310	63	63	62	63	63	157	
9	60	60	60	62	1406	1440	1364	1249	1281	1321	1324	1311	63	63	62	63	63	157	
9.25	60	60	61	62	1410	1447	1355	1226	1250	1331	1307	1319	63	63	62	64	63	157	
9.5	60	61	61	62	1395	1483	1352	1227	1231	1341	1304	1320	62	63	63	64	63	158	
9.75	60	61	61	62	1410	1466	1360	1236	1255	1338	1306	1328	63	63	64	64	63	155	
10	60	61	61	62	1398	1460	1365	1247	1257	1339	1304	1334	63	63	64	64	63	154	
10.25	60	61	61	63	1452	1454	1360	1250	1254	1341	1308	1322	63	63	64	64	63	153	
10.5	60	61	61	63	1409	1456	1371	1246	1257	1333	1305	1327	63	63	64	64	63	153	
10.75	61	61	61	63	1419	1473	1371	1246	1260	1350	1306	1334	63	63	64	64	63	152	
11	61	61	61	63	1413	1475	1382	1244	1282	1353	1312	1353	63	63	64	64	63	151	
11.25	61	61	61	64	1414	1475	1387	1247	1281	1366	1324	1351	63	63	64	64	64	151	
11.5	61	61	62	64	1465	1468	1405	1262	1262	1294	1373	1346	63	63	64	64	64	150	
11.75	61	62	62	64	1487	1464	1407	1278	1286	1388	1339	1351	63	63	64	64	63	150	
12	61	62	62	64	1434	1477	1392	1268	1281	1391	1337	1342	63	63	64	64	63	150	
12.25	61	62	62	65	1434	1487	1397	1261	1381	1376	1330	1350	63	63	64	64	63	150	
12.5	61	62	62	65	1457	1475	1391	1267	1278	1380	1338	1344	63	63	64	65	64	150	
12.75	61	62	62	65	1436	1469	1393	1268	1283	1382	1331	1345	63	63	64	64	64	150	
13	61	62	62	66	1485	1518	1401	1280	1285	1345	1345	1370	63	63	64	65	64	151	
13.25	61	62	62	66	1470	1493	1399	1278	1290	1398	1355	1358	63	63	64	65	64	152	
13.5	62	62	62	66	1447	1494	1407	1278	1286	1388	1339	1362	63	63	64	64	64	153	
13.75	62	62	63	67	1454	1511	1406	1279	1292	1388	1344	1365	63	63	64	64	64	154	
14	62	63	63	67	1472	1488	1413	1280	1298	1392	1348	1380	64	64	64	64	64	153	
14.25	62	63	63	67	1435	1541	1415	1285	1306	1402	1355	1378	64	64	64	64	64	156	
14.5	62	63	63	68	1472	1507	1423	1289	1302	1401	1362	1384	64	64	64	64	64	157	
14.75	62	63	63	68	1472	1481	1414	1290	1295	1393	1355	1373	64	64	64	65	64	158	
15	62	63	63	68	1468	1527	1418	1291	1298	1395	1367	1377	64	64	64	65	64	160	
15.25	62	63	63	69	1572	1575	1487	1333	1340	1454	1418	1442	64	64	64	65	64	161	
15.5	62	63	63	70	1573	1603	1502	1354	1352	1480	1443	1456	64	64	64	64	64	162	
15.75	63	63	63	70	1589	1633	1521	1362	1371	1497	1472	1471	64	64	64	64	64	163	
16	63	64	64	70	1553	1636	1507	1362	1368	1494	1456	1475	64	64	64	65	64	165	
16.																			

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Time (min)	Pass/ Fail				Pass/ Fail															
	TC #37	TC #38	TC #39	TC #40	TC #41	TC #42	TC #43	TC #44	TC #45	TC #46	TC #47	TC #48	TC #49	TC #50	TC #51	TC #52	TC #53	TC #54	TC #55	
18	64	65	65	75	1576	1677	1545	1395	1409	1551	1499	1520	64	64	64	65	64	64	168	
18.25	64	65	65	75	1550	1659	1549	1396	1409	1559	1520	1534	64	64	64	65	65	64	168	
18.5	64	65	65	76	1616	1668	1562	1406	1416	1585	1509	1524	64	64	64	65	65	64	171	
18.75	64	65	65	77	1627	1661	1555	1418	1405	1565	1521	1533	64	64	64	66	65	64	172	
19	64	66	66	77	1643	1662	1566	1418	1409	1560	1519	1530	64	64	64	66	65	64	181	
19.25	65	66	66	78	1637	1648	1561	1420	1411	1573	1518	1524	64	64	64	65	65	64	187	
19.5	65	66	66	79	1588	1658	1560	1413	1421	1581	1583	1536	65	64	64	66	65	64	189	
19.75	65	66	66	79	1604	1687	1572	1417	1422	1585	1524	1538	65	64	64	65	65	65	193	
20	65	66	66	80	1602	1676	1565	1421	1424	1599	1521	1538	65	65	64	66	65	65	189	
20.25	65	67	67	81	1656	1656	1575	1425	1425	1593	1525	1538	64	64	64	65	65	65	177	
20.5	66	67	67	82	1603	1674	1567	1419	1432	1592	1529	1545	65	64	64	67	65	65	221	
20.75	66	67	67	82	1612	1681	1574	1424	1436	1622	1528	1548	67	64	64	67	65	65	270	
21	66	67	67	83	1597	1664	1569	1430	1444	1606	1543	1546	65	65	64	68	65	65	308	
21.25	66	68	67	84	1641	1672	1573	1429	1434	1610	1585	1538	66	65	64	68	65	65	347	
21.5	66	68	68	85	1650	1677	1572	1434	1435	1606	1534	1555	67	65	64	69	66	65	378	
21.75	66	68	68	86	1691	1675	1570	1462	1430	1593	1538	1548	67	65	65	68	66	65	400	
22	67	68	68	87	1546	1656	1577	1439	1433	1624	1546	1553	66	65	65	66	65	65	424	
22.25	67	69	68	88	1609	1712	1585	1437	1440	1624	1547	1559	66	65	65	67	65	65	438	
22.5	67	69	69	89	1603	1660	1588	1439	1446	1599	1544	1563	66	65	65	66	65	65	460	
22.75	67	69	69	90	1669	1666	1577	1447	1440	1626	1549	1554	68	65	65	68	66	65	469	
23	67	69	69	91	1630	1671	1575	1445	1445	1598	1538	1551	70	65	65	69	65	65	466	
23.25	68	69	69	92	1637	1670	1579	1449	1442	1600	1539	1555	68	66	65	71	66	65	476	
23.5	68	70	70	94	1618	1709	1578	1447	1441	1606	1550	1566	69	66	65	71	66	65	486	
23.75	68	70	70	95	1624	1693	1582	1447	1455	1631	1559	1563	71	66	65	70	66	65	492	
24	68	70	70	97	1604	1683	1578	1446	1463	1638	1570	1562	69	66	65	73	66	66	506	
24.25	68	71	70	98	1622	1703	1586	1450	1454	1610	1551	1569	70	66	65	69	66	66	515	
24.5	69	71	71	100	1615	1688	1595	1450	1458	1633	1564	1571	71	66	65	68	66	65	525	
24.75	69	71	71	101	1643	1668	1596	1458	1454	1615	1558	1580	69	66	65	71	66	66	581	
25	69	71	71	103	1628	1697	1593	1456	1460	1627	1559	1574	73	67	65	71	66	66	533	
25.25	69	71	71	105	1722	1706	1632	1486	1474	1678	1596	1598	74	67	65	71	66	66	545	
25.5	70	72	72	107	1706	1716	1652	1495	1494	1688	1620	1617	69	67	65	69	66	67	554	
25.75	70	72	72	108	1674	1786	1639	1493	1493	1690	1615	1640	71	67	66	70	67	67	561	
26	70	72	72	110	1695	1784	1634	1498	1498	1705	1623	1641	73	68	66	71	67	66	575	
26.25	70	72	72	111	1698	1774	1636	1497	1497	1706	1631	1641	71	66	66	71	67	66	587	
26.5	70	73	73	113	1675	1775	1653	1499	1504	1721	1644	1642	77	68	66	73	66	66	599	
26.75	71	73	73	114	1680	1811	1658	1504	1513	1730	1650	1666	76	68	66	72	66	66	604	
27	71	73	73	116	1662	1831	1653	1507	1532	1716	1661	1681	70	68	66	70	67	66	579	
27.25	71	73	74	117	1730	1768	1643	1510	1514	1704	1636	1649	70	68	66	69	67	66	592	
27.5	71	74	74	118	1690	1786	1657	1510	1512	1725	1644	1630	71	68	66	70	67	66	608	
27.75	72	74	74	119	1703	1768	1654	1513	1517	1729	1668	1647	73	68	66	71	67	66	615	
28	72	74	75	121	1676	1793	1663	1516	1522	1747	1669	1660	69	68	66	69	67	66	627	
28.25	72	74	75	122	1688	1762	1672	1516	1521	1713	1655	1652	73	69	66	71	67	67	625	
28.5	73	75	75	123	1688	1757	1669	1517	1521	1735	1652	1652	75	69	67	72	68	67	627	
28.75	73	75	76	124	1676	1800	1666	1516	1526	1715	1664	1673	75	69	66	72	68	67	636	
29	73	75	76	125	1687	1812	1679	1524	1529	1753	1675	1683	71	70	66	72	68	67	643	
29.25	73	76	76	125	1665	1799	1682	1527	1533	1758	1676	1675	70	70	67	70	68	67	643	
29.5	73	76	77	126	1693	1826	1675	1523	1536	1751	1665	1672	70	69	66	70	68	67	665	
29.75	74	76	77	127	1676	1833	1680	1528	1540	1753	1660	1675	73	70	67	71	68	67	684	
30	74	76	78	127	1726	1759	1668	1528	1526	1737	1663	1664	72	70	67	71	69	67	690	
<b>Max Temp</b>	74	76	78	127	1730	1833	1682	1528	1540	1758	1660	1683	77	70	67	73	69	67		
<b>Max Allowed</b>	809	809	810	810									562	562	562	562	563	562		

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Time (min)	Test Room Burner (V)	Test Window Burner (V)	Test Room Burner SCFM	Test Window Burner SCFM	Test Room Burner SCFM	Calibration Room Burner SCFM	Calibration Window Burner SCFM	
0	3.822	0.898	16.175	0.000	16.207	0.000	16.309	0.000
0.25	3.823	0.901	16.178	0.000	16.207	0.000	16.309	0.000
0.5	3.828	0.899	16.192	0.000	16.207	0.000	16.309	0.000
0.75	3.829	0.9	16.194	0.000	16.207	0.000	16.309	0.000
1	3.828	0.901	16.192	0.000	16.207	0.000	16.309	0.000
1.25	3.837	0.9	16.216	0.000	16.207	0.000	16.309	0.000
1.5	3.832	0.9	16.203	0.000	16.207	0.000	16.309	0.000
1.75	3.832	0.899	16.203	0.000	16.207	0.000	16.309	0.000
2	3.836	0.899	16.213	0.000	16.207	0.000	16.309	0.000
2.25	3.838	0.899	16.219	0.000	16.207	0.000	16.309	0.000
2.5	3.834	0.899	16.208	0.000	16.207	0.000	16.309	0.000
2.75	3.839	0.898	16.222	0.000	16.207	0.000	16.309	0.000
3	3.832	0.897	16.203	0.000	16.207	0.000	16.309	0.000
3.25	3.838	0.897	16.219	0.000	16.207	0.000	16.309	0.000
3.5	3.835	0.897	16.211	0.000	16.207	0.000	16.309	0.000
3.75	3.841	0.897	16.227	0.000	16.207	0.000	16.309	0.000
4	3.838	0.899	16.219	0.000	16.207	0.000	16.309	0.000
4.25	3.834	0.897	16.208	0.000	16.207	0.000	16.309	0.000
4.5	3.841	0.9	16.227	0.000	16.207	0.000	16.309	0.000
4.75	3.839	0.897	16.222	0.000	16.207	0.000	16.309	0.000
5	3.827	2.616	16.189	6.059	16.164	6.015	16.194	5.996
5.25	3.819	2.627	16.167	6.076	16.164	6.015	16.194	5.996
5.5	3.819	2.503	16.167	5.853	16.164	6.015	16.194	5.996
5.75	3.822	2.566	16.175	5.987	16.164	6.015	16.194	5.996
6	3.818	2.563	16.164	5.982	16.164	6.015	16.194	5.996
6.25	3.825	2.563	16.183	5.962	16.164	6.015	16.194	5.996
6.5	3.819	2.592	16.167	6.014	16.164	6.015	16.194	5.996
6.75	3.821	2.594	16.173	6.017	16.164	6.015	16.194	5.996
7	3.819	2.591	16.167	6.012	16.164	6.015	16.194	5.996
7.25	3.82	2.586	16.170	6.003	16.164	6.015	16.194	5.996
7.5	3.818	2.535	16.164	5.911	16.164	6.015	16.194	5.996
7.75	3.818	2.562	16.164	5.960	16.164	6.015	16.194	5.996
8	3.814	2.566	16.153	5.987	16.164	6.015	16.194	5.996
8.25	3.818	2.599	16.164	6.026	16.164	6.015	16.194	5.996
8.5	3.816	2.603	16.159	6.033	16.164	6.015	16.194	5.996
8.75	3.815	2.602	16.156	6.032	16.164	6.015	16.194	5.996
9	3.812	2.547	16.149	5.933	16.164	6.015	16.194	5.996
9.25	3.817	2.572	16.162	5.978	16.164	6.015	16.194	5.996
9.5	3.813	2.561	16.151	5.958	16.164	6.015	16.194	5.996
9.75	3.813	2.561	16.151	5.958	16.164	6.015	16.194	5.996
10	3.813	2.963	16.151	6.642	16.203	6.759	16.197	6.773
10.25	3.809	3.048	16.140	6.776	16.203	6.759	16.197	6.773
10.5	3.809	3.044	16.140	6.772	16.203	6.759	16.197	6.773
10.75	3.808	3.042	16.137	6.769	16.203	6.759	16.197	6.773
11	3.808	3.045	16.137	6.773	16.203	6.759	16.197	6.773
11.25	3.849	3.048	16.249	6.776	16.203	6.759	16.197	6.778
11.5	3.851	3.044	16.254	6.772	16.203	6.759	16.197	6.773
11.75	3.852	3.048	16.257	6.778	16.203	6.759	16.197	6.773
12	3.854	3.05	16.263	6.781	16.203	6.759	16.197	6.773
12.25	3.812	2.808	16.149	6.387	16.203	6.759	16.197	6.773
12.5	3.826	3.064	16.186	6.803	16.203	6.759	16.197	6.773
12.75	3.832	3.067	16.203	6.808	16.203	6.759	16.197	6.773
13	3.856	3.066	16.268	6.806	16.203	6.759	16.197	6.773
13.25	3.862	3.066	16.284	6.806	16.203	6.759	16.197	6.773
13.5	3.809	3.053	16.140	6.784	16.203	6.759	16.197	6.773
13.75	3.831	3.052	16.200	6.784	16.203	6.759	16.197	6.773
14	3.852	3.051	16.257	6.783	16.203	6.759	16.197	6.773
14.25	3.853	3.053	16.260	6.788	16.203	6.759	16.197	6.773
14.5	3.853	3.059	16.266	6.794	16.203	6.759	16.197	6.773
14.75	3.803	3.055	16.123	6.789	16.203	6.759	16.197	6.773
15	4.068	3.308	16.834	7.177	17.195	7.694	17.211	7.682
15.25	4.162	3.692	17.079	7.730	17.195	7.694	17.211	7.682
15.5	4.204	3.692	17.188	7.730	17.195	7.694	17.211	7.682
15.75	4.256	3.69	17.321	7.727	17.195	7.694	17.211	7.682
16	4.216	3.631	17.219	7.645	17.195	7.694	17.211	7.682
16.25	4.221	3.709	17.231	7.753	17.195	7.694	17.211	7.682
16.5	4.227	3.534	17.247	7.507	17.195	7.694	17.211	7.682
16.75	4.226	3.673	17.244	7.703	17.195	7.694	17.211	7.682
17	4.225	3.668	17.242	7.696	17.195	7.694	17.211	7.682
17.25	4.224	3.677	17.239	7.709	17.195	7.694	17.211	7.682
17.5	4.229	3.674	17.252	7.705	17.195	7.694	17.211	7.682
17.75	4.232	3.672	17.260	7.702	17.195	7.694	17.211	7.682

CastleRock Building Products, Inc.

G102864745SAT-005

17 February 2017

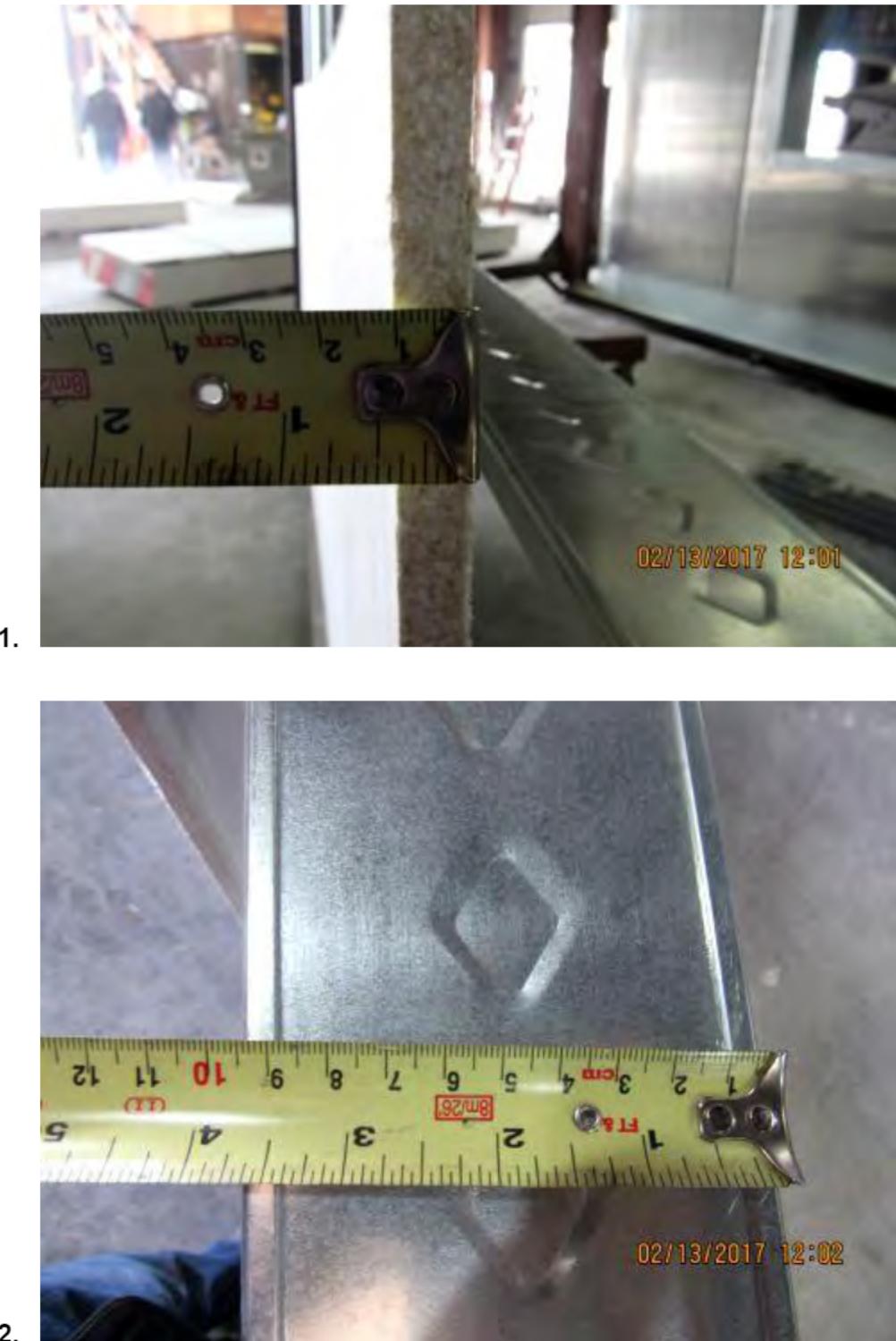
Time (min)	Test Room			Test Window			Test Room			Test Window			Calibration Room			Calibration Window		
	Burner	V	Burner	V	Burner	SCFM	Burner	SCFM	Burner	SCFM	Burner	SCFM	Burner	SCFM	Burner	SCFM	Burner	SCFM
18	4.227	3.674	17.247	7.705	17.195	7.694	17.211	7.682										
18.25	4.218	3.674	17.224	7.705	17.195	7.694	17.211	7.682										
18.5	4.231	3.67	17.257	7.699	17.195	7.694	17.211	7.682										
18.75	4.23	3.672	17.254	7.702	17.195	7.694	17.211	7.682										
19	4.098	3.674	16.913	7.705	17.195	7.694	17.211	7.682										
19.25	4.224	3.672	17.239	7.702	17.195	7.694	17.211	7.682										
19.5	4.21	3.689	17.203	7.725	17.195	7.694	17.211	7.682										
19.75	4.213	3.702	17.211	7.743	17.195	7.694	17.211	7.682										
20	4.204	3.964	17.188	8.098	17.202	8.501	17.201	8.523										
20.25	4.202	4.431	17.183	8.694	17.202	8.501	17.201	8.523										
20.5	4.235	4.381	17.267	8.632	17.202	8.501	17.201	8.523										
20.75	4.243	4.121	17.288	8.303	17.202	8.501	17.201	8.523										
21	4.105	4.114	16.931	8.294	17.202	8.501	17.201	8.523										
21.25	4.205	4.361	17.190	8.607	17.202	8.501	17.201	8.523										
21.5	4.206	4.38	17.193	8.631	17.202	8.501	17.201	8.523										
21.75	4.214	4.114	17.213	8.294	17.202	8.501	17.201	8.523										
22	4.217	4.368	17.221	8.616	17.202	8.501	17.201	8.523										
22.25	4.211	4.372	17.206	8.621	17.202	8.501	17.201	8.523										
22.5	4.214	4.352	17.213	8.596	17.202	8.501	17.201	8.523										
22.75	4.217	4.102	17.221	8.279	17.202	8.501	17.201	8.523										
23	4.214	4.388	17.213	8.641	17.202	8.501	17.201	8.523										
23.25	4.216	4.366	17.219	8.614	17.202	8.501	17.201	8.523										
23.5	4.213	4.169	17.211	8.365	17.202	8.501	17.201	8.523										
23.75	4.22	4.364	17.229	8.611	17.202	8.501	17.201	8.523										
24	4.215	4.383	17.216	8.632	17.202	8.501	17.201	8.523										
24.25	4.211	4.111	17.206	8.290	17.202	8.501	17.201	8.523										
24.5	4.21	4.365	17.203	8.612	17.202	8.501	17.201	8.523										
24.75	4.22	4.353	17.229	8.597	17.202	8.501	17.201	8.523										
25	4.433	4.364	17.767	8.611	17.773	8.837	17.779	8.523										
25.25	4.444	4.525	17.794	8.809	17.773	8.837	17.779	8.707										
25.5	4.45	4.564	17.809	8.857	17.773	8.837	17.779	8.707										
25.75	4.446	4.55	17.799	8.640	17.773	8.837	17.779	8.707										
26	4.429	4.568	17.757	8.861	17.773	8.837	17.779	8.707										
26.25	4.443	4.567	17.792	8.860	17.773	8.837	17.779	8.707										
26.5	4.441	4.556	17.787	8.847	17.773	8.837	17.779	8.707										
26.75	4.449	4.535	17.807	8.621	17.773	8.837	17.779	8.707										
27	4.445	4.555	17.797	8.848	17.773	8.837	17.779	8.707										
27.25	4.347	4.555	17.552	8.848	17.773	8.837	17.779	8.707										
27.5	4.438	4.574	17.779	8.869	17.773	8.837	17.779	8.707										
27.75	4.439	4.554	17.782	8.845	17.773	8.837	17.779	8.707										
28	4.448	4.571	17.804	8.865	17.773	8.837	17.779	8.707										
28.25	4.431	4.547	17.762	8.838	17.773	8.837	17.779	8.707										
28.5	4.439	4.57	17.782	8.865	17.773	8.837	17.779	8.707										
28.75	4.439	4.555	17.782	8.846	17.773	8.837	17.779	8.707										
29	4.439	4.536	17.782	8.823	17.773	8.837	17.779	8.707										
29.25	4.441	4.567	17.787	8.866	17.773	8.837	17.779	8.707										
29.5	4.441	4.552	17.787	8.842	17.773	8.837	17.779	8.707										
29.75	4.437	4.579	17.777	8.875	17.773	8.837	17.779	8.707										
30	4.427	4.559	17.752	8.651	17.773	8.837	17.779	8.707										

Max Temp  
Max Allowed

## **APPENDIX C**

### Photographs

### Installation Photos





3.



4.



5.



6.





9.



10.



11.



12.



13.



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29.



30.

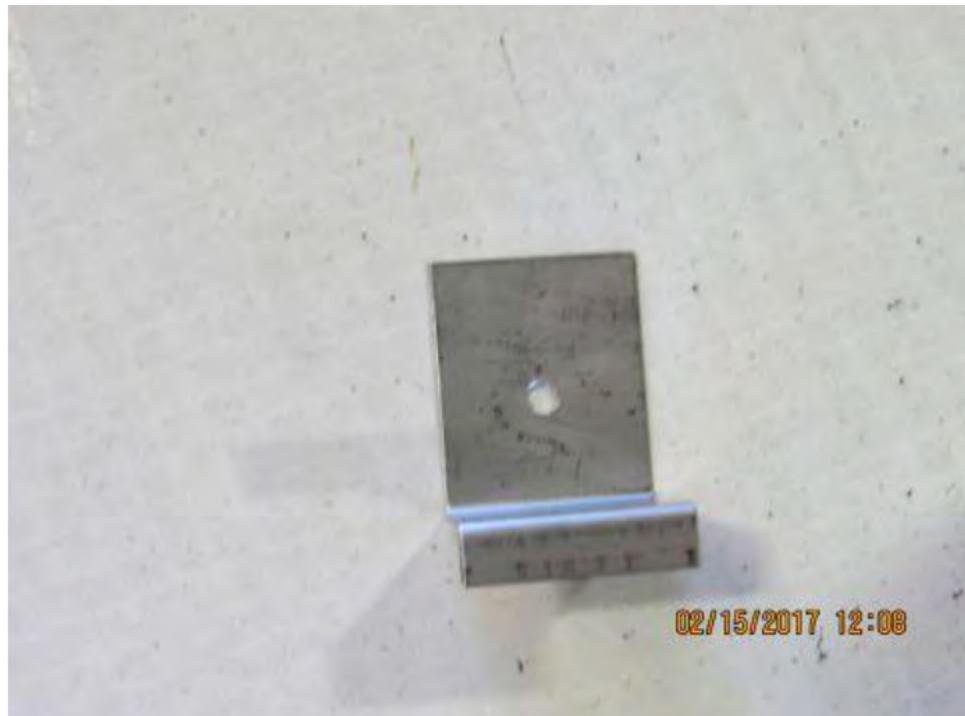


31.



32.

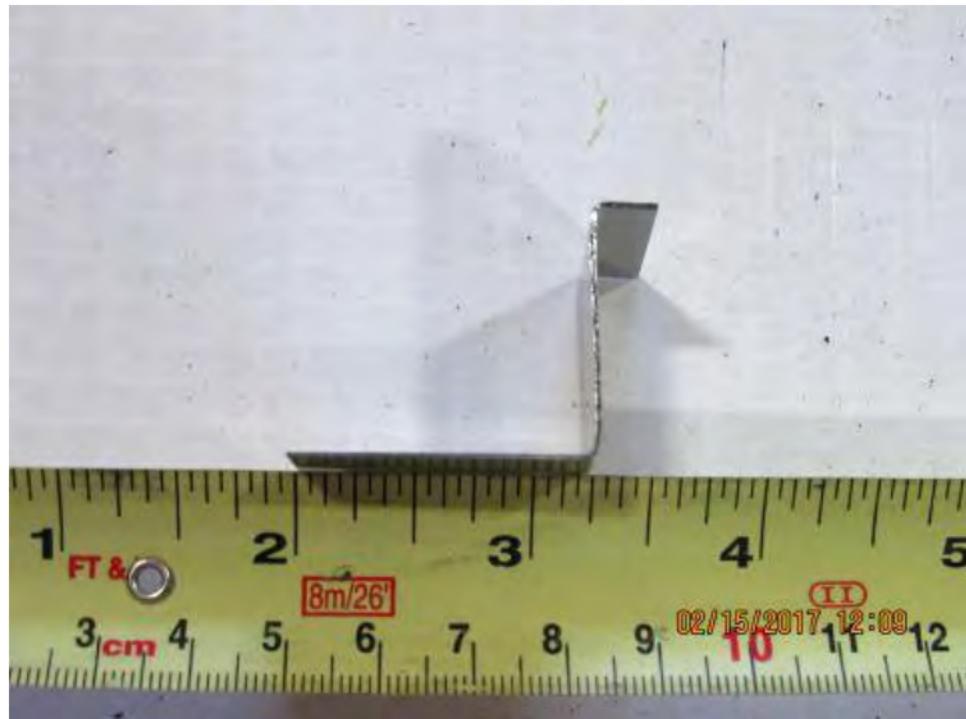




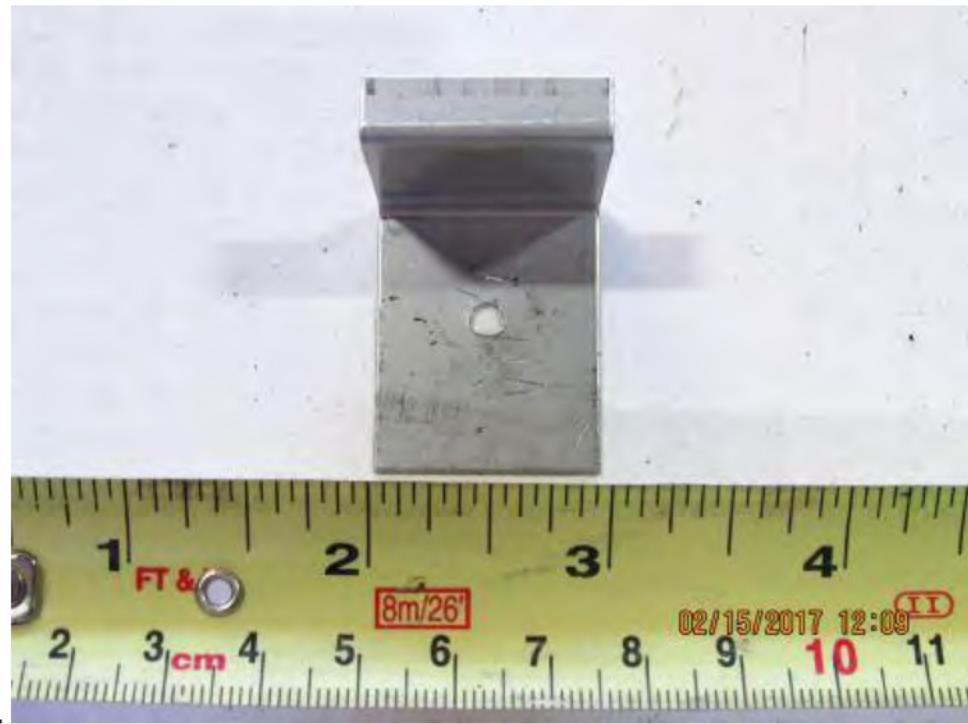
35.



36.



37.



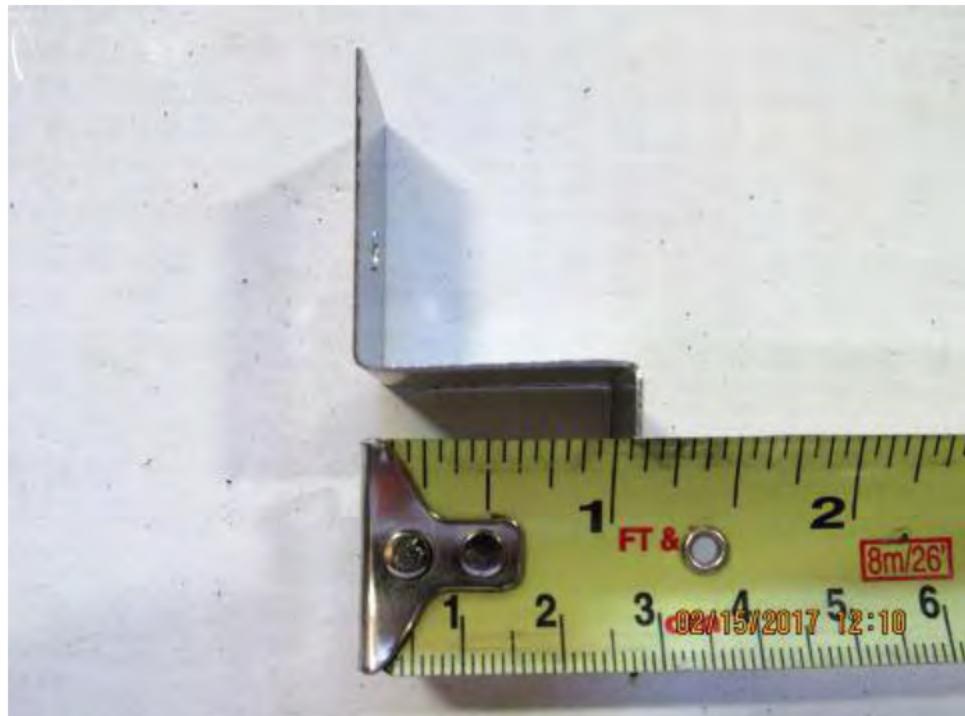
38.



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62.



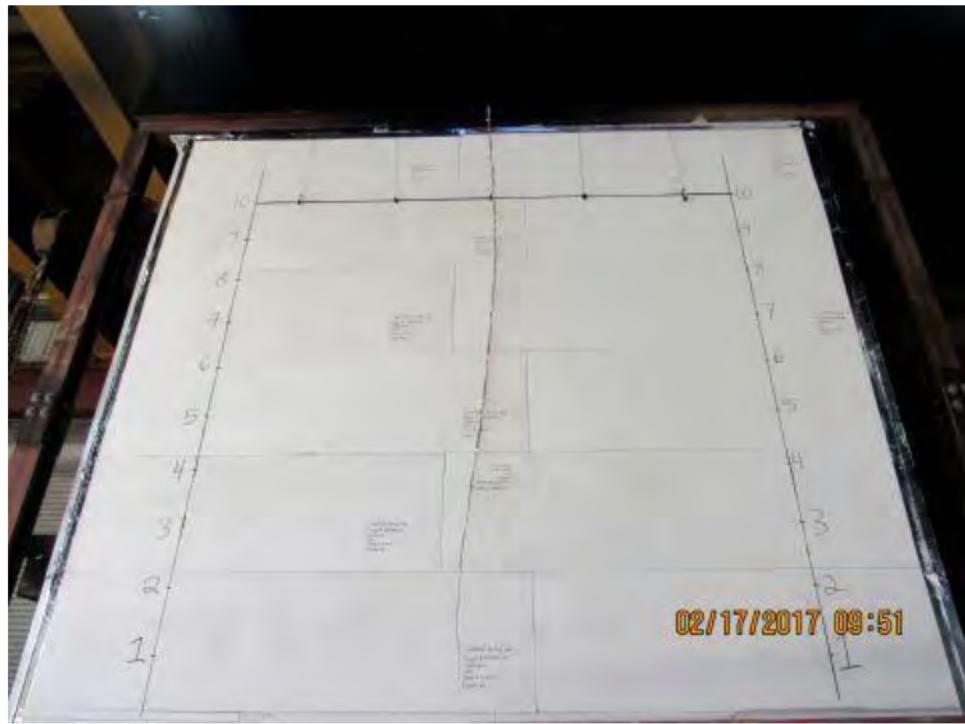
63.



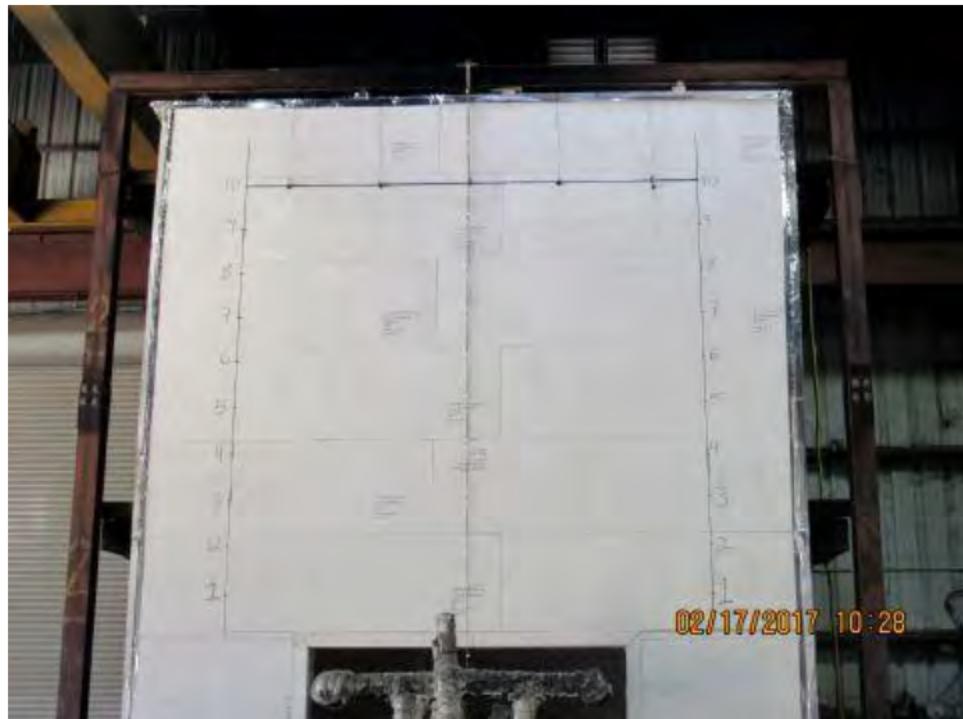
64.



65.



66.



**Test Photos**





71.



72.



73.



74.



75.



76.



77.



78.



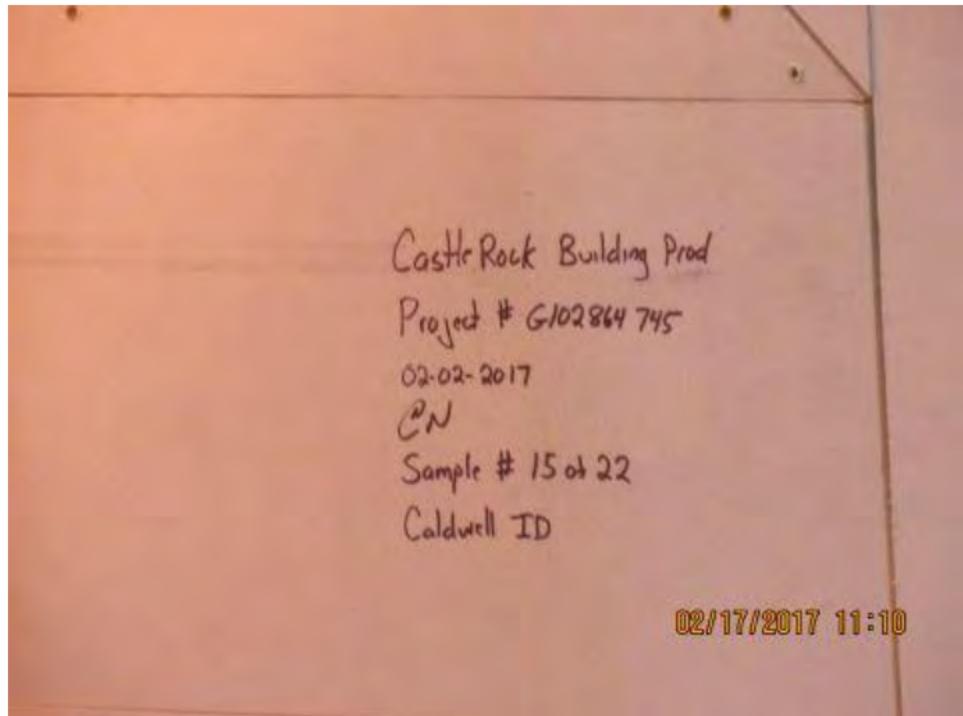


81.



82.





85.



86.





89.



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92.



93.



94.





97.



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99.



100.

**Post Test Photos**

101.



102.



103.



104.



105.



106.



## CALIBRATED INSTRUMENTATION USED FOR TESTING

Description	Serial No.	Calibration Due Date
DAQ	99LE006	3/22/17
Thermo/hygrometer	140626113	9/18/17
Stopwatch	150135660	2/27/17
Stopwatch	150135668	2/27/17

## REVISION SUMMARY

DATE	SUMMARY
February 27, 2017	Original Issue Date