



ASTM E119
PERFORMANCE TEST REPORT

Report No.: F1663.01-121-24

Test Date: October 7, 2015

Rendered to:

THERMASTEEL CORPORATION
Radford, Virginia

PRODUCT TYPE: Loadbearing Wall Assembly
SERIES/MODEL: 5-1/2 inch thick ThermaSteel Wall Panel

This report contains in its entirety:

Cover Page:	1 page
Report Body:	8 pages
Graphical Data:	2 pages
Numerical Data:	8 pages
Photographs:	6 pages
Drawings:	1 page

1.0 Report Issued To: ThermaSteel Corporation
609 West Rock Road
Radford, Virginia 24141

2.0 Test Laboratory: Architectural Testing, Inc., an Intertek company (“Intertek-ATI”)
130 Derry Court
York, Pennsylvania 17406-8405
717-764-7700

3.0 Test Method Information:

3.1 Introduction: The purpose of Fire Resistance testing is to measure a building element’s ability to resist the transfer of energy and hot gases through the element and subjecting adjacent rooms, structures, etc. from a single standardized fire scenario. The standard measures this performance by quantifying the temperature rise on the unexposed face of the building element when the exposed side is subjected to the ASTM E119 Time vs. Temperature curve. In addition to exposing the element to the fire test, the standard references procedures for the element to be able to resist the cooling effects of a water hose stream test. After the fire test, the specimen is subjected to the hose stream procedures outlined in ASTM E2226. If the end-use of the element is intended for structural support, it must also maintain its integrity by holding the design load during the standard fire exposure and hose stream procedures.

It is important for the user of fire standards and data generated from them to understand the method only exposes the system to one standard exposure. The standard does not address every possible scenario or hazard associated with an actual fire.

4.0 Project Summary:

4.1 Product Type: Loadbearing Wall Assembly

4.2 Series/Model: 5-1/2 inch thick ThermaSteel Wall Panel

4.3 Compliance Statement: Results obtained are tested values and were secured by using the designated test method(s). The specimen(s) were tested and evaluated against the requirements of the standard. A summary of the results is listed in the Test Results section and the complete graphical test data is included in Appendix A of this report.

4.4 Test Date: 10/7/2015 – 10/16/2015

4.5 Ambient Conditions: 71°F and 61% RH on 10/7/2015

4.6 Test Location: Intertek-ATI test facility in York, Pennsylvania

4.7 Test Sample Source: The wall panel sections were selected by Intertek-ATI personnel (Reference Intertek-ATI Sample Report# F1663.02-117-38-R0). The ThermaSteel Wall Panels were witnessed during production and tagged prior to shipment on 9/30/2015. Specimens were marked with “MCH”.

4.0 Project Summary: (Continued)

4.7 Test Method(s), Practices and/or Classifications:

ASTM E119-14, Standard Test Methods for Fire Tests of Building Construction and Materials

4.8 List of Official Observers:

<u>Name</u>	<u>Company</u>
Tim Thomas	ThermaSteel Corporation
Art Parker	Jensen-Hughes
Matt Freeborn	Intertek-ATI
Ethan Grove	Intertek-ATI
Scott Gingrich	Intertek-ATI

5.0 Test Specimen Description:

5.1 Interior Wall Cladding: The simulated interior surface of the assembly was clad with three layers of 5/8 inch thick National Gypsum Gold Bond® Fire-Shield® Type-X Gypsum Board (complying with ASTM C1396). Fastener spacing for each layer was 12 inches on center on each wall panel framing member. The first layer of Type-X gypsum board was oriented vertically and fastened to each vertical framing member as well as the top and bottom track with #6 x 1-1/4 inch long self-drilling, bugle head fasteners. The second layer of Type-X gypsum board was oriented horizontally and fastened to each vertical framing member as well as the top and bottom track with #6 x 2 inches long self-drilling, bugle head fasteners. The third layer of Type-X gypsum board was oriented vertically and fastened to each vertical framing member as well as the top and bottom track with #8 x 3 inch long self-drilling, bugle head fasteners. All joints and fastener heads of the third layer of gypsum were Level II finished with USG Sheetrock paper joint tape and spackled with USG Sheetrock Joint Compound.

5.2 Structural Component: 5-1/2 inch thick Thermasteel Wall Panels were assembled prior to installation into the test frame. The designated exterior surface of the assembly was assembled by fastening the 18 gauge galvanized steel flange to the framing member of the panel beside with #12 x 3/4 inch long self-drilling fasteners every 12 inches. 18 gauge nominal 2 inches x 4 inches gusset plates were placed at the mid-height (5 feet) of the assembly at each panel joint and fastened to the panels with three #12 x 3/4 inch long self-drilling fasteners into each panel. Once assembled, 18 gauge x 5-1/2 inches wide galvanized steel track was then placed at the top and bottom of the assembly and fastened to each vertical framing member with two #12 x 3/4 inch long self-drilling fasteners per framing member.

5.0 Test Specimen Description: (Continued)

5.3 Exterior Sheathing: The simulated exterior surface of the assembly was clad with one layer of 5/8 inch thick National Gypsum Gold Bond® eXP® Gypsum Sheathing (complying with ASTM C 1177). Fastener spacing for the sheathing was 12 inches on center on each wall panel framing member. Fasteners used on the sheathing were #6 x 1-1/4 inch long self-drilling, bugle head fasteners.

6.0 Test Details:

6.1 Equipment: Furnace used for testing has an exposure space of 14 ft. wide by 12 ft. tall by 4 ft. deep. The furnace is equipped with six burners capable of producing 1.5 MBtu/hr of energy each. Three burners are positioned on each side wall of the furnace to allow for an even distribution of heat flux across the surface area of the test specimen. The exposed area of the furnace is reduced to 10 ft. by 10 ft. by utilizing a frame consisting of steel and concrete with the exposed surface protected by fiber ceramic blankets. The temperature inside the furnace is controlled by adjusting the blower speed of the air provided to the burners. This temperature is determined by the average of the nine thermocouples symmetrically placed behind the assembly. The neutral-pressure-plane is controlled by two pressure transducers that adjust the opening of the damper.

6.2 Loading Calculation & Procedure: Four RC-258 ENERPAC single acting actuators were spaced evenly below a reinforced steel free floating beam that held the test specimen and framing blocks. Specimen was centered on this beam to allow concentric loading. Sides of the assembly were held in place with lumber and set screws to allow for in-plane loading only, but did not constrain the sides. The hydraulic lines of the actuators were attached to a manifold system and that created pressure by an electric pump. When pumped, the actuators lifted the free floating beam so the test specimen was bearing on the top of the frame. The specimen was loaded to 1,033 psi 15 minutes prior to the start of the test and load was maintained until noted in the observation section of this report.

6.0 Test Details: (Continued)

6.3 Loading Calculation & Procedure:

$$F_t = W + DL * N$$

$$A = N_a * A_{eff.}$$

$$P = \frac{F_t}{A}$$

Variable	Description	Value	Unit
W	Uniform Load of Dead Weight	2,290	lb.
DL	Design Load*	38,500	lb.
N	Number of Studs*	N/A	--
N _a	Number of Actuators	4	--
A _{eff.}	Effective Area / Actuator	5.15	in. ²
A	Total Area	20.6	in. ²
F _t	Total Force	40,790	lb.
P	Pressure in Hydraulic Line	1,980	PSI

*Design load based on pounds/lineal feet calculation.

6.0 Test Details: (Continued)

6.4 Test Observations:

10/7/2016 Test #1

Time (hr:min:sec)	Observations
Fire Exposure	
00:00	Baseline Deflection Measurement Left 1/4: 5-1/2 inches from assembly Centerline: 5-1/4 inches from assembly Right 1/4: 5-1/8 inches from assembly
02:00	Ignition of exposed cladding.
19:00	Deflection Measurement Left 1/4: 5-1/2 inches from assembly Centerline: 5-1/4 inches from assembly Right 1/4: 5-1/4 inches from assembly
32:00	Deflection Measurement Left 1/4: 5-1/2 inches from assembly Centerline: 5-1/2 inches from assembly Right 1/4: 5-1/4 inches from assembly
45:00	Deflection Measurement Left 1/4: 5-5/8 inches from assembly Centerline: 5-1/2 inches from assembly Right 1/4: 5-3/8 inches from assembly
1:00:00	Deflection Measurement Left 1/4: 5-5/8 inches from assembly Centerline: 5-5/8 inches from assembly Right 1/4: 5-3/8 inches from assembly
1:15:00	Deflection Measurement Left 1/4: 6 inches from assembly Centerline: 6-3/4 inches from assembly Right 1/4: 5-7/8 inches from assembly
1:18:00	Structural failure determined by inability to withstand actuator pressure and sustain the design load. Fire endurance test continued for nonloadbearing data purposes.
1:30:00*	Flames emitting from the exposed gypsum joints.
1:48:00*	Third layer of exposed gypsum fallout.
2:00:00*	Fire endurance test concluded.
Hose Stream*	
	The hose stream did not penetrate through the unexposed surface during the test. The wall system was not under load during the hose stream procedure. This is considered a 2-hour fire-rated non-load bearing system only.

*Observations taken under non-load bearing conditions at these elapsed times.

6.0 Test Details: (Continued)

6.5 Test Results:

Testing under Loadbearing Conditions:

Variable	Description	Test Value
C	Correction Factor	N/A seconds
I	Indicated FR Period	120 minutes
A	Area under Indicated FR Period for first $\frac{3}{4}$ of test period	N/A
As	Area under Standard E119 Time vs. Temp. Curve for first $\frac{3}{4}$ of test period	N/A
L	Lag Correction	3240 °F*min
FR Period	Fire-Resistance Period	78 minutes

Testing under Nonloadbearing Conditions (after witnessed structural failure):

Variable	Description	Test Value
C	Correction Factor	11 seconds
I	Indicated FR Period	120 minutes
A	Area under Indicated FR Period for first $\frac{3}{4}$ of test period	132444
As	Area under Standard E119 Time vs. Temp. Curve for first $\frac{3}{4}$ of test period	132749
L	Lag Correction	3240 °F*min
FR Period	Fire-Resistance Period	120 minutes

7.0 Test Conclusion:

The load-bearing assembly described in this report and tested by Intertek-ATI achieved a 78 minute fire-resistance rating when tested in accordance with ASTM E119 under loadbearing conditions.

Under nonloadbearing conditions, the test assembly described in this report and tested by Intertek-ATI achieved a 120 minute fire-resistance rating when tested in accordance with ASTM E119 under nonloadbearing conditions.

Intertek-ATI will service this report for the entire test record retention period. The service life of this report will expire on the stated Test Record Retention End Date, at which time such materials as drawings, data sheets, samples of test specimens, copies of this report, and any other pertinent project documentation, shall be discarded without notice.

This report does not constitute certification of this product nor an opinion or endorsement by this laboratory. It is the exclusive property of the client so named herein and relates only to the specimen(s) tested. This report may not be reproduced, except in full, without the written approval of Intertek-ATI.

For INTERTEK-ATI:

Ethan Grove
Project Manager – Fire Testing

Karl Houser, P.E.
Sr. Fire Protection Engineer

EJG:ddr

Attachments (pages): This report is complete only when all attachments listed are included.

- Appendix A: Graphical Data (2)
- Appendix B: Numerical Data (8)
- Appendix C: Photographs (6)
- Appendix D: Drawings (1)

Revision Log

<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
0	11/17/2016	N/A	Original Report Issue

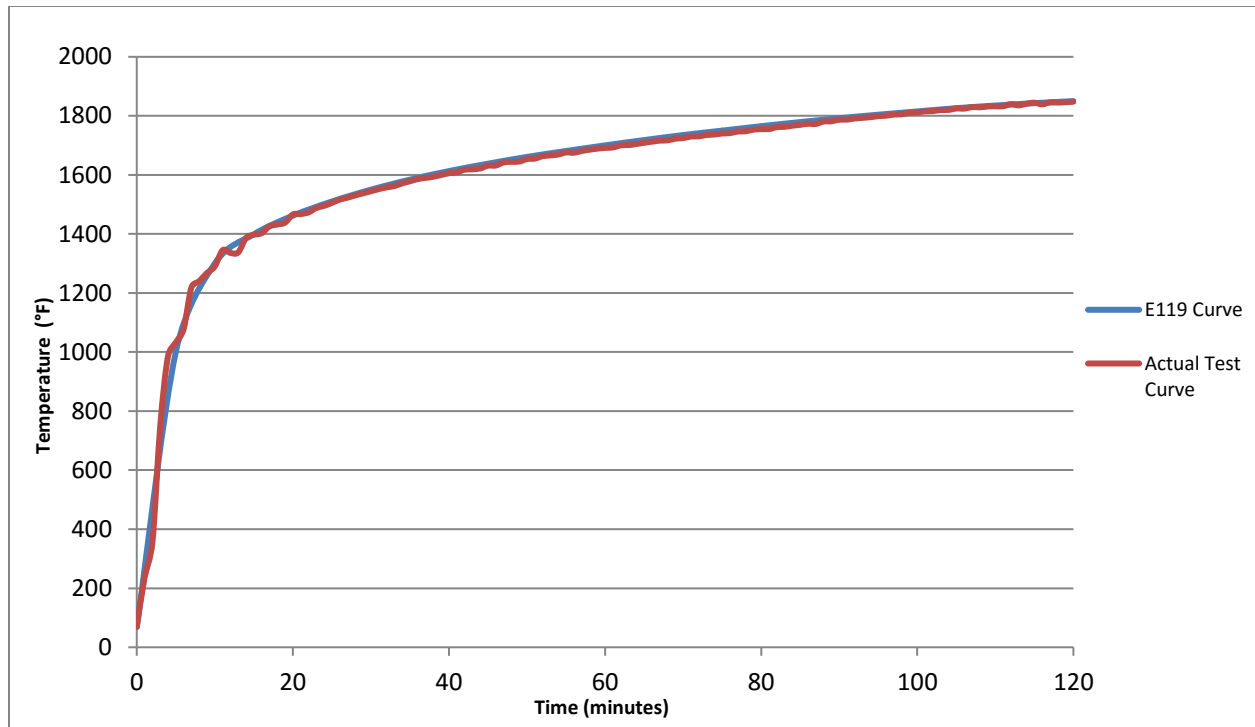
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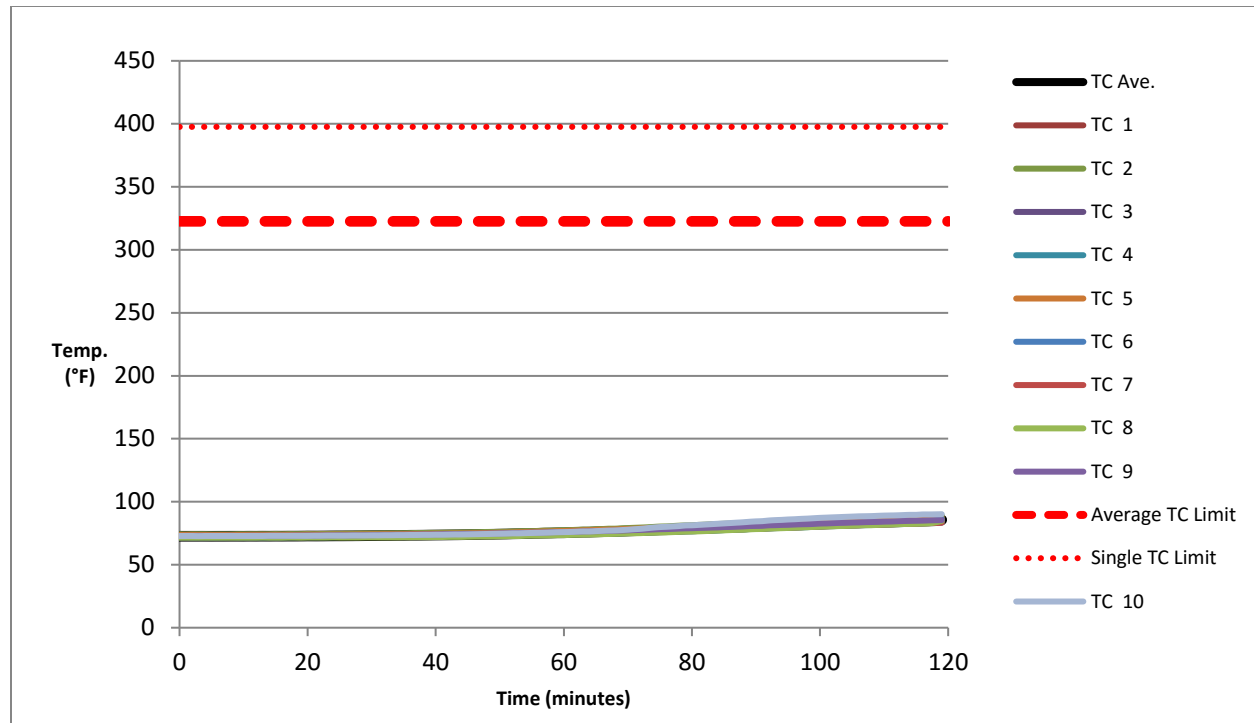
Test Report No.: F1663.01-121-24
Report Date: 11/17/2016
Test Record Retention End Date: 10/07/2019

Appendix A

Graphical Data



Graph No. 1
Average Furnace Temperature vs. Standard Temperature



Graph No. 2
Unexposed Surface Temperatures



Test Report No.: F1663.01-121-24
Report Date: 11/17/2016
Test Record Retention End Date: 10/07/2019

Appendix B

Numerical Data

Time (min)	Ave. Temp Furnace
0	70
1	236
2	355
3	747
4	986
5	1033
6	1077
7	1219
8	1240
9	1268
10	1290
11	1345
12	1336
13	1337
14	1386
15	1397
16	1403
17	1426
18	1432
19	1438
20	1466
21	1468
22	1473
23	1488
24	1495
25	1505
26	1516
27	1523
28	1531
29	1538
30	1545
31	1552
32	1558
33	1562
34	1571
35	1579
36	1586
37	1590
38	1594

Time (min)	Ave. Temp Furnace
39	1600
40	1606
41	1608
42	1618
43	1619
44	1622
45	1631
46	1632
47	1642
48	1644
49	1645
50	1654
51	1655
52	1663
53	1666
54	1669
55	1676
56	1675
57	1681
58	1685
59	1689
60	1692
61	1693
62	1700
63	1701
64	1705
65	1709
66	1713
67	1716
68	1717
69	1723
70	1725
71	1730
72	1731
73	1735
74	1737
75	1740
76	1742
77	1747
78	1748

Time (min)	Ave. Temp Furnace
79	1753
80	1755
81	1755
82	1762
83	1763
84	1767
85	1770
86	1773
87	1773
88	1781
89	1782
90	1787
91	1787
92	1791
93	1793
94	1796
95	1799
96	1801
97	1804
98	1805
99	1811
100	1812
101	1815
102	1816
103	1820
104	1820
105	1825
106	1825
107	1830
108	1829
109	1832
110	1832
111	1833
112	1840
113	1836
114	1841
115	1845
116	1839
117	1846
118	1845

Time (min)	Ave. Temp Furnace
119	1846
120	1848
121	1847
122	1849
123	1852

Table 1
Average Furnace Temperature

Time (Hr:Min:Sec)	TC Ave.	TC 1	TC 2	TC 3	TC 4	TC 5	TC 6	TC 7	TC 8	TC 9	TC 10
0:00:00	73	73	74	72	72	74	72	72	72	73	73
0:01:00	73	73	74	72	72	74	72	72	72	73	73
0:02:00	73	73	74	72	72	74	72	72	72	73	73
0:03:00	73	73	74	72	72	74	72	72	72	73	73
0:04:00	73	73	74	72	72	74	72	72	72	73	73
0:05:00	73	73	74	72	72	74	72	72	72	73	73
0:06:00	73	73	74	72	72	74	72	72	72	73	73
0:07:00	73	73	74	72	72	74	72	72	72	73	73
0:08:00	73	73	74	72	72	74	72	72	72	73	73
0:09:00	73	73	74	72	72	74	72	72	72	73	73
0:10:00	73	73	74	72	72	74	72	72	72	73	73
0:11:00	73	73	74	72	72	74	72	72	72	73	73
0:12:00	73	73	74	72	72	74	72	72	72	73	73
0:13:00	73	73	74	72	72	74	72	72	72	73	73
0:14:00	73	73	74	72	72	74	72	72	72	73	73
0:15:00	73	73	74	72	72	74	72	72	72	73	73
0:16:00	73	73	74	72	72	74	72	72	72	73	73
0:17:00	73	73	74	72	72	74	72	72	72	73	73
0:18:00	73	73	74	72	72	74	72	72	72	73	73
0:19:00	73	74	74	72	72	74	73	72	72	73	73
0:20:00	73	74	74	72	72	74	73	72	72	73	73
0:21:00	73	74	74	72	72	74	73	72	72	73	73
0:22:00	73	74	74	72	72	74	73	72	72	73	73
0:23:00	73	74	74	72	72	74	73	72	72	73	73
0:24:00	73	74	75	72	72	74	73	73	72	73	73
0:25:00	73	74	75	72	72	74	73	73	72	73	73
0:26:00	73	74	75	72	72	74	73	73	72	73	73
0:27:00	73	74	75	72	72	74	73	73	72	73	73
0:28:00	73	74	75	72	72	74	73	73	72	73	73
0:29:00	73	74	75	72	72	74	73	73	72	74	73
0:30:00	73	74	75	72	72	74	73	73	72	74	73
0:31:00	73	74	75	72	72	74	73	73	72	74	73
0:32:00	73	74	75	72	72	74	73	73	72	74	73
0:33:00	73	74	75	72	72	74	73	73	72	74	73
0:34:00	73	74	75	73	72	74	73	73	72	74	74
0:35:00	73	74	75	73	72	74	73	73	72	74	74
0:36:00	73	74	75	73	72	74	73	73	72	74	74
0:37:00	73	74	75	73	72	74	73	73	72	74	74
0:38:00	73	74	75	73	72	74	73	73	72	74	74

Time (Hr:Min:Sec)	TC Ave.	TC 1	TC 2	TC 3	TC 4	TC 5	TC 6	TC 7	TC 8	TC 9	TC 10
0:39:00	74	74	75	73	73	75	73	73	72	74	74
0:40:00	74	75	75	73	73	75	73	73	72	74	74
0:41:00	74	75	75	73	73	75	73	73	72	74	74
0:42:00	74	75	76	73	73	75	73	73	72	74	74
0:43:00	74	75	76	73	73	75	74	73	72	74	74
0:44:00	74	75	76	73	73	75	74	73	72	74	74
0:45:00	74	75	76	73	73	75	74	73	72	75	74
0:46:00	74	75	76	73	73	75	74	73	72	75	74
0:47:00	74	75	76	73	73	75	74	73	72	75	74
0:48:00	74	75	76	74	73	75	74	73	72	75	74
0:49:00	74	75	76	74	73	75	74	74	73	75	75
0:50:00	74	75	76	74	73	75	74	74	73	75	75
0:51:00	74	75	76	74	73	76	74	74	73	75	75
0:52:00	75	75	76	74	73	76	74	74	73	75	75
0:53:00	75	76	77	74	73	76	74	74	73	75	75
0:54:00	75	76	77	74	74	76	74	74	73	75	75
0:55:00	75	76	77	74	74	76	75	74	73	76	75
0:56:00	75	76	77	74	74	76	75	74	73	76	75
0:57:00	75	76	77	75	74	76	75	74	73	76	75
0:58:00	75	76	77	75	74	76	75	74	73	76	76
0:59:00	75	76	77	75	74	77	75	75	74	76	76
1:00:00	75	76	77	75	74	77	75	75	74	76	76
1:01:00	76	76	78	75	74	77	75	75	74	76	76
1:02:00	76	77	78	75	74	77	75	75	74	76	76
1:03:00	76	77	78	75	75	77	76	75	74	76	76
1:04:00	76	77	78	75	75	77	76	75	74	77	76
1:05:00	76	77	78	76	75	78	76	75	74	77	77
1:06:00	76	77	78	76	75	78	76	75	74	77	77
1:07:00	76	77	79	76	75	78	76	75	74	77	77
1:08:00	76	77	79	76	75	78	76	75	75	77	77
1:09:00	77	77	79	76	75	78	76	76	75	77	78
1:10:00	77	78	79	77	75	78	77	76	75	77	78
1:11:00	77	78	79	77	75	79	77	76	75	78	78
1:12:00	77	78	80	77	76	79	77	76	75	78	79
1:13:00	77	78	80	77	76	79	77	76	75	78	79
1:14:00	77	78	80	77	76	79	77	76	75	78	80
1:15:00	78	78	80	78	76	79	78	76	76	78	80
1:16:00	78	78	80	78	76	80	78	76	76	78	80
1:17:00	78	79	81	78	76	80	78	77	76	79	80

Time (Hr:Min:Sec)	TC Ave.	TC 1	TC 2	TC 3	TC 4	TC 5	TC 6	TC 7	TC 8	TC 9	TC 10
1:18:00	78	79	81	78	76	80	78	77	76	79	81
1:19:00	78	79	81	78	77	80	78	77	76	79	81
1:20:00	78	79	81	78	77	80	78	77	76	79	81
1:21:00	79	79	82	79	77	80	79	77	77	79	82
1:22:00	79	79	82	79	77	81	79	77	77	79	82
1:23:00	79	80	82	79	77	81	79	77	77	80	82
1:24:00	79	80	82	79	77	81	79	78	77	80	83
1:25:00	79	80	83	79	78	81	79	78	77	80	83
1:26:00	80	80	83	80	78	82	80	78	78	80	83
1:27:00	80	80	83	80	78	82	80	78	78	80	83
1:28:00	80	80	83	80	78	82	80	78	78	80	84
1:29:00	80	81	84	80	78	82	80	79	78	81	84
1:30:00	80	81	84	81	79	83	80	79	78	81	84
1:31:00	81	81	84	81	79	83	80	79	78	81	85
1:32:00	81	81	84	81	79	83	81	79	79	81	85
1:33:00	81	81	84	81	79	83	81	79	79	81	85
1:34:00	81	82	84	81	79	83	81	79	79	82	86
1:35:00	81	82	85	82	79	83	81	80	79	82	86
1:36:00	82	82	85	82	80	84	81	80	79	82	86
1:37:00	82	82	85	82	80	84	82	80	80	82	86
1:38:00	82	82	85	82	80	84	82	80	80	82	87
1:39:00	82	83	86	82	80	84	82	80	80	82	87
1:40:00	82	83	86	83	80	84	82	80	80	83	87
1:41:00	83	83	86	83	81	85	82	81	80	83	87
1:42:00	83	83	86	83	81	85	83	81	81	83	88
1:43:00	83	83	86	83	81	85	83	81	81	83	88
1:44:00	83	83	87	83	81	85	83	81	81	83	88
1:45:00	83	84	87	83	81	85	83	81	81	84	88
1:46:00	83	84	87	84	81	85	83	81	81	84	88
1:47:00	84	84	87	84	81	85	83	82	81	84	89
1:48:00	84	84	87	84	82	85	83	82	81	84	89
1:49:00	84	84	87	84	82	86	84	82	82	84	89
1:50:00	84	84	87	84	82	86	84	82	82	84	89
1:51:00	84	85	88	84	82	86	84	82	82	84	89
1:52:00	84	85	88	85	82	86	84	82	82	85	89
1:53:00	84	85	88	85	82	86	84	82	82	85	89
1:54:00	85	85	88	85	82	86	84	83	82	85	90
1:55:00	85	85	88	85	83	87	84	83	83	85	90
1:56:00	85	85	88	85	83	87	85	83	83	85	90

Time (Hr:Min:Sec)	TC Ave.	TC 1	TC 2	TC 3	TC 4	TC 5	TC 6	TC 7	TC 8	TC 9	TC 10
1:57:00	85	85	88	85	83	87	85	83	83	85	90
1:58:00	85	86	89	85	83	87	85	83	84	85	90
1:59:00	86	86	89	86	84	87	86	83	85	85	90
2:00:00	88	86	91	86	87	89	95	86	91	86	91
Max Temp.	85	86	89	86	84	87	86	83	85	85	
PASS/FAIL	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	PASS	

Table No. 2



Test Report No.: F1663.01-121-24
Report Date: 11/17/2016
Test Record Retention End Date: 10/07/2019

Appendix C

Photographs

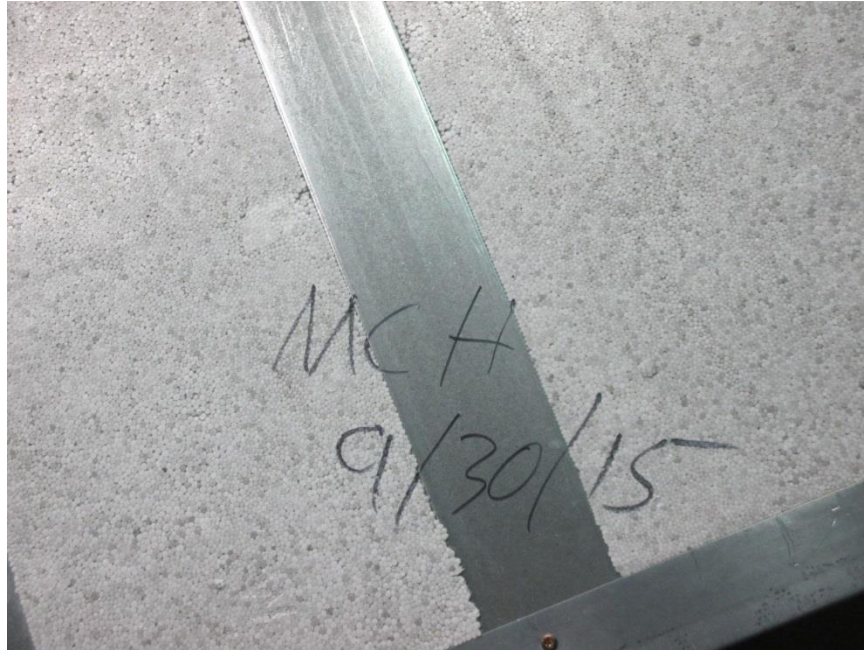


Photo No. 1
Sampling Markings on Wall Panels



Photo No. 2
Wall Panel Assembly



Photo No. 3
Installation of First Layer of Type-X Gypsum



Photo No. 4
Installation of Second Layer of Type-X Gypsum



Photo No. 5
Installation of Third Layer of Type-X Gypsum



Photo No. 6
Installation of Exterior Type-X Gypsum

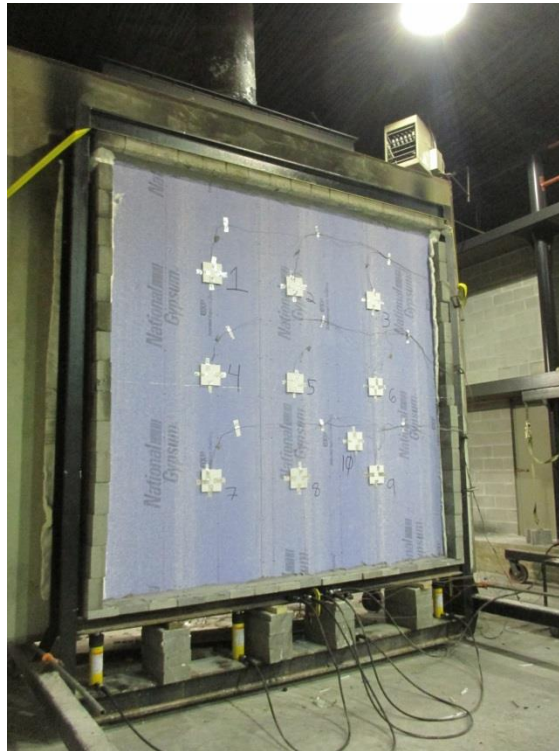


Photo No. 7
Complete Assembly (Pre-test)

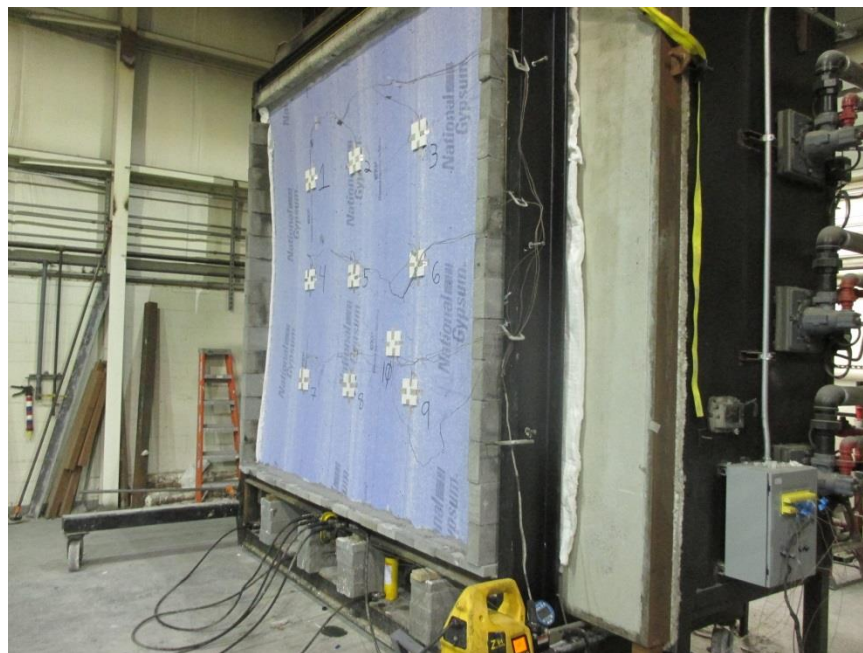


Photo No. 8
Evidence of Structural Failure



Photo No. 9
End of Fire Resistance Test



Photo No. 10
Exposed Surface after Fire Resistance Test



Photo No. 11
Post Hose-stream Test



Test Report No.: F1663.01-121-24
Report Date: 11/17/2016
Test Record Retention End Date: 10/07/2019

Appendix D

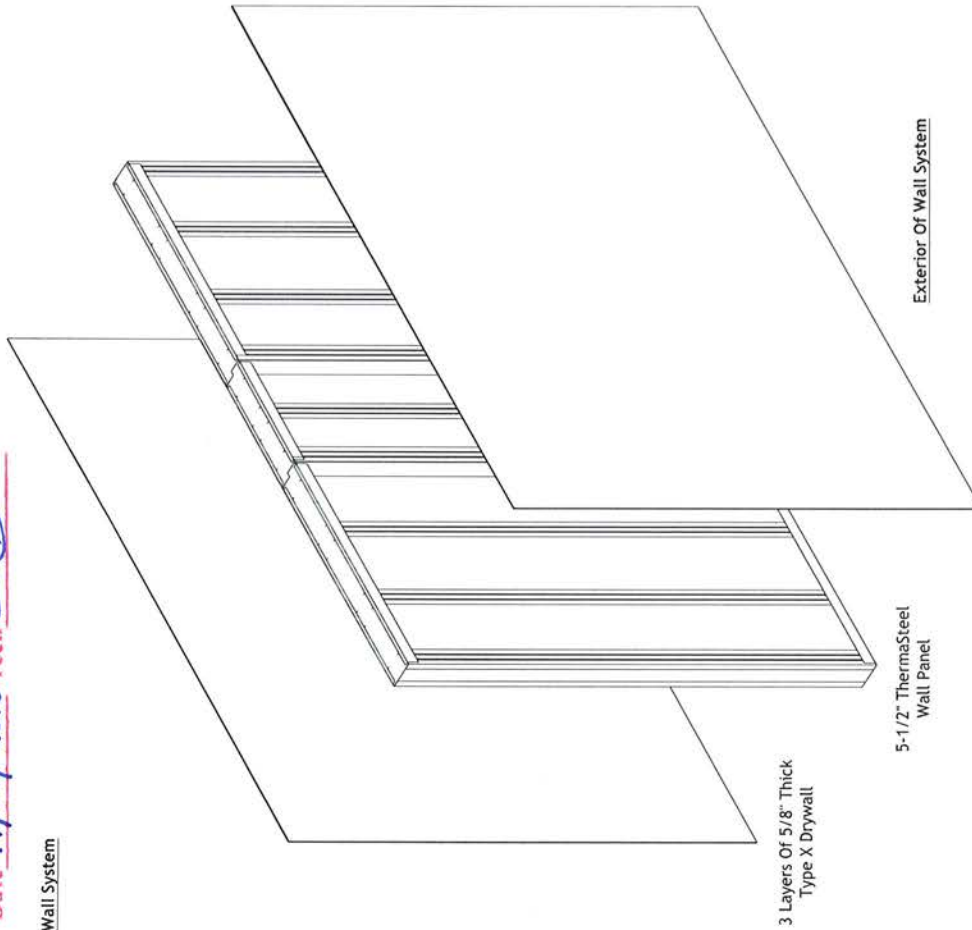
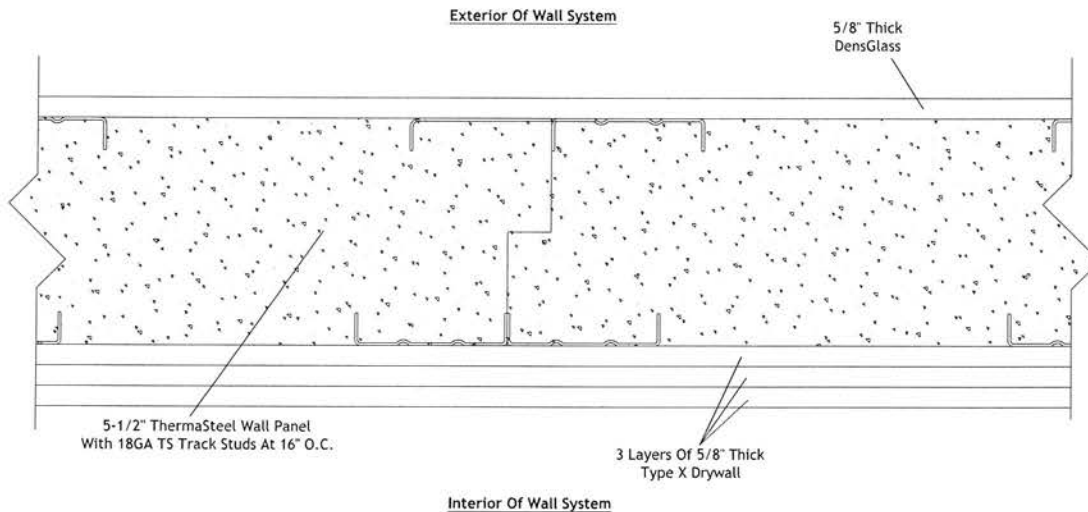
Drawings

Test sample complies with these details.

Deviations are noted.

Report # **F1663.01-121-24**

Date **11/17/2016** Tech **EG**



Fire Test (Exploded Assembly)

FINISH DATE:	11/10/2015
REVISION:	NTS
SCALE:	NTS
DESIGNED:	
DRAWN:	B. Revell

www.thermaSteelcorp.com

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AND LOCAL CODE REQUIREMENTS ARE MET.

SHEET

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JOB NUMBER

CD-2