ICC NTA TEST REPORT

ASTM E119 (Fire Resistance Performance)

RENDERED TO: Litecon Corporation
18911 Hardy Oak BLVD. No. 190
San Antonio, TX 78258

PRODUCT: 2-in. thick, Precast Aerated Autoclaved Concrete Panels

Report No.: AMAB040423-62
Test Date(s): 05/25/2023
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Pages: 28

TABLE OF CONTENTS

1.0 General Information

1.1 Product

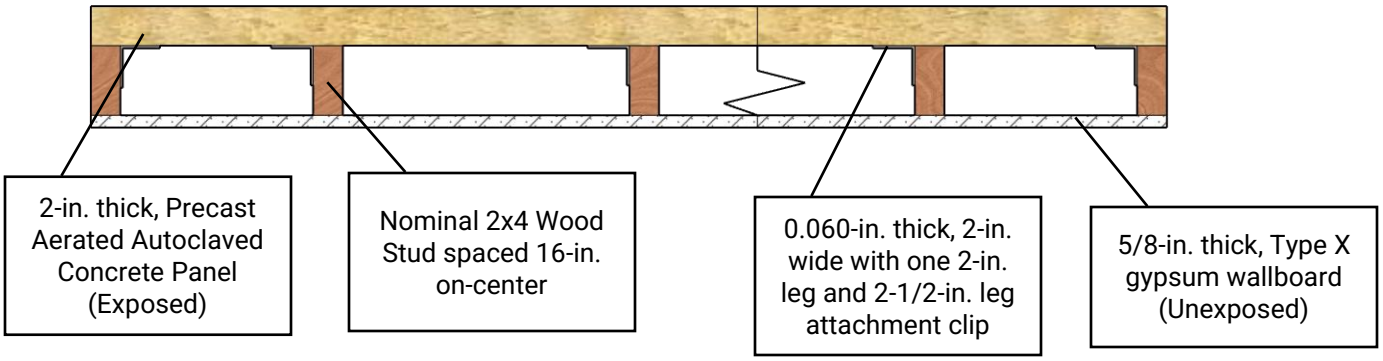
2-in. thick, Precast Aerated Autoclaved Concrete Panels

1.2 Project Summary

ICC NTA, LLC was contracted by Litecon Corporation to evaluate 2-in. thick, Precast Aerated Autoclaved Concrete Panels in accordance with ASTM E119. Results obtained are tested values and were secured by using the designated test method(s). Testing was conducted at ICC NTA's facility in Bryan, Texas.

1.3 Product Description

The asymmetrical, load-bearing wall assembly consisted of light, prefabricated concrete panels, with reinforcing, steel mesh inside and a smooth exterior finish. The panels were installed applying an adhesive mortar between mating faces of the panels and aluminum attachment clips were used to attach the panels to the wood framing. The wall assembly was constructed per UL Design No. U210, Configuration A.



1.4 Qualifications

ICC NTA in Bryan, TX has demonstrated compliance with ISO/IEC 17025 and is consequently accredited as a Testing Laboratory. ICC NTA is accredited to perform all testing reported herein.

1.5 Product Sampling

Litecon Corporations 2-in. thick, Precast Aerated Autoclaved Concrete (PAAC) Panels were not sampled or witnessed during production. Adhesive mortar and PAAC panels were provided by the client. Materials arrived at the testing facility on April 21, 2023.

1.6 Witnessing

The following were present for testing reported herein:

Witness	Organization
Leonel Borja	Aircrete Mexico
Ruben Gonzalez	Litecon USA
Alfredo Parra	Litecon USA

1.7 Conditions of Testing

Unless otherwise indicated, all testing reported herein was conducted in ambient laboratory conditions.

2.0 Referenced Standards

ASTM E119-22, *Standard Test Methods for Fire Tests of Building Construction and Materials*

ASTM E2226-15b, *Standard Practice for Application of Hose Stream*

3.0 Summary of Results

Fire Resistance Rating: 120 minutes (2-in. thick PAAC Exposed)
Hose Stream: Pass
Load Bearing Assembly

4.0 ASTM E119-22

4.1 General

4.1.1 Fire Endurance Test

The fire exposure is continued on the specimen with its applied load, if applicable, until failure occurs, or until the specimen has withstood the test conditions for the desired fire endurance rating.

4.1.2 Test Furnace

The test furnace is designed to allow the test specimen to uniformly be exposed to the specified time-temperature conditions. It is fitted with six (6) natural gas/air burners positioned on the left and right-side walls, designed to provide an even heat flux distribution across the face of the test specimen while inhibiting direct flame introduction. Each burner can produce a maximum of 1.5 MBtu/hr. The test engineer has overall control of the furnace in order to vary the following variables during the test: the overall energy input into the furnace, the air: gas ratio to the burners, and the input of additional air beyond that passing through the burners. The furnace opening is 14 ft. wide by 12 ft. tall by 4 ft. deep. The furnace can be equipped with a concrete adapter in order to reduce the opening for testing of a 10 feet x 10 feet wall, if desired. Furnace pressure may be maintained at a predetermined value based on the laboratory ambient pressure.

The temperature within the furnace is determined to be the mathematical average of thermocouples located symmetrically within the furnace and positioned six (6) inches away from the vertical face of the test specimen. The construction of these thermocouples is per ASTM E119. During the test, the furnace temperatures are recorded and displayed every 15 seconds to allow for the test engineer to control the energy input and follow the specified time-temperature curve. The data is saved every minute for report purposes.

The furnace interior temperature during a test is controlled such that the corresponding area under the time-temperature curve is within 10% of the corresponding area under the standard time-temperature curve for one (1) hour or less tests, 7.5% for tests longer than 1 hour, but less than two (2) hours, and 5% for tests longer than two (2) hours.

The fire exposure is controlled in order to follow the standard time-temperature curve, see Figure No. 1 in Appendix B - Data.

4.1.3 Temperatures of Unexposed Surfaces

Temperatures of the unexposed face are monitored using 18-gauge or lighter gauge, Type K thermocouples placed under 6-inch x 6-inch x 0.4-inch-thick, dry felted pads as described in the standard. Temperature readings are taken at not less than nine points on the surface, at intervals not exceeding one minute. The temperature on the unexposed surface is to be taken as the average value of all thermocouples, unless noted otherwise. Transmission of heat through the test assembly during the fire-resistance period shall not raise the temperature on the unexposed face more than 250° F above its initial average temperature at the start of the test or 325°F above its initial temperature at any single point. One thermocouple is located approximately at the center of the wall and four others are placed approximately in the center of each quarter of the wall. The remaining four are symmetrically located on the unexposed face to record the representative temperatures of the unexposed face. Thermocouples were located no closer than 3 in. to a fastener head. For thermocouple locations on the unexposed face, see Appendix D – Drawings and graphical representation within Appendix B – Data.

4.1.4 Applied Load

If required, this test method may be used to expose a test specimen to fire and hose stream tests while maintaining a compressive load on the wall. The load bearing wall is constructed within the top and bottom masonry/steel constraints. This is achieved in this laboratory using a load-bearing frame which has a movable base section. Hydraulic actuators press upwards on the bottom beam applying the prescribed load to the test specimen. For load calculations and procedure, see Appendix C – Load Calculations.

4.1.5 Hose Stream Test

If required, this practice is intended to standardize the apparatus and method used to represent a standard hose stream to building elements as part of the assessment and fire resistance of building products. This practice specifies the water pressure and duration of application of the hose stream to the test assembly. This practice is to be used only after a test assembly has completed a prescribed standard fire-resistance test. The practice exposes a test assembly to a standard hose stream under controlled laboratory conditions. The apparatus used to apply the hose stream is built per ASTM E2226 with a 2-1/2 in. diameter hose to a playpipe with a 1-1/8 in. discharge tip that delivers a solid stream of water. Hose stream application time and water pressure varies based on the intended fire resistance period and is noted within ASTM E2226. The nozzle tip is located 20 feet away from the test assembly and verified prior to applying the hose stream to the test assembly. The hose stream starts at one corner of the test assembly and the stream is directed to the entire face of the test assembly. The hose stream follows the pattern provided in the standard. A fully developed hose stream shall not pass through the unexposed face of the test assembly. Alternatively, a duplicate wall assembly shall be exposed to a standard time-temperature curve for one-half the duration of the initial fire-resistance test prior to be subjected to the rapid cooling and erosional effects of the standard hose stream application.

4.1.6 Correction Factor

When the indicated resistance period is 1⁄2 h or over, and the wall assembly exceeds acceptance criteria limitations, determined by the average or maximum temperature rise on the unexposed surface or within the test specimen, or by failure under load, a correction shall be applied for variation of the furnace exposure from that prescribed, where it will affect the classification.

The correction factor can be expressed as follows:

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

Where:
C = time correction in the same units as *I*
I = indicated fire resistance in minutes
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 temperature 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)).

5.0 Test Specimens

A representative test specimen was constructed and built under representative conditions of those applied in the field during construction in order to assess the materials, workmanship, and details such as dimensions of parts and all components in the assembly. ICC NTA, LLC lab personnel constructed the 10 ft. × 10 ft. wall assembly. The wall assembly was constructed per UL Design No. U210, Configuration A.

5.1 Framing

The framing consisted of No.2 Southern Yellow Pine 2x4 wood studs spaced 16-in. on-center with 12-in. edge-to-center spacing on each side of the wall assembly. The studs were secured to single top and single bottom plate of similar grade and species using 3-in. long x 0.131-in. diameter smooth shank framing nails. Lateral bracing was installed at mid-height and staggered across the horizontal centerline of the assembly. Lateral bracing consisted of No. 2 Southern Yellow Pine 2x4s and were secured to the studs using 3-in. x 0.131-in. diameter smooth shank framing nails.

5.2 Exterior Cladding

The side of the wall assembly exposed to the furnace environment was cladded with Litecon Corporation's 2-in. thick, Precast Aerated Autoclaved Concrete (PAAC) panels. The nominal 2-ft. x 7-ft. PAAC panels were installed with the long dimension oriented vertically. The horizontal butt joints were staggered approximately 40-in. Between each panel, vertically and horizontally, Cemix adhesive mortar was placed at each mating face of the panels at a nominal thickness of 1/16-in. The PAAC panels were installed tight to the backside of the wood framing with no air gap present between the wood studs and the panels. PAAC panel installation was completed on 04/27/2023. The panel adhesive mortar was cured in ambient lab conditions for a period of 28 days per client's request.

The panels were secured to the wood framing using 0.060-in. thick aluminum attachment clips. The aluminum attachment clips were 2-in. wide with one 2-in. leg and one 2-1/2-in. leg. The 2-1/2-in. leg was secured to the wood stud using two (2), #6 – 1-1/4-in. long, Coarse thread, Type W wood screw. The 2-in. leg was secured to the backside of the PAAC panel using two (2), #8 – 1-1/2-in. long, self-piercing, modified truss screw with wafer head.

5.3 Exposed Face Sheathing

The side of the wall assembly not exposed to the furnace was sheathed using a single layer of 5/8-in. thick, Type X gypsum wallboard conforming to ASTM C1396 directly attached to the wood studs. The gypsum wallboard was secured to the studs using #6 – 1-5/8-in. long coarse thread, Type W, bugle head drywall screws. The fasteners were spaced 8 in. on-center around the perimeter and 12 in. on-center in the field of the panel. Fasteners around the perimeter of the gypsum wallboard were spaced 3/8 in. from the edge of the panel. The 10 ft. long edge of the panels were oriented vertically. All GWB seams were treated with a level 2 finish consisting of nominal 2-in. wide paper seam tape and a layer of joint compound. Fasteners heads were covered with a layer of joint compound.

6.0 Test Setup and Procedure

The product(s) were setup and evaluated in accordance with the 2022 version of ASTM E119. The loadbearing, non-symmetrical wall assembly was placed in front of the vertical furnace at ICC NTA, Inc.'s Fire Testing Laboratory with the 2-in. thick, PAAC panel face towards the furnace opening on 05/25/2023. The thermocouple leads were connected to the data acquisition system in the control room and the connection was verified prior to ignition. The ambient air temperature within the lab was 77°F, with a relative humidity of 67%.

Deviations from the standard include: None.

6.1 Test Observations

At 10:37 AM, the burners were ignited, and the furnace temperature was controlled following the standard time-temperature curve for a target period of 120 minutes.

Time (hr:min:sec)	Observation
Pre-Test	Test load applied to wall assembly; deflection reference measurements recorded
0:00	Burners Lit, Test Started
15:00	No change to unexposed face
16:00	No change to exposed face
30:00	No change to unexposed face
31:00	Vertical and horizontal cracking developing in face of exposed PAAC panels
44:00	Little to no change to exposed face
45:00	No change to unexposed face
52:00	No apparent changes to exposed face
53:15	Finish rating of PAAC panels exceeded average temperature rise of 250°F
1:00:00	No change to unexposed face
1:03:00	Little to no change to exposed face
1:13:00	No significant change to exposed face
1:15:00	No change to unexposed face
1:30:00	No change to unexposed face
1:31:00	Little to no change to exposed face
1:42:00	No change to exposed face
1:43:30	Light smoke escaping top perimeter of wall assembly on unexposed face
1:45:00	No change to unexposed face
2:00:00	Furnace burners extinguished; end of Fire Resistance Period

Hose Stream Observations

Time (hr:min:sec)	Observation
2:02:37	Wall Assembly in position for hose stream application (2.5 minutes at 30 psi).
2:02:48	Hose stream test started
2:05:20	Hose stream test completed; no projection of water beyond unexposed surface of wall assembly

Deflection Measurements

Time (hr:min:sec)	Location 1 (in.)	Location 2 (in.)	Location 3 (in.)	Location 4 (in.)	Location 5 (in.)
Pre-Test	5-1/4	5-1/4	5-1/8	5-1/8	5-1/8
5:00	-	-	-	-	-
10:00	-	-	-	-	-
15:00	-	-	-	-	-
20:00	-	5-1/8	5	5	-
30:00	-	-	-	-	-
40:00	-	-	-	-	-
50:00	5-3/8	5-1/4	5-1/8	5-1/8	-
1:00:00	-	5-1/8	5	5	5
1:10:00	-	5	4-7/8	4-7/8	-
1:20:00	5-1/4	4-3/4	4-5/8	4-3/4	-
1:30:00	-	4-5/8	4-1/2	-	4-7/8
1:40:00	-	4-1/2	4-3/8	4-5/8	-
1:45:00	5	4-3/8	4-1/4	-	-
1:50:00	-	4-1/4	-	-	-
1:55:00	-	-	4-1/8	4-1/2	-
Overall Deflection	-1/4	-1	-1	-5/8	-1/4

Note: minus (-) denotes deflection away from the furnace

7.0 Summary and Conclusions

The asymmetrical, load-bearing wall assembly described in this report did meet the Conditions of Acceptance of ASTM E119 when the face of the wall assembly with 2-in. thick, Precast Aerated Autoclaved Concrete panels were exposed to the standard time-temperature curve. The wall assembly described in this report obtained a Fire Resistance Rating of 120 minutes. The unexposed temperatures of the wall assembly detailed within this report did not exceed the maximum temperature thresholds for the duration of the fire resistance period of the test. The wall assembly sustained the applied load for the duration of the fire resistance period. No projection of water was observed beyond the unexposed face of the wall assembly during the hose stream test.

8.0 Closing Statement

This report contains only findings and results arrived at after employing the specific test procedures listed herein. It does not constitute a recommendation for, endorsement of, or certification of the product or material tested. Unless differently required, ICC NTA, LLC reports apply the "Simple Acceptance" rule, also called "Shared Risk approach", of ILAC-G8:09/2019, Guidelines on Decision Rules and Statements of Conformity. ICC NTA makes no warranty, expressed or implied, except that the test has been performed, and a report prepared, based upon the specimen specified by the client. Extrapolation of data, from the test data provided herein, to the batch or lot from which the specimens were obtained may not correlate and should be interpreted with extreme caution. ICC NTA assumes no responsibility for variations in quality, composition, appearance, performance, or other features of similar materials produced by the client, other persons, or under conditions over which ICC NTA has no control. ICC NTA has issued this report for the exclusive use of the client to whom it is addressed. Any use or duplication of this report shall not be made without their consent. This report shall only be reproduced in its entirety.

For ICC NTA, LLC:

Joseph Briski 06/01/2023
Project Engineer

Glenn Schwabe 06/01/2023
Operations Manager

Photo No. 1
Completed framing of base wall

Photo No. 2
Completed installation of PAAC panels. Finish Rating Thermocouples placed on backside of panels.

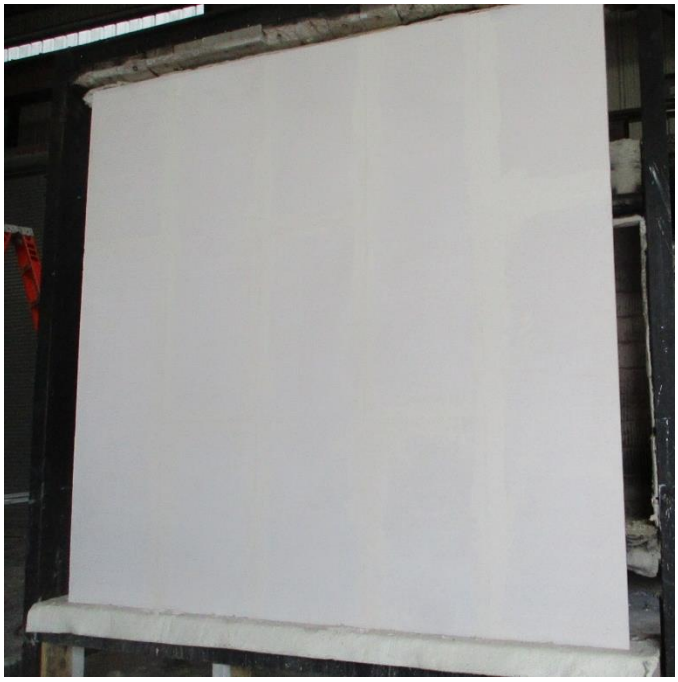


Photo No. 3
Exposed face of Wall Assembly – (Pre-Test)

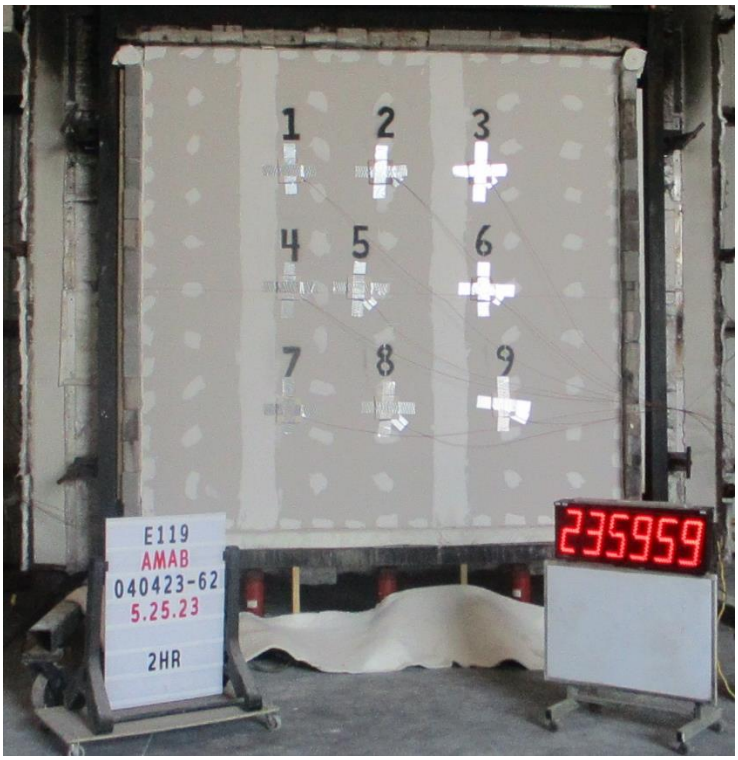


Photo No. 4
Completed Test Set-Up – (Pre-Test)

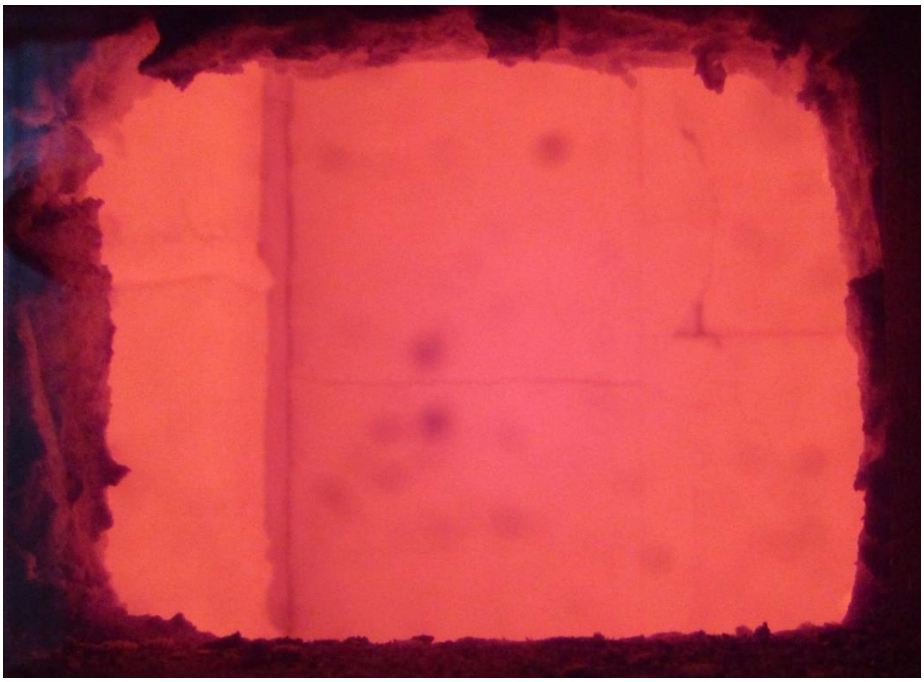


Photo No. 5
Vertical and Horizontal cracks developing in PAAC panel on exposed face – (31:00 minutes into test)

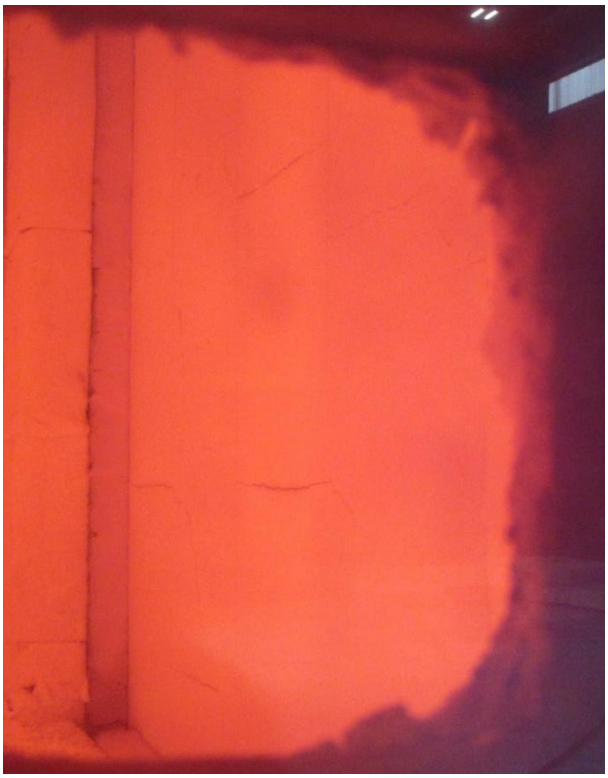


Photo No. 6
Little to no change on exposed face – (1:00:00)

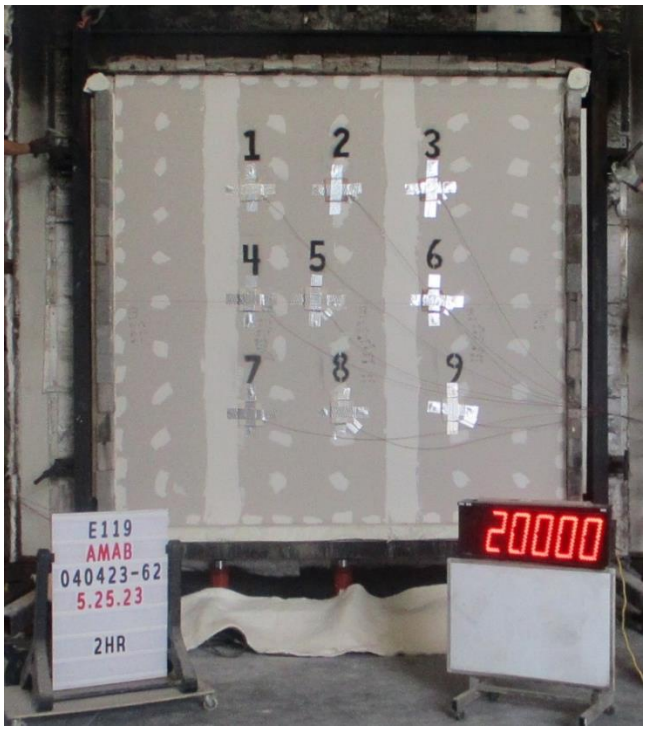


Photo No. 7
Unexposed face – (Post-Fire Resistance Period)

Photo No. 8
Exposed Face – (Post-Fire Resistance Period)

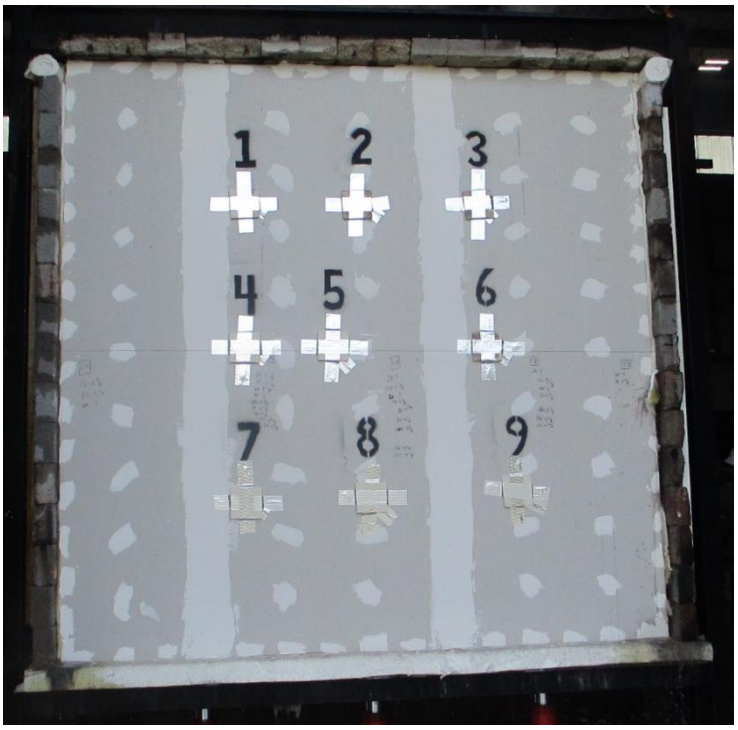


Photo No. 9
Unexposed face – (Post-Hose Stream Test)

Photo No. 10
Exposed face – (Post-Hose Stream Test)

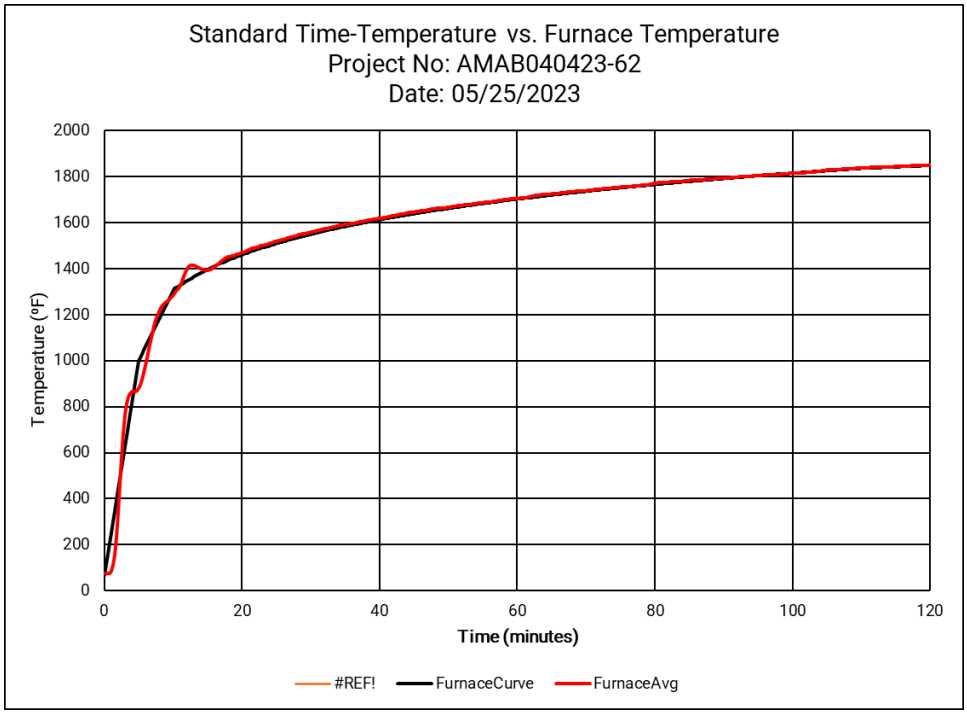


Figure No. 1

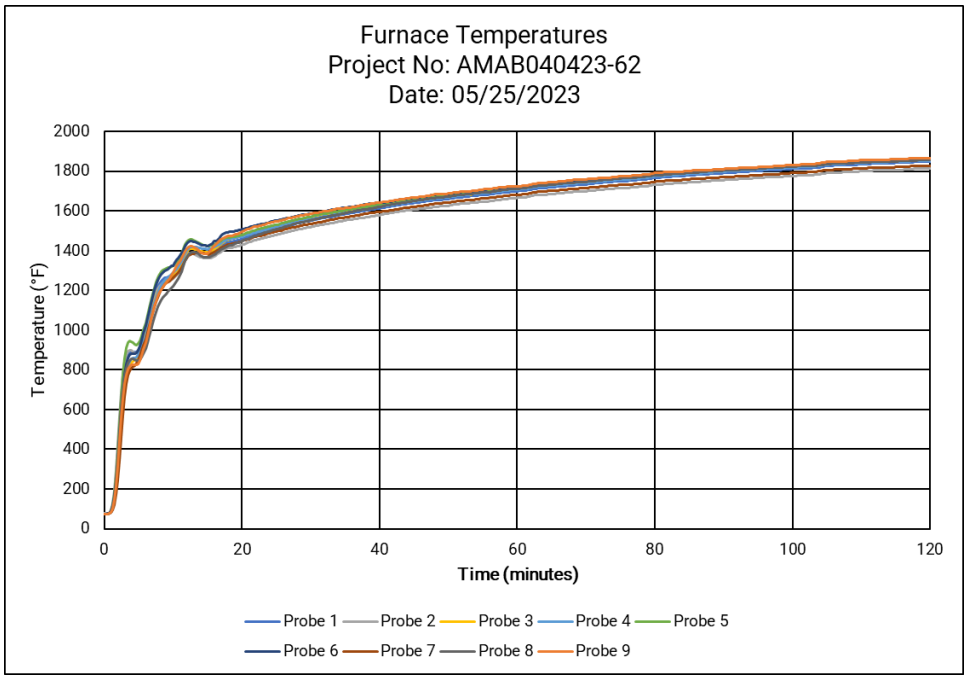


Figure No. 2

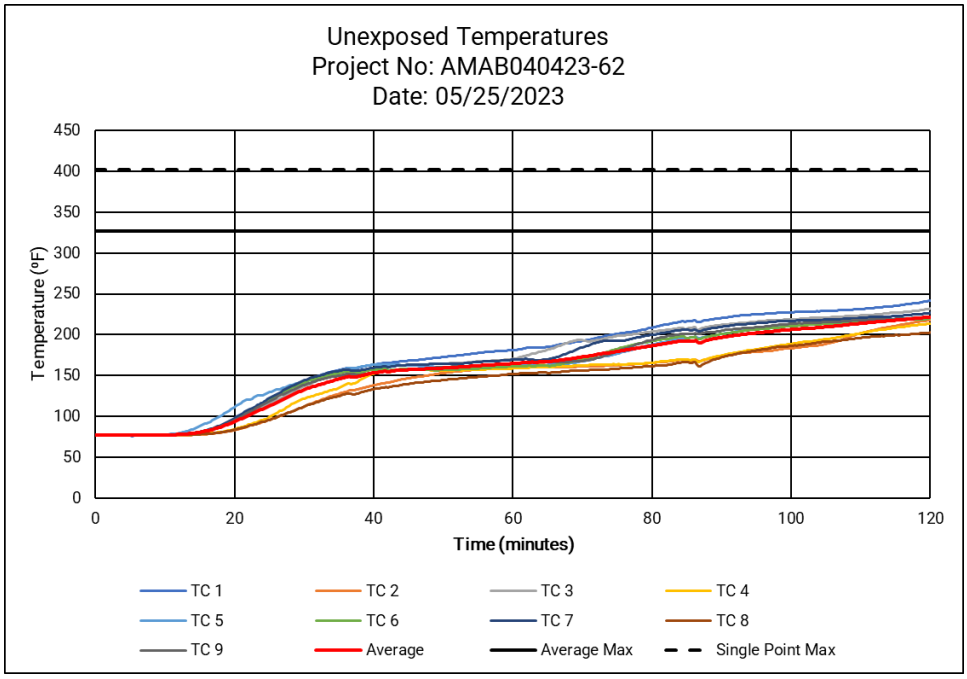


Figure No. 3

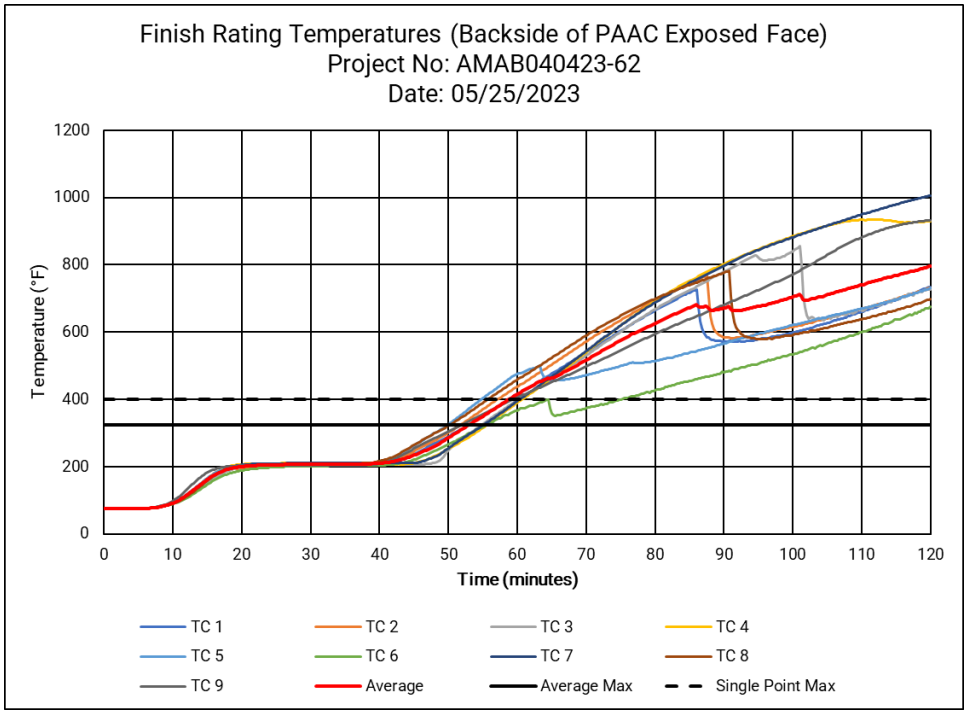


Figure No. 4

Tabular Data

Furnace Temperatures										
Time (minutes)	Probe 1	Probe 2	Probe 3	Probe 4	Probe 5	Probe 6	Probe 7	Probe 8	Probe 9	Average
0	76	76	75	75	76	76	75	75	75	75
1	88	92	86	83	89	89	81	83	83	86
2	362	430	327	296	392	340	246	361	319	342
3	791	843	715	725	862	777	666	765	729	764
4	890	897	836	854	943	881	809	854	825	865
5	900	898	874	878	932	899	851	847	832	879
6	1003	1007	976	973	1036	1021	956	907	936	979
7	1142	1143	1113	1108	1182	1170	1086	1036	1088	1119
8	1235	1222	1209	1207	1280	1268	1185	1135	1190	1215
9	1265	1244	1248	1257	1312	1302	1236	1184	1238	1254
10	1284	1260	1277	1289	1326	1326	1262	1222	1290	1282
11	1332	1302	1322	1330	1368	1374	1302	1274	1346	1328
12	1403	1379	1394	1401	1445	1436	1364	1367	1411	1400
13	1415	1384	1409	1420	1454	1445	1385	1393	1418	1414
14	1397	1368	1398	1413	1434	1432	1388	1377	1394	1400
15	1386	1360	1392	1407	1424	1424	1382	1365	1386	1392
16	1401	1372	1407	1417	1432	1447	1390	1379	1422	1407
17	1424	1394	1433	1437	1450	1474	1412	1403	1457	1432
18	1442	1412	1454	1456	1466	1492	1431	1422	1472	1450
19	1449	1419	1465	1464	1471	1499	1438	1435	1481	1458
20	1459	1429	1475	1472	1480	1507	1448	1448	1495	1468
21	1471	1442	1485	1482	1492	1517	1459	1462	1510	1480
22	1483	1453	1497	1493	1504	1527	1470	1475	1521	1492
23	1491	1461	1505	1501	1513	1533	1478	1486	1529	1500
24	1501	1471	1514	1511	1521	1543	1487	1498	1539	1510
25	1510	1480	1523	1520	1530	1551	1496	1508	1547	1518
26	1519	1488	1531	1528	1539	1558	1504	1517	1554	1526
27	1528	1497	1540	1537	1548	1566	1514	1527	1564	1536
28	1537	1505	1548	1544	1556	1573	1521	1537	1572	1544
29	1544	1512	1556	1552	1564	1581	1529	1545	1579	1551
30	1550	1519	1562	1558	1570	1585	1534	1552	1584	1557
31	1559	1527	1569	1566	1580	1592	1542	1562	1592	1565
32	1566	1533	1576	1572	1587	1599	1549	1569	1598	1572
33	1571	1538	1583	1578	1591	1605	1555	1576	1604	1578
34	1579	1546	1591	1585	1598	1612	1562	1582	1613	1585
35	1584	1552	1596	1590	1603	1616	1568	1589	1614	1590
36	1590	1557	1600	1596	1610	1620	1572	1595	1619	1595
37	1596	1562	1607	1602	1616	1626	1579	1603	1625	1602
38	1601	1568	1613	1608	1621	1633	1586	1608	1631	1608
39	1607	1573	1618	1614	1626	1638	1590	1613	1637	1613
40	1613	1579	1623	1620	1632	1642	1595	1620	1643	1618
41	1618	1586	1627	1625	1638	1644	1599	1627	1646	1623
42	1624	1591	1633	1631	1643	1649	1605	1633	1651	1629
43	1630	1597	1639	1637	1649	1657	1611	1639	1658	1635
44	1636	1602	1645	1642	1655	1662	1617	1645	1663	1641
45	1640	1606	1648	1647	1660	1666	1621	1650	1667	1645

Furnace Temperatures										
Time (minutes)	Probe 1	Probe 2	Probe 3	Probe 4	Probe 5	Probe 6	Probe 7	Probe 8	Probe 9	Average
46	1644	1611	1652	1652	1665	1670	1625	1656	1671	1650
47	1649	1616	1658	1656	1668	1675	1630	1660	1676	1654
48	1654	1620	1664	1661	1673	1682	1636	1665	1684	1660
49	1656	1623	1666	1665	1676	1685	1639	1667	1685	1663
50	1660	1626	1669	1668	1680	1687	1642	1672	1687	1666
51	1666	1633	1675	1674	1686	1692	1647	1678	1693	1671
52	1669	1636	1679	1678	1688	1696	1652	1682	1696	1675
53	1673	1639	1681	1681	1693	1696	1654	1685	1698	1678
54	1677	1642	1686	1685	1696	1701	1658	1689	1703	1682
55	1680	1646	1690	1688	1699	1706	1663	1693	1708	1686
56	1683	1649	1694	1692	1701	1709	1666	1695	1711	1689
57	1688	1654	1698	1696	1706	1713	1670	1700	1717	1694
58	1693	1658	1702	1700	1710	1718	1675	1705	1720	1698
59	1695	1662	1706	1704	1714	1722	1678	1709	1722	1701
60	1699	1665	1708	1707	1718	1723	1681	1711	1725	1704
61	1702	1668	1711	1710	1721	1725	1683	1715	1727	1707
62	1708	1675	1717	1716	1727	1731	1689	1721	1732	1713
63	1713	1680	1723	1721	1732	1738	1696	1726	1739	1719
64	1716	1681	1727	1724	1733	1741	1699	1729	1741	1721
65	1719	1685	1729	1727	1736	1743	1701	1732	1745	1724
66	1723	1688	1731	1730	1740	1745	1704	1735	1747	1727
67	1725	1691	1735	1733	1743	1749	1707	1739	1751	1730
68	1728	1695	1738	1736	1746	1753	1711	1742	1755	1734
69	1732	1698	1741	1739	1749	1754	1713	1744	1757	1736
70	1733	1699	1743	1741	1750	1757	1716	1747	1759	1738
71	1737	1703	1746	1745	1754	1760	1719	1750	1763	1742
72	1741	1707	1749	1748	1759	1762	1722	1753	1765	1745
73	1744	1710	1751	1752	1761	1764	1725	1758	1767	1748
74	1747	1712	1756	1754	1764	1767	1728	1761	1770	1751
75	1749	1715	1759	1757	1766	1770	1730	1764	1774	1754
76	1751	1716	1759	1759	1768	1772	1732	1764	1775	1755
77	1754	1719	1762	1761	1769	1775	1734	1767	1778	1758
78	1757	1722	1765	1764	1772	1778	1738	1770	1781	1761
79	1760	1725	1770	1768	1777	1781	1741	1774	1784	1764
80	1766	1731	1776	1773	1782	1787	1747	1779	1791	1770
81	1768	1734	1778	1776	1784	1791	1750	1781	1794	1773
82	1771	1736	1779	1778	1787	1792	1752	1784	1796	1775
83	1774	1739	1781	1781	1789	1793	1754	1787	1797	1777
84	1776	1741	1785	1783	1791	1795	1756	1788	1798	1779
85	1779	1744	1788	1786	1794	1799	1759	1791	1802	1783
86	1781	1746	1790	1788	1796	1800	1761	1793	1804	1785
87	1783	1748	1792	1790	1798	1802	1763	1796	1806	1786
88	1786	1750	1794	1793	1802	1803	1765	1799	1807	1789
89	1787	1752	1796	1795	1803	1806	1767	1801	1809	1791
90	1790	1755	1798	1797	1806	1808	1770	1803	1811	1793
91	1791	1756	1799	1799	1807	1809	1771	1804	1812	1794
92	1794	1759	1803	1801	1810	1812	1774	1806	1815	1797
93	1797	1762	1805	1804	1813	1813	1776	1809	1817	1800
94	1799	1764	1807	1806	1814	1815	1778	1811	1818	1801

Furnace Temperatures										
Time (minutes)	Probe 1	Probe 2	Probe 3	Probe 4	Probe 5	Probe 6	Probe 7	Probe 8	Probe 9	Average
95	1801	1766	1808	1808	1816	1816	1779	1812	1820	1803
96	1803	1769	1811	1811	1819	1819	1782	1815	1823	1806
97	1805	1770	1813	1812	1820	1821	1783	1817	1824	1807
98	1806	1771	1815	1814	1821	1823	1785	1819	1826	1809
99	1809	1774	1818	1816	1823	1826	1788	1821	1829	1812
100	1811	1776	1820	1818	1826	1828	1791	1823	1831	1814
101	1813	1777	1821	1820	1827	1829	1792	1825	1832	1815
102	1814	1778	1823	1821	1828	1831	1794	1825	1834	1816
103	1816	1781	1825	1823	1830	1834	1796	1826	1835	1818
104	1820	1785	1829	1826	1833	1839	1800	1830	1841	1823
105	1826	1790	1834	1831	1839	1843	1805	1835	1846	1828
106	1829	1793	1836	1834	1842	1844	1807	1838	1848	1830
107	1829	1794	1837	1835	1843	1845	1808	1839	1848	1831
108	1831	1795	1840	1837	1844	1848	1810	1840	1850	1833
109	1832	1797	1841	1838	1845	1851	1812	1841	1853	1835
110	1834	1799	1843	1840	1847	1853	1815	1843	1855	1837
111	1836	1802	1845	1842	1849	1854	1816	1844	1856	1838
112	1839	1803	1847	1845	1853	1855	1818	1847	1858	1840
113	1839	1804	1848	1845	1852	1855	1818	1847	1857	1841
114	1839	1805	1849	1846	1852	1856	1819	1848	1858	1841
115	1841	1807	1849	1848	1855	1857	1820	1849	1860	1843
116	1842	1807	1850	1848	1856	1858	1821	1850	1860	1844
117	1844	1809	1853	1850	1857	1861	1824	1852	1863	1846
118	1847	1812	1855	1852	1859	1863	1826	1854	1865	1848
119	1847	1813	1857	1853	1860	1864	1827	1855	1866	1849
120	1848	1814	1857	1854	1861	1864	1828	1855	1866	1850

Unexposed Face Temperatures										
Time (minutes)	TC 1	TC 2	TC 3	TC 4	TC 5	TC 6	TC 7	TC 8	TC 9	Average
0	77	76	77	77	78	77	77	77	77	77
1	77	76	77	77	78	77	77	77	77	77
2	77	76	77	77	78	77	77	77	77	77
3	76	76	77	77	78	77	77	77	77	77
4	76	76	77	77	78	77	77	77	77	77
5	76	76	77	77	78	77	77	77	77	77
6	77	76	77	77	78	77	77	77	77	77
7	77	77	77	77	78	77	77	77	77	77
8	76	77	77	77	78	78	77	77	77	77
9	76	77	77	77	78	78	77	77	77	77
10	77	77	77	77	78	78	78	77	77	77
11	77	77	77	78	78	78	78	77	77	77
12	77	77	78	78	80	78	78	77	78	78
13	78	77	78	78	82	79	79	77	79	78
14	79	77	79	78	84	80	80	78	79	79
15	81	78	80	79	88	81	81	78	81	81
16	83	78	82	79	92	83	83	79	83	82

Unexposed Face Temperatures										
Time (minutes)	TC 1	TC 2	TC 3	TC 4	TC 5	TC 6	TC 7	TC 8	TC 9	Average
17	85	79	84	80	96	85	86	79	85	84
18	88	80	87	81	101	88	89	81	88	87
19	92	82	90	82	106	92	93	82	91	90
20	97	83	94	84	112	96	98	84	95	94
21	101	85	98	87	117	101	103	86	100	98
22	106	88	102	90	121	106	108	88	105	102
23	111	90	107	93	124	111	113	91	110	106
24	115	93	111	96	126	116	117	93	114	109
25	121	96	115	99	130	121	122	96	119	113
26	126	99	120	104	133	125	127	99	123	117
27	130	102	124	108	135	130	132	102	127	121
28	135	105	128	113	138	134	136	105	131	125
29	139	109	133	118	140	138	140	109	135	129
30	143	112	137	122	143	142	144	112	139	133
31	146	116	141	124	145	145	147	115	142	136
32	149	119	144	127	147	147	150	118	144	138
33	152	122	147	130	149	149	152	120	146	141
34	155	125	150	133	152	151	154	123	148	143
35	157	128	152	136	156	153	156	125	150	146
36	159	130	154	139	158	155	157	127	151	148
37	158	132	154	140	159	153	156	127	152	148
38	160	134	156	144	160	154	156	129	151	149
39	162	136	158	149	162	156	158	131	152	152
40	164	138	159	152	163	157	160	133	154	153
41	165	140	160	154	164	158	161	135	154	155
42	165	141	160	154	163	157	160	135	155	155
43	166	143	162	156	164	157	162	137	156	156
44	167	145	162	156	163	158	162	138	157	157
45	168	147	163	157	162	158	163	140	158	157
46	169	148	163	157	162	158	164	141	158	158
47	170	149	163	157	161	158	164	142	158	158
48	171	150	164	157	161	157	164	143	159	158
49	172	152	164	156	161	156	164	144	160	159
50	173	153	165	157	161	157	165	145	160	159
51	174	154	165	157	160	157	165	145	161	160
52	175	155	165	157	160	157	165	146	161	160
53	176	156	166	157	161	158	165	147	161	161
54	177	157	167	157	161	158	166	148	162	161
55	178	158	167	157	162	159	167	148	163	162
56	179	159	168	158	163	159	167	149	163	163
57	179	160	168	158	163	160	168	150	164	163
58	180	160	169	158	163	160	168	150	164	164
59	180	161	169	158	162	161	169	151	164	164
60	181	162	170	159	162	161	169	152	165	165
61	182	162	172	159	163	161	170	152	165	165
62	184	163	175	160	162	162	170	153	166	166
63	184	164	177	160	163	161	170	153	167	167
64	184	163	179	160	163	162	169	154	166	167
65	185	162	182	160	163	162	170	153	166	167

Unexposed Face Temperatures										
Time (minutes)	TC 1	TC 2	TC 3	TC 4	TC 5	TC 6	TC 7	TC 8	TC 9	Average
66	187	160	184	161	163	163	172	154	167	168
67	188	160	188	161	164	164	175	155	167	169
68	190	160	190	162	165	166	178	155	167	170
69	191	161	193	162	166	168	181	156	168	172
70	192	161	194	162	167	170	185	156	168	173
71	194	161	192	163	169	173	188	157	169	174
72	196	162	193	163	171	175	190	157	172	176
73	198	162	195	164	173	177	193	157	174	177
74	200	162	197	164	174	180	192	158	176	178
75	201	162	198	164	177	182	192	158	180	179
76	202	163	199	164	179	185	193	159	183	181
77	203	164	200	164	182	187	195	160	186	182
78	205	164	201	164	184	189	197	160	189	184
79	207	165	203	165	186	191	199	161	191	185
80	209	166	204	166	188	192	200	161	193	186
81	210	166	205	167	190	194	201	162	196	188
82	212	167	206	168	192	195	203	163	198	189
83	214	168	207	169	194	197	204	164	199	191
84	216	169	208	170	195	198	206	166	201	192
85	217	168	207	169	196	196	206	167	201	192
86	217	169	209	170	197	197	206	166	201	193
87	216	167	207	167	196	195	204	161	201	190
88	218	170	210	171	198	198	207	167	203	194
89	219	172	211	173	199	199	209	170	204	195
90	221	174	212	175	201	201	210	172	205	197
91	222	175	213	176	202	202	211	175	206	198
92	223	176	214	178	204	203	212	176	207	199
93	224	178	214	180	205	205	213	178	208	200
94	224	178	215	181	206	206	213	179	209	201
95	225	179	216	182	207	206	214	181	209	202
96	226	180	217	184	208	207	215	182	210	203
97	226	180	217	185	208	208	215	183	210	204
98	227	181	218	186	210	209	216	185	212	205
99	227	183	218	188	211	210	217	185	213	206
100	227	184	219	189	211	211	217	187	213	206
101	228	184	219	190	212	211	217	187	214	207
102	228	185	220	191	213	212	217	188	215	208
103	229	186	220	192	213	212	217	189	214	208
104	229	187	220	193	213	213	218	190	215	209
105	229	189	221	195	214	213	219	192	216	210
106	229	191	222	196	214	214	219	192	216	210
107	230	193	222	197	215	214	219	193	216	211
108	230	196	223	199	215	215	220	194	216	212
109	231	199	223	200	216	215	220	195	217	213
110	231	202	224	202	216	215	220	196	218	214
111	232	204	224	203	217	216	221	197	218	215
112	233	206	225	205	218	217	222	198	218	216
113	234	208	225	206	218	217	222	198	219	216
114	235	209	226	207	218	217	222	199	219	217

Unexposed Face Temperatures										
Time (minutes)	TC 1	TC 2	TC 3	TC 4	TC 5	TC 6	TC 7	TC 8	TC 9	Average
115	235	211	227	209	219	217	223	200	219	218
116	236	212	228	210	219	218	223	200	220	218
117	238	214	229	211	219	218	224	200	220	219
118	239	215	229	212	220	219	225	201	221	220
119	240	217	230	213	221	219	226	202	221	221
120	242	218	232	214	221	220	227	203	222	222

Note: All tabular data reported in one (1) minute intervals. Data measured and recorded in 15 second intervals available upon request.

Appendix C – Load Calculations

The calculation of the design load (ASD) for the load-bearing wood-framed walls herein are based on the allowable axial load of the wall framing studs and support bracing (if applicable) in accordance with the NDS (National Design Specification for Wood Construction), unless noted otherwise. Sheathing was not considered in the calculation of design loads.

For the testing reported herein, the load was applied to the wall assembly at 100% of the design load for No. 2 Southern Yellow Pine 2x4 wood Studs with mid-height bracing. The load applied can be expressed as follows:

Load Calculation	
Stud Length	117-in.
Stud Design Load (lbs./stud) *	1,385
Percent of Design Load	100%
Stud Spacing	16-in. on-center
Length of wall (in.)	120
Maximum Design Load (lbs.)	10,388
Dead Load – Weight of Wall (lbs.)	1,175
Dead Load – Load Beam (lbs.)	2,060
Dead Load – Blocks (lbs.)	1,504
Actuator Effective Area (sq. in.)	11.04
No. of Actuators	3

Eqn. 1: *Test Load = (Stud Design Load*(Length of Wall/ Stud Spacing)) *(Percent of Design Load)*
Restricted Test Load = (1,385*(120/16)) *(100/100) = 10,388 lbs.

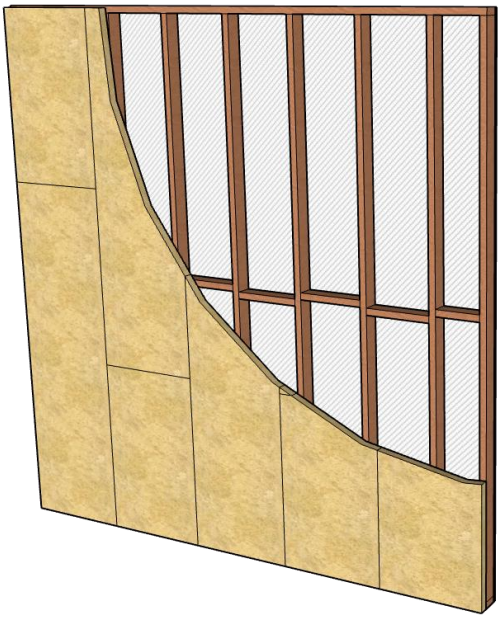
Eqn. 2: *Superimposed Load = Test Load – Weight of Wall*
Superimposed Load = 10,388 – 1,175 = 9,213 lbs.

Eqn. 3: *Load to Overcome (Sum of Dead Loads) = (Weight of Wall + Weight of Load Beam + Weight of Blocks)*
Load to Overcome (Sum of Dead Loads) = 1,175 + 2,060 + 1,504) = 4,739 lbs.

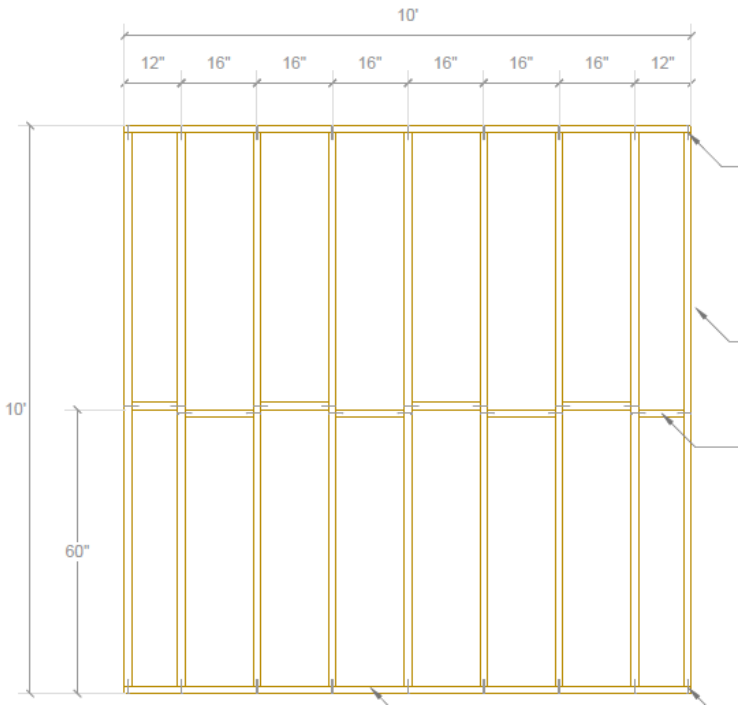
Eqn. 4: *Actuator Load = Superimposed Load + Load to Overcome*
Actuator Load = 9,213 + 4,739 = 13,952 lbs.

Eqn. 5: *Hydraulic Pressure Applied = Actuator Load/ (Actuator Effective Area*No. of Actuators)*
Hydraulic Pressure Applied = 13,952/ (11.04*3) = 421 psig

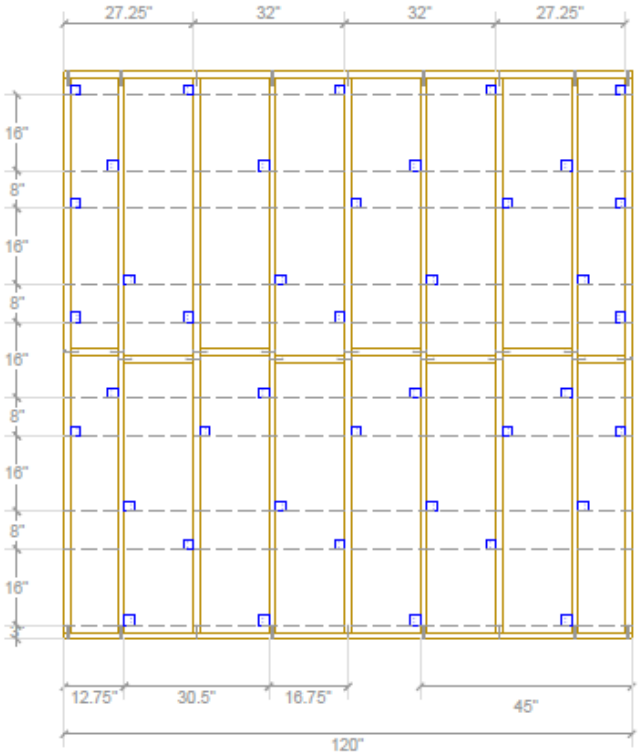
**Compression resistance of wood plates loaded perpendicular to grain does not govern. Load per stud is based on compressive resistance of wood stud wall loaded parallel to grain (buckling).*



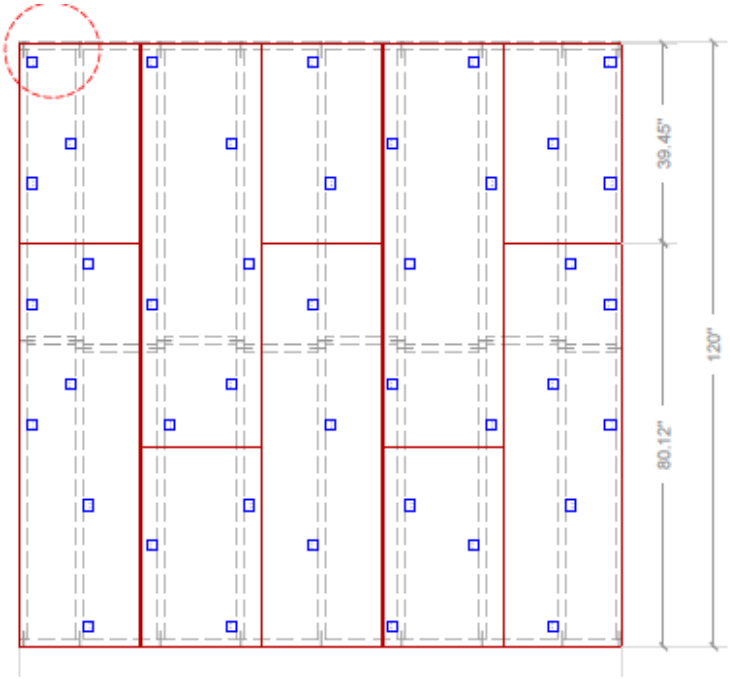
Drawing No. 3
Wall Assembly Plan View



Drawing No. 4
Framing Layout – Provided by Aircrete Mexico



Drawing No. 3
Aluminum Attachment Clip Layout – Provided by Aircrete Mexico



Drawing No. 4
Attachment layout for 7-ft. long PAAC panels – Provided by Aircrete Mexico

Appendix E – Revision Log

Rev. #	Date	Page(s)	Revision(s)
0	06/01/2023	N/A	Original report issue