Tru-Brix

TECHNICAL DATA AND TEST RESULTS

Glen-Gery

Tru-Brix

Technical Data and Test Results

T A B L E O F C O N T E N T S

TECHNICAL DATA

Weight: 11.5 psf

Brick Sizes: $2^3/_4$" H x $7^5/_8$" L x 1" T (Engineer Size)
$2^3/_4$" H x $8^1/_2$" L x 1" T (Williamsburg Size) $2^1/_4$" H x $7^5/_8$" L x 1" T (Modular Size)

Brick Coursing: $2^3/_4$" (Oversize) Rails: 5 Courses = 16"
Adjusts up to: 5 Courses = $16^5/_8$"
$2^1/_4$" (Modular) Rails: 6 Courses = 16"
Adjusts up to: 6 Courses = $16^3/_4$"

Brick Specification: ASTM C216 Face Brick Grade SW (Severe Weathering)
ASTM C1088 Thin Brick Grade Exterior (Severe Weathering)

Mortar: Polymer modified mortar for workability, durability and flexibility
ASTM C144 sand is included in the 50 lb. bags

Steel Holding Rails: 0.027" HDG , Commercial CS Type B, Non-chemical Treated, Minimum Spangle, Smooth,
Cold Roll Formed
G-90 Galvanizing
Protective polymeric coating

Anchors: Type 1: #10 Polymer coated Wood Screws 1" to $2^1/_2$"
Type 2: Self-tapping Polymer coated Metal screws 1" to $1^1/_2$"
Type 3: Concrete and Masonry Screws 1" to $2^1/_2$"
Type 4: Glen-Gery-approved anchors for special applications

Building Wrap: Vapor permeability 10 perms per ASTM E96 Procedure A
Vapor transmission 73 g/m^2/24hrs per ASTM E96 Procedure A/B
Air Leakage/Resistance 0.03 cfm/ft^2@75Pa
Water resistance >60 minutes per ASTM D779
Water resistance “Pass” per ASTM E331
Fire ratings; Flame Spread <25 FSI and Smoke <450 SDI per ASTM E84

Flashing: Self-adhesive PVC 20 mil

Fire Rating: Adds only Non-combustible materials to rated walls. (See Building Wrap)

Tru-Brix Siding System guaranty applies only when installed with Tru-Brix proprietary products in accordance with the Tru-Brix Installation Instructions.

TEST RESULTS – WATER PENETRATION

Tests performed by: Whitlock Dalrymple Poston & Associates P.C. (See Appendix)
Test Method: ASTM E-514

Test Samples: Type 1; Tru-Brix Siding installed over 7/16" OSB Sheathing on untreated 2" x 4" wood studs spaced at 16" on center. Three wall samples of 6' x 6' were built and two were tested. The E514 Test chamber was 40" W x 48" H and attached in the approximate center horizontally, and 2 courses from the top, on each test wall. (See Figure 1) Holes were drilled in the wood studs close to the sheathing in order to expose eight Siding attachment screws for observation. (See Figure 2)

Type 2; Tru-Brix siding installed over 5/8" Fiberglass faced exterior gypsum sheathing (Georgia Pacific Dens-Glass Gold) on 18 gauge steel studs spaced at 16" on center. Three wall samples of 6' x 6' were built and two were tested. The E514 Test chamber was 40" W x 48" H and attached in the approximate center horizontally, and 2 courses from the top, on each test wall. (See Figure 1)

Figure 1

E514 Test Chamber on Wood Stud Sample Wall (foreground) and Metal Stud Wall (behind).

Figure 2 - Observation holes at anchoring screws in wood studs.

The test walls were constructed with a trough below the test area to collect water. (See Figure 1) The procedure called for measuring the water that was collected in the trough, measuring any water that might penetrate into the drainage wrap and drain to the bottom of the test panel, and observing any wetness behind the sheathing with emphasis on monitoring the screw penetrations.

Test Samples: The E514 apparatus was pressurized to 5 psf and 10 psf in two cycles over four hours, including periods at 0 psf. A summary of cycles is shown in Table 1.

Cycle	Air Pressure	Duration	Cumulative Time
1	10 psf	30 minutes	0 hour 30 minutes
2	0 psf	60 minutes	1 hour 30 minutes
3	5 psf	60 minutes	2 hour 30 minutes
4	10 psf	60 minutes	3 hours 30 minutes
5	0 psf	30 minutes	4 hours 0 minutes

Table 1; Summary of ASTM E514 air pressure cycles.

At all times during the tests, water was introduced into the test chamber through the ASTM prescribed spray bar inside the top of the chamber. Water flow was adjusted such that a continuous running sheet of water was running over the entire test area. This test applies pressure to a “solid” layer of water on the masonry surface, forcing water into the masonry.

The corresponding wind speed to the applied pressures is:

0 psf = 0 mph
5 psf = 26 mph
10 psf = 52 mph

The test is obviously severe as a continuous sheet of water on a wall for 4 hours at a time while wind blows steadily at 52 mph for $1^1/_2$ hours of the time is rare in nature.

TEST RESULTS:

1. Outer layer of masonry. Water penetrated into the siding, through the 1" masonry, as anticipated. The water went into the Tru-Brix Rail channels and flowed horizontally until interrupted, again, as expected. The amounts of water were measured and recorded.

2. Steel Rail layer. None of the four tests had any measurable water observed at the bottoms of the panels within the Tru-Brix Drainage Wrap. One of the wood stud tests, and one of the metal stud tests, had some moisture in a small area of the drainage wrap at the bottom of the test panels. This indicated that a very small amount of the water within the steel rails was forced through openings into the drainage wrap. However, although not measurable, this small amount that was observed indicates that the Drainage Wrap was performing its function as intended within the system.

3. The Tru-Brix Siding System. No water penetrated the System in any test. There was no dampness observed at any location on the sheathing, nor at any of the screw penetrations in any of the wood studs or steel studs.

NOTE: Due to uncontrolled conditions and damages to materials at the outer edges of the test walls, not considered to be within the test, water was able to flow out of the channels in the Rails and behind the drainage wrap at the edges of the sheathing, causing some observable moisture between the Wrap and the outer face of the sheathings only at the bottom corners of the panels on 3 of the tests. One metal stud test had no such moisture. In actual construction, no such conditions as this will exist, and these observations are considered moot.

TEST RESULTS – WATER PENETRATION AT WINDOWS

Tests performed by: Whitlock Dalrymple Poston & Associates P.C. (See Appendix)
Test Method: ASTM E 1105

Test Samples: Test samples: Type 1; Tru-Brix Siding installed over 5/8" Fiberglass faced exterior gypsum sheathing (Georgia Pacific Dens-Glass Gold) on 18 gauge steel studs spaced at 16" on center. A flanged 16" x 16" fixed window was installed with standard construction methods. The E1109 spray test apparatus was set up and plastic covering was installed around the test apparatus. See Figure 3.

Type 2: Tru-Brix siding installed over 5/8" Fiberglass faced exterior gypsum sheathing (Georgia Pacific Dens-Glass Gold) on 18 gauge steel studs spaced at 16" on center. A non-flanged 16" x 16" window was installed with standard construction methods. The E1109 spray apparatus was set up the same way as for Type 1.

Figure 3

E1105 Setup

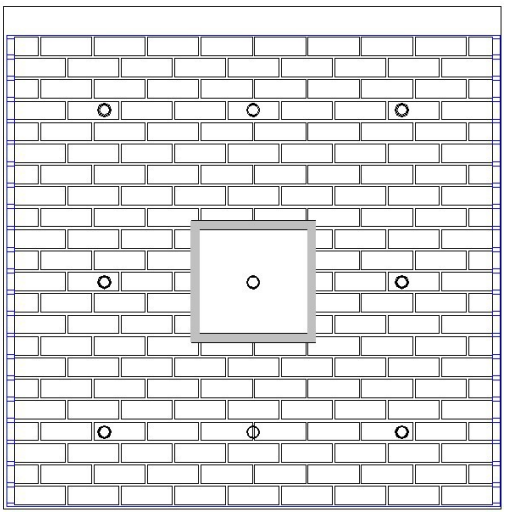

Figure 4

Spray Nozzle Locations

Test procedure: Nine spray nozzles were aimed at the test walls as indicated in Figure 4. Water was applied for two 15-minute periods with a 10-minute wait between applications.

Test Method: Examinations of the results show that correct window flashing details are required to prevent water penetration at window heads. The correct installation is shown in Figure 5. The Drainage Wrap must be cut to install window head flashing underneath the Wrap. Any moisture in the Drainage Wrap will then be removed from the wall by the window head flashing.

Figure 5

Window with Drainage Wrap and Flashing.

TEST RESULTS – WIND LOADING ON METAL STUD WALL SYSTEM

Tests performed by: Whitlock Dalrymple Poston & Associates P.C. (See Appendix)
Test Method: ASTM E-72

Test Samples: Three walls 4' wide by 8' tall were constructed with Tru-Brix siding installed over 5/8" Fiberglass faced exterior gypsum sheathing (Georgia Pacific Dens-Glass Gold) on 18 gauge steel studs spaced at 16" on center and 5/8" interior gypsum sheathing. A sturdy wood reaction frame of the same size was placed at 1/2" from each wall, first at the interior side of the wall for the first test (negative wind loading), and then at the exterior (brick) side of the wall for a second test (positive wind pressure). A plastic inflatable air bag was placed in the 1/2" space.

Test Procedure: An air compressor with a variable flow nozzle was used to inflate the air bag. The pressure in the bag was measured with a water manometer. The pressure was adjusted in accordance with ASTM E72 procedure. A minimum pressure of 3.9 psf was used instead of 0 psf. Micrometer readings were taken at 6 locations and used to calculate the net deflection at the mid height of the panel. Readings were taken at every 5 psf change in pressure while pressure increased. At pressures of 20, 40, 60, 85, and 100 psf, the pressure was held for 5 minutes and then was dropped back to 3.9 psf and held for 20 minutes before starting the next cycle of pressure increases. Results; Data was generated about the amounts of deflection at over 80 times during the tests of each panel, with 6 readings at each of those times for each panel. A summary of the important data is shown in Table 2.

Load P.S.F.	Equivalent Wind Speed (mph)	Typical Average Deflections			
		Negative Loading		Positive Loading	
		Inch	Ratio	Inch	Ratio
20	104	0.05	L/1800	0.10	L/900
40	208	0.14	L/640	0.15	L/600
60	312	0.22	L/410	0.20	L/450
80	416	0.30	L/300	0.25	L/360
84	436	0.31	L/290		
100	520			0.30	L/300

Table 2; E72 Results.

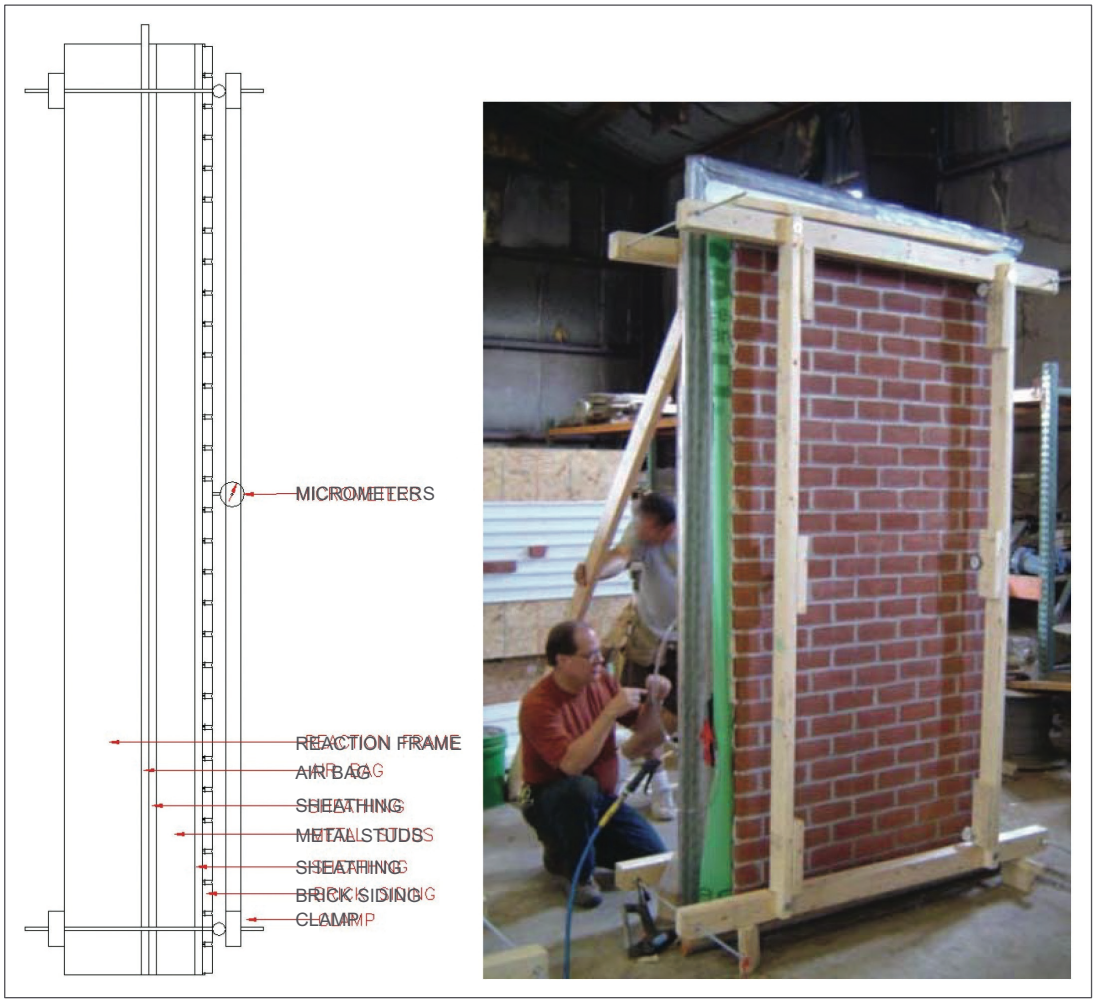

Figure 6; E72 Flexural Test.

Some bed joints developed barely visible hairline cracks. No mortar broke and no masonry was ever in jeopardy of being dislodged, even at 400 and 500 mph wind speed pressures. The design load of the metal studs was 84 psf. The walls returned to 0.07" or less deflection after the 100 psf positive loading which was the last of the many loading cycles.

TEST RESULTS

MASONRY PULL OFF TESTS:

A 6" x 6" square plate was epoxied to the surface of masonry in 8 locations, and a device pulled on this until masonry broke away from the wall. For six of the tests, a saw was used to cut through the masonry at the edge of the plate. For two of the tests, the masonry was left intact without cutting. In every case, the masonry pulled out of the rails without damaging the rails. The results are shown in Table 3.

Test	Edge	Failure Load		**Wind Speed
		Lbs.	Lbs./Sq.ft.	1 P.S.F. = 5.2 mph
1	Cut Free	433	1,732	9,000 mph
2	Cut Free	482	1,982	10,020 mph
3	Cut Free	500	2,000	10,400 mph
4	Restrained	784	3,136	16,300 mph
5	Cut Free	*Error		
6	Cut Free	444	1,776	9,200 mph
7	Cut Free	514	2,056	10,690 mph
8	Restrained	771	3,084	16,000 mph

Table 3

* Test apparatus did not work properly – no reading taken **
This conversion made for emphasis

SCREW PULL-OUT TEST:

The same device was used to pull out a piece of rail with 1 screw in a wood stud (#10 x 1 1/2 "). Only one test was done, so the result is not scientifically representative.

Pull Out Load	2.8 Screws/Sq.ft.		1.4 Screws/Sq.ft.	
	Load/Sq.ft.	Wind Speed	Load/Sq.ft.	Wind Speed
240 lbs.	670 psf	3,480 mph	335 psf	1,740 mph

Manufacturer's Data:	Screw in Clear Pine	Pull out Force
	#7 x 2"	235 lbs.
	#8 x 2 1/2"	275 lbs.
	#10 x 3"	307 lbs.