Architectural Testing

MIAMI-DADE COUNTY TEST REPORT

Rendered to:

TREX COMPANY, LLC
245 Capitol Lane
Winchester, Virginia 22602

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1.0 General Information

1.1 Product

6 ft high *Seclusions*™ wood-plastic composite privacy fence system with 5 in support posts

1.2 Project Description

Architectural Testing was contracted by Trex Company, Inc. to perform Miami-Dade County Performance tests on their 6 ft high by 8 ft wide *Seclusions*™ privacy fence system with 5 in support posts. The following tests were performed:

Dynamic Wind Load Testing of Fence System and Lateral, Static Load Testing of Posts.

This report includes comprehensive written and photographic documentation of the testing performed.

2.0 Fence Wind Load Testing

2.1 Test Specimen

A fence section measuring 8 ft wide (post center to post center) by 6 ft high was tested. Trex Company, Inc. provided all test materials. The test specimen was assembled by Architectural Testing at their York, Pennsylvania campus. See Appendix A for component drawings and installation instructions and Appendix B for component and test photographs.

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2.2 Test Equipment

The wind generator consists of an engine driven vane axial fan. The fan blades were fixed at a 5-1/2° pitch as marked on the fan. The plenum has an outlet of 8 ft wide by 4 ft high with eight 2 ft by 2 ft baffled outlets. Fence deflections were measured with linear displacement transducers accurate to 0.01 in. Wind speeds were calibrated according to Section 7 of Florida Building Code Test Protocol TAS 100-95 (reference ATI Report No. 72064.02-119-18).

2.3 Test Setup

A steel test fixture was used to simulate a rigid post embedment. The bottom of the bottom rail was fixed at 2 in above the top of the test fixture. The wind generator outlet was located 48 in from the face of the specimen (see photographs in Appendix B). Electronic linear displacement transducers were fixed at mid-span on the top rail, middle of the in-fill area, and mid-span on the bottom rail for deflection measurements.

2.4 Test Procedure

Wind load testing was initiated at 75 mph and held for a duration of 50 seconds, then reduced to zero for at least one minute to determine recovery. Wind speed was then increased to 110 mph and held for a duration of 35 seconds, then reduced to zero for at least one minute to determine recovery. The duration of the applied wind load at each wind speed was determined by the following equation:

$$t = 3600 / V_{fm}$$

where: t = duration, seconds; and V_{fm} = "fastest mile" wind speed, mph.

Wind speeds used in testing correlate with "fastest mile" wind speeds (V_{fm}) for reference to codes and design standards. Maximum deflections were recorded at each wind load level.

2.5 Limitations of Test

Test setup and procedure provide information for evaluation of the fence assembly to resist sustained wind speeds indicated in the test results. This evaluation included the transfer of wind loads to the fence panels, rails, and support posts. The posts only support a single section of fence in this simulation and were therefore not fully evaluated for actual field conditions. Evaluation of the supporting post members is addressed in Section 3 of this report.

2.6 Test Specimen Details

The test specimen was comprised of the following components and attachments:

Top Rail: Wood - plastic composite extrusion: 4-1/8 in wide by 5in high by 1/2 in wall by 91 in long, double-legged "T" profile with center slot to accept pickets

Bottom Rail: 6063-T5 aluminum extrusion: 2-3/4 in wide by 5-1/8 in high by 0.07 in wall by 91 in long, "H" profile

Picket / Bottom Rail Cover: Wood - plastic composite extrusion: 5-7/8 in by 1 in by 1/4 in wall, "C" profile; nineteen 66-1/2 in long as pickets and two 91 in long as bottom rail covers

Post: 5 in square by 0.5 in wall by 97 in long, wood - plastic composite hollow extrusion

Rail Bracket: 3 in high by 1-7/8 in deep by 1.3 in wide by 0.15 in wall, glass filled nylon 6 injection molded part with four 0.21 in diameter holes through surface that contacts post

Fastener: #8 x 1-5/8 in x 9 tpi, coated flat head, Phillips head, steel deck screw - four to attach each bracket to post, one to attach each rail end to top of bracket, three to attach each end picket to post

2.7 Wind Load Test Results

Wind Speed	Duration	Deflection (in)		
		Top	Mid	Bottom
75 mph	50 sec	2.05	2.13	0.45
0 mph	≥ 1 min	0.19	0.01	0.09
110 mph	35 sec	4.51	5.56	0.98
0 mph	≥ 1 min	0.44	0.24	0.14

2.8 Observations

There was no separation of fence components or any visible damage to any fence component at the completion of the test. The *Seclusions*™ privacy fence test specimen withstood a maximum sustained wind speed, V_{fm}, of 110 mph, which is equivalent to a "three-second gust" wind speed, V_{3s}, of 126 mph.

3.0 Post Static Load Testing

3.1 Test Equipment

The support post was tested in a self-contained structural frame designed to accommodate anchorage of the specimen and application of the test loads. The specimen was loaded using an electric winch mounted to a rigid steel test frame. High strength steel cables and nylon lifting straps were used to impose test loads on the specimen. Applied load was measured using an electronic load cell located in-line within the loading system. Deflection at point of load application was measured to the nearest 0.01 in using an electronic linear displacement transducer.

3.2 Test Setup

One end of the tested post was securely anchored and braced in a rigid test frame to simulate post embedment. The test load was applied to the free end of the post 38 in from the test frame. This distance represents the vertical mid-span of the assembled 72 in tall fence section plus the 2 in recommended clearance between the bottom of the fence section and grade. The post and anchorage were arranged in a horizontal orientation to facilitate testing. See Photo No. 5 in Appendix B for typical test setup.

3.3 Test Procedure

Three support posts were preloaded up to a level not exceeding design load. After pre-loading, all load was released and any necessary fixture adjustments were made. Each post was then loaded at a uniform rate until failure.

3.4 Post Test Results

Specimen	Ultimate Test Load (lb)	Deviation from Average
1	1,719	1%
2	1,739	0%
3	1,757	-1%
Average:	**1,738**	

3.5 Post Test Analysis

The design wind load for a 6 ft high by 8 ft wide fence system was calculated using ASCE 7-98 based on a sustained wind speed of 75 mph, which correlates to a 90 mph three-second gust wind. The average ultimate load for the post was then divided by the corresponding design load to obtain a Factor of Safety for the fence system post. See Appendix C for design wind load calculations.

3.5 Post Test Analysis (Continued)

The analysis results are as follows:

Calculated Design Load (lb)	Average Ultimate Test Load (lb)	Calculated Factor of Safety
749	1,738	2.32

4.0 Closing Statement

Detailed drawings, data sheets, representative samples of test specimens, a copy of this test report will be retained by Architectural Testing for a period of ten years from the original test date. At the end of this retention period such materials shall be discarded without notice and the service life of this report by Architectural Testing will expire. Results obtained are tested values and were secured using the designated test methods. 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 specimens tested. This report may not be reproduced, except in full, without the written approval of Architectural Testing.

For ARCHITECTURAL TESTING:

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Attachments (pages): This report is complete only when all attachments listed are included.
Appendix A - Drawings (10)
Appendix B - Photographs (3)
Appendix C - Calculations (1)