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HR Engineering, Inc.

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11 September 2020

Taha Nana
NANA WALL SYSTEMS, INC.
100 Meadowcreek Dr. #250
Corte Madera, CA 94925

RE: Florida Eval., FBC 2020, CERO III

Dear Taha,

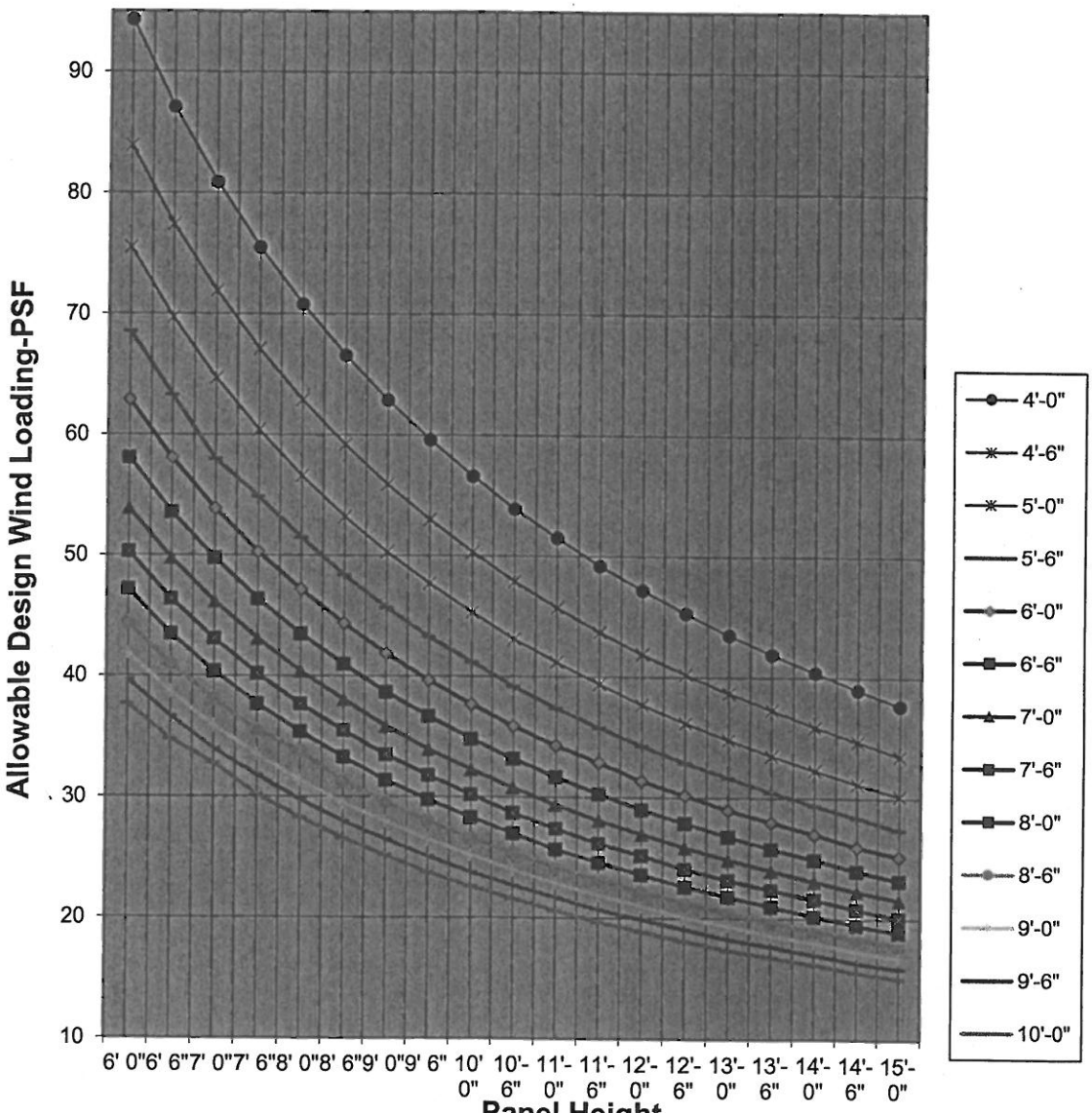
The following Nana Wall Systems product, CERO III, is an aluminum framed, glazed, sliding door system. One specimen, with two steel reinforcement bars in each interlock and pocket, and one specimen with no steel reinforcement bars, has been tested in accordance with AAMA/WDMA/CSA101/I.S.2/A440-08 and 11 as required in Florida Building Code 2020, Section 1709.5.1. Testing was done at Intertek-ATI, 2524 East Jensen Ave., Fresno, CA 93706 and is reported in 13646.01-301-44R3. Based on these tests, I have done a comparative analyses, the results of which are shown in the allowable design wind loading curves on the next two pages. Page 2 has the results of the wind loading curves, for both positive and negative wind loadings on unreinforced units. Page 3 has the results of the wind loading curves, for both positive and negative wind loadings on reinforced units.

The stiles between adjacent panels are the point of failure in the system. The stiles take the uniform loads in the panels and transfer them to the frames through a concentrated load at each panel corner. In the tests done on these specimens, the stiles recess into the top and bottom tracks. Failure happened when the stiles came out, and the panel disengaged from the track.

Glazing for the tested units was triple glazed insulating glass with all 3 panes being tempered. Glazing tested was 1-15/16" IG (5/16" temp + 17/32" air + ¼" temp + 17/32" air + 5/16" temp). The tested unit successfully passed the tests in the above AAMA test program. I have analyzed the panel size tested and the 4 extremes of the panel sizes in the wind loading curves, using ASTM E 1300-09, in conformance with FBC Section 2404.1 *Vertical glass.* This glass is adequate for all of the sizes and wind loads in the curves. Tested sizes were 4 panels wide, having an overall width of 23'-1-11/16" x 10'-2" high.

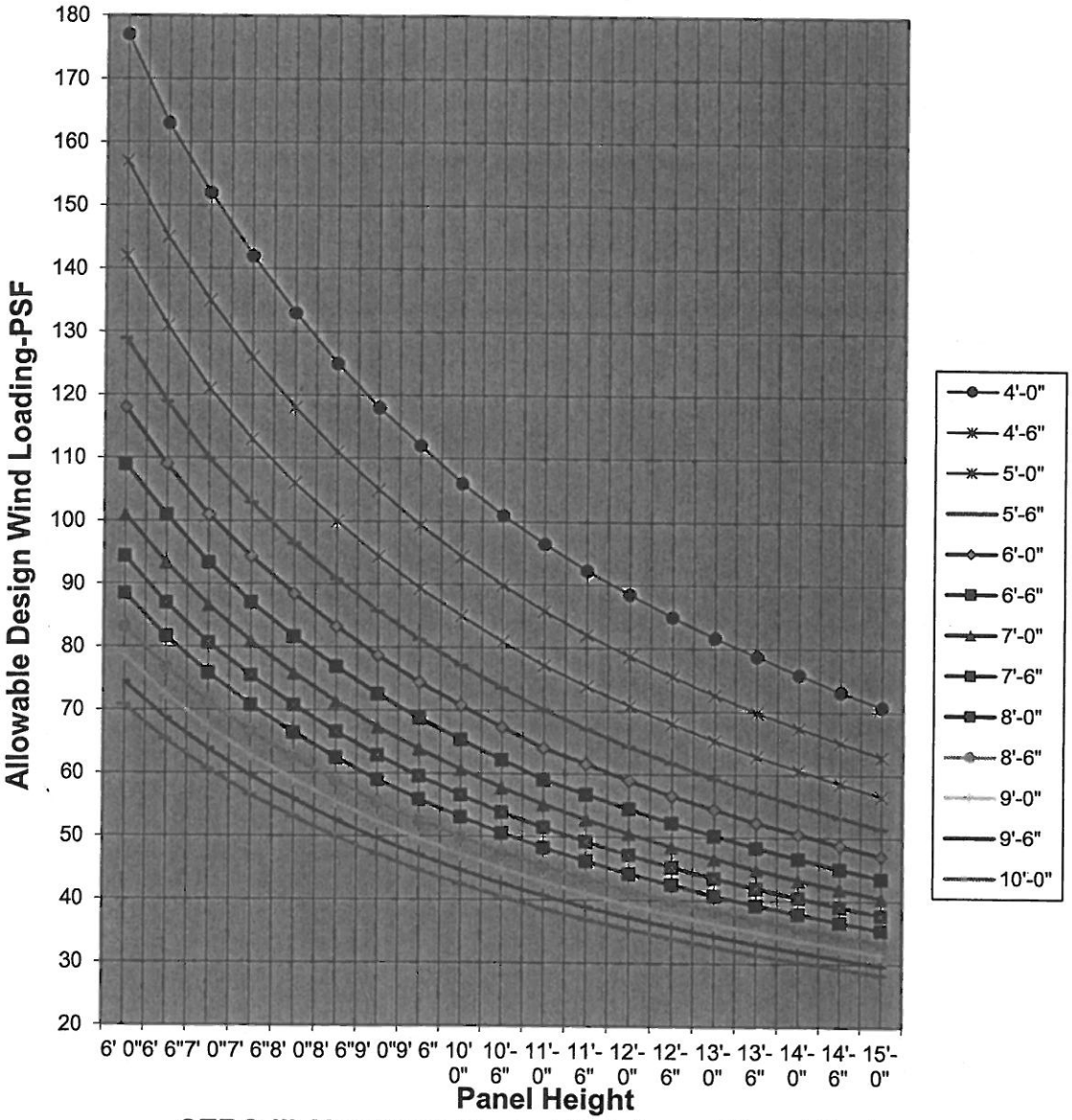
A standard sill was used in the testing that had all three tracks. Each sliding panel requires its own track. Fixed panels can be also be used in the system, that moves to the same side. The tested doors each had had four panels, comprised of three sliding panels into a pocket and one fixed panel on the other side. Other sill arrangements will be adequate for the wind loadings

NANA WALL SYSTEMS, Inc.
Positive and Negative



CERO III Aluminum Framed Unreinforced Panel System
Curves represent some typical panel widths

NANA WALL SYSTEMS, Inc.
Positive and Negative



CERO III Aluminum Framed Reinforced Panel System
Curves represent some typical panel widths

The CERO III System is composed of repetitive panels, generally all the same size. Each panel transfers the wind loading to the frame through the stiles, located at all panel corners. So, once the allowable wind loading is determined for a panel, this same allowable wind loading would apply to any number of equal sized panels installed side by side in the system. For the unit with different panel widths, the allowable wind loading of the wider panel will govern. However, there is a practical limit to the width of the sill and frame because each sliding panel going to each side requires its own track.

Both of the tested units had the same panel sizes, 7'-4" wide by 10'-2" high. The reinforced test specimen achieved allowable design pressure rating of +80.2 psf and -75.19 psf. Also, installation designs include all panel sizes. The unreinforced test specimen achieved allowable design pressure rating of +/-40.10 psf.

This system can be installed as either straight or with a 90 degree or 135 degree corners. Experience has shown that the segmented installations are somewhat stronger than straight, due to arch action in compression and tensile field action in tension.

I have calculated the required installation fasteners for four different substrates to meet the wind loadings in the curves. These fasteners are installed through the sill, jamb, and head frames so that they are loaded in shear. The installation fastener designs include consideration of each substrate strength and that all loads are carried in the fasteners, with none carried by friction through the joints. The results of this analyses result in 3.5 times the number of fasteners required than were present during the actual structural testing. At the head and sill, two pairs of installation fasteners are required at each panel corner. At the end jambs, a single row of installation fasteners, starting 4" from the corners, and at 22" maximum spacing is require. Additional details are shown on an 11" x 17" installation drawing by HR Engineering dated 11 September 2020.

Wood substrate installations must be of Southern pine, or wood of equivalent specific gravity. Installation fasteners must be #12 (0.216" diameter) wood screws with a minimum penetration of 2-1/2". Fastener material must be a Series 300 stainless steel with a minimum bending yield stress of 80,000 psi.

Structural steel substrates must be a minimum of ¼" thick. Installation fasteners must be ¼" diameter self drilling screws. Fastener material must be Series 300 stainless steel with a minimum yield stress of 70,000 psi.

Masonry block substrates can be light weight or medium weight block, but must have cells grouted full around system openings. Installation fasteners must be ¼" diameter ITW Buildex Scots Tapcons with Series 300 stainless steel heads, built in washer, rubber EPDM sealing washer, and carbon steel shank. The shank must have a minimum yield stress of 100,000 psi. Fastener minimum embedment must be 1-1/4" and minimum edge distance must be 4".

Concrete substrates must have a minimum 28 day compressive strength of 2,000 psi. Installation fasteners must be ¼" diameter ITW Buildex Scots Tapcons. Fastener minimum embedment must be 1" and minimum edge distance must be 4".

My structural analyses included earthquake loads in conformance with FBC 2020, Section 1613. Wind loads govern over earthquake loads for all aspects of this product.

A limiting factor for CERO III System is that it does not qualify to be installed in the *High Velocity Hurricane Zone* or the *Wind Bourne Debris Region*, as described in 2020 FBC. I trust that this evaluation report is sufficient for your needs. If there are any questions about this report, or if anything additional is required, please advise me.

Sincerely yours,

Allen N. Reeves

Allen N. Reeves, P.E., SECB
Structural Engineer
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1 Oct. 2020
ANR:anr Cc: 20080003