

PRODUCT APPROVAL SUPPORTING CALCULATIONS

Series/Model 3300 Narrow Picture Window (Impact)

REPORT NO.: 29261.13-106-11-R1

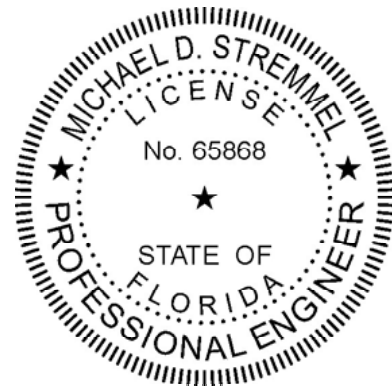
RENDERED TO: Vytex Corporation
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REVISION 1 DATE: 4/23/2026

This item has been digitally signed and sealed by Michael D. Stremmel, PE on the date adjacent to the seal.

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It is a violation to alter this document in any way unless acting under the direction of a licensed professional engineer.

SCOPE:

Molimo, LLC was contracted by Vytex Corporation to evaluate alternate installation methods for their 3300 Narrow Picture Window (Impact). The evaluation is based on physical testing and product certifications.

Reference standards utilized in this project include:

Florida Building Code, Building, 8th Edition (2023). International Code Council, 2023.

ANSI/AWCNDS-2018 National Design Specification (NDS) for Wood Construction. American Wood Council, 2018.

AISI S100-16 North American Specification for the Design of Cold-Formed Steel Structural Members, 2016. American Iron and Steel Institute, 2016.

2020 Aluminum Design Manual. The Aluminum Association, Inc. 2020.

ICC-ES Report ESR-1976 ITW Buildex TEKS Self-Drilling Fasteners. ICC Evaluation Service. 07/2016.

NOA 21-0201.06 *Tapcon Concrete and Masonry Anchors with Advanced Threadform Technology.* Miami-Dade County Product Control Section. 05/06/2021.

The anchorage analysis presented herein do not address the water resistance, water penetration, or air infiltration performance of the installation method or the installed product. In addition, the analyses rely on the assumption that the building substrate is capable of withstanding the incurred loads.

Certification of Independence

In accordance with Rule 61G20-3 Florida Administrative Code, Molimo, LLC hereby certifies the following:

- Molimo, LLC does not have, nor does it intend to acquire or will it acquire, a financial interest in any company manufacturing or distributing products tested or labeled by the agency.
- Molimo LLC is not owned, operated or controlled by any company manufacturing or distributing products it tests or labels.
- Michael D. Stremmel, P.E. does not have nor will acquire, a financial interest in any company manufacturing or distributing products for which the reports are being issued.
- Michael D. Stremmel, P.E. does not have, nor will acquire, a financial interest in any other entity involved in the approval process of the product.

ANALYSES:

Summary of Test Results

Table 1 summarizes the various 3300 Narrow Picture Window (Impact) products and their corresponding performance levels which have been established by testing of product certification.

The products considered in this report satisfy the requirements of the *Florida Building Code, Building 8th Edition (2023)* for the overall sizes and design pressures of the following product certifications and their installation methods presented in this report.

Table 1: Summary of Product Certifications and Limitations of Use

Series/Model	Test Report Number	Product Certification	Size (W x H)	Performance
3300 Narrow Picture (Impact)	30144.02-106-11 (Rev. 0, 2/11/2025)	CPD 22312	84" x 60"	±55 psf Missile Leve D Wind Zone 3
	30144.01-106-11 (Rev. 0, 2/11/2025)			

Testing documented in Table 1 was conducted by Molimo, LLC of York, Pennsylvania (Florida Department of Business & Professional Regulation Test Lab No. TST11282, IAS Certificate of Accreditation TL-678).

ANALYSES: (Continued)

ASTM E1300 Glazing Analysis

The glazing is evaluated with ASTM E1300-12ae1 *Standard Practice for Determining Load Resistance of Glass in Buildings* assuming four-sided support. Glazing construction is listed in Table 2. Glazing analysis is presented on Page 10 and summarized in Table 3.

Table 2: Glazing Constructions

Glass Type	Glazing Construction
Insulating Glass (Tested Configuration)	1/8" Annealed 1/8" Annealed – 0.090" PVB – 1/8" Annealed

Table 3: Glazing Analysis

Overall Size	Glass Type	Glass Size	Load Resistance
84" x 60"	Insulating Glass	79-1/2" x 55-1/2"	32.5 psf

The glazing load resistance is more than the product design pressures. Glazing strength will be a limiting condition.

A glazing analysis was performed to determine the required glazing construction of the picture window in accordance with ASTM E1300 for units smaller than the tested size. The results of the glazing analysis is listed on the following page.

ANALYSES: (Continued)

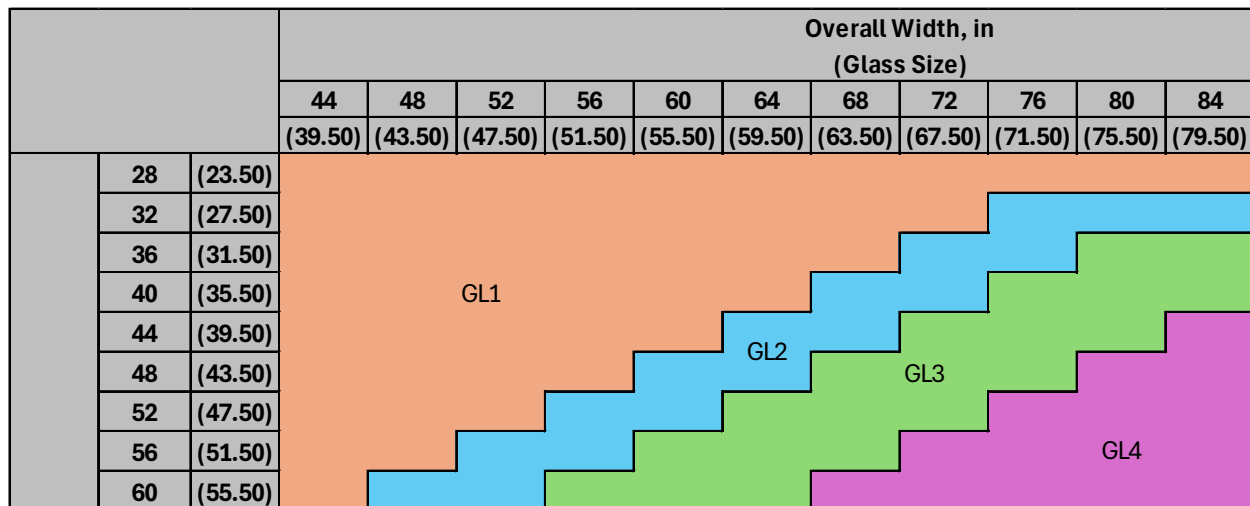
ASTM E1300 Glazing Analysis (Continued)

Table 4 lists the alternate glazing constructions for the Picture Window and Chart 1 shows the required glazing construction for the window based on overall unit size.

Table 4: Center Sash Alternate Glazing Constructions

Glass Type	Glazing Construction
GL1 (Tested Configuration)	1/8" Annealed 1/8" Annealed – 0.090" PVB – 1/8" Annealed
GL2	5/32" Annealed 1/8" Annealed – 0.090" PVB – 1/8" Annealed
GL3	3/16" Annealed 1/8" Annealed – 0.090" PVB – 1/8" Annealed
GL4	1/4" Annealed 1/8" Annealed – 0.090" PVB – 1/8" Annealed

Chart 1: ASTM E1300 Glazing Requirements per Unit Size



ANALYSES: (Continued)**As-Tested Installation Analysis**

For air/water/structural testing, the test specimen was secured to a pine wood test buck with #10 x 2" screws at the jambs. The rough opening allowed for a 1/4" shim space. The as tested installation methods are evaluated on Pages 11 and 12 and the established design capacities are summarized in Table 5.

Table 5: As-tested Anchorage Design Capacities

Test Specimen Installation Method	Connection Details	Capacity
Through Frame (Head, Sill, and Jamb)	#10 x 1-1/2" Pan head screw Located 6" from each end and spaced 18" on center	122 lb

The capacities presented in Table 3 will be used to prove acceptable alternate anchors and substrates for the windows.

ANALYSES: (Continued)

Calculations on Pages 13 through 16 determine the design capacity of alternate through-frame installation anchorages for the window. The alternate anchorage capacities are summarized in Table 6.

Table 6: Alternate Anchorage Capacities for Through-frame Installations

Substrate	Anchor	Capacity	Comments
18 Ga. Steel Stud	#10-16 TEKS Screw	152 lb	1. 33 KSI yield strength stud 2. Full penetration +3 threads 3. Limited by bending capacity
Concrete	3/16" Tapcon	136 lb	1. Minimum $f'_c = 3,000$ psi 2. 1-1/2" min. embedment 3. 2" min. edge distance 4. Limited by frame bearing capacity 5. Maximum 1x buck strip
CMU Block	3/16" Tapcon	135 lb	1. Minimum ASTM C90 CMU Block 2. 1-1/2" min. embedment 3. 2" min. edge distance 4. Limited by anchor shear capacity 5. Maximum 1x buck strip
Aluminum (1/8" thick)	#10-16 TEKS Screw	152 lb	1. Minimum 6063-T5 aluminum 2. Full penetration +3 threads 3. Limited by bending capacity

Note: Maximum available length of a 3/16" Tapcon anchor is 3-1/4". Use 1/4" x 4" Tapcon anchors for through-frame installations with 1x buck strip.

ANALYSES: (Continued)

Anchorage Requirements

It must be determined the anchorages are not overloaded for the approved window size and design pressures. Calculations presented on Page 17 shows the following:

Based on the calculations, Table 7 shows the maximum anchor spacing for each installation method. The anchor spacings shown in the following table apply to all substrates and anchor types.

Table 7: Anchorage Spacing Requirements

Installation Method	Maximum Anchor Spacing
Through-Frame (Head and Sill)	Located 6" from each end and spaced 18" on center, through the frame into the building substrate

ASTM E1300 Glazing Analysis

Input

March 23, 2025

Glazing Information

Supported Edges: Four sides simply supported
 Shape: Rectangular
 Lite Width: 79.5 in.
 Lite Height: 55.5 in.
 Glazing Angle: 90.0 °

Glazing Construction (Double Glazed Insulating Unit)

Exterior Lite Properties (1/8 in. Monolithic)

Construction: 1/8 in. (AN)

Airspace Properties

Thickness: 0.500 in.

Interior Lite Properties (1/4 in. Laminated)

Construction: 1/4 in. (AN) | 0.060 in. (PVB)

Applied Loads

Description	Load	Duration
Short Duration	55.0 psf	3.00 sec

Load Resistance

Short Duration (3 Sec)

Description	NFL	GTF	LSF	LR
Exterior Lite	15.6 psf	0.900	1/0.127	111 psf
Interior Lite	31.5 psf	0.900	1/0.873	32.5 psf

Long Duration (30 Days)

Description	NFL	GTF	LSF	LR
Exterior Lite	15.6 psf	0.390	1/0.417	14.6 psf
Interior Lite	31.5 psf	0.390	1/0.583	21.1 psf

Comparisons

Short Duration	
55.0 psf 3.00 sec > 32.5 psf	Load exceeds LR
Approximate center of glass deflection	
Exterior Lite	0.64 in. *
Interior Lite	1.03 in.

Notes

Load resistance values are computed in accordance with ASTM E1300-16 Section 6.2 and are based on non-factored load values calculated in a manner consistent with those presented in ASTM E1300-16.

* Deflection value extends beyond deflection chart

As-Tested Installation – Through-Frame to Wood

Anchor: #10 x 1-1/2" Wood Screw

Details: Through the PVC Frame
- 0.080" thick frame at anchor location
- 1/4" max shim space

Substrate: SPF wood test buck (G = 0.42 min.)

Wood Screw Capacity (Shear)

$$Z' = \underline{122 \text{ lb}}$$

(Reference the following page)

Bearing Capacity (of PVC frame)

$$P_b = D t F_{tu} = (0.190")(0.080")(10,000 \text{ psi})$$

$$P_b = \underline{152 \text{ lb}}$$

Bending Capacity (of Wood Screw)

$$L = 1/4" \text{ (maximum shim space)}$$

$$S = \pi d^3 / 32 = \pi (0.131")^3 / 32 = 0.000221 \text{ in}^3$$

$$F_b = (1.3)(0.6 F_y) = (1.3)(0.6)(90,000 \text{ psi}) = 70,200 \text{ psi} \quad (1.3 \text{ for weak axis bending})$$

$$F_b = M / S = (V) (L/2) / S \quad (L/2 \text{ for guided bending})$$

$$V = 2 S F_b / L = (2)(0.000221 \text{ in}^3)(70,200 \text{ psi}) / 1/4"$$

$$V = \underline{124 \text{ lb}}$$

Design Capacity of the Connection = 122 lb

Lateral Design Strength of Wood Connections

Data

Fastener

Fastener	=	#10 Wood Screw
Shank Dia	=	0.190 in.
Root Dia.	=	0.152 in.
F_{yb}	=	80,000 psi
Fastener length	=	1.500 in.

Project:	3300 Impact
Comments:	As-Tested Installation - Thru-Frame 1-1/2" min embedment

Main Member

Material	=	SPF
G	=	0.42
θ	=	90
F_e	=	3,350 psi
Thickness	=	1.500 in.

Side Member

Material	=	Vinyl (PVC)
G	=	N/A
θ	=	90
F_{es}	=	13,750 psi
Thickness	=	0.080 in.

Calculations

Lateral Bearing Factors

D	=	0.152 in.
ℓ_m	=	1.230 in.
K_θ	=	1.25
K_D	=	2.20
R_e	=	0.244
R_t	=	15.38

k_1	=	1.4579
k_2	=	0.6879
k_3	=	10.80
R_d	=	2.20 (Mode I _m , I _s)
R_d	=	2.20 (Mode II)
R_d	=	2.20 (Mode III _m , III _s , IV)

Lateral Design Values, Z

Mode I _m	=	285 lbf
Mode I _s	=	76 lbf
Mode II	=	111 lbf
Mode III _m	=	132 lbf
Mode III _s	=	89 lbf
Mode IV	=	126 lbf

<===== Minimum Value

Adjustment Factors

C_D	=	1.6
Wet Service Factor		
Fabrication/In-Service		Dry/Dry
C_M	=	1.0
In service temperature		$T \leq 100^\circ\text{F}$
C_t	=	1.0
C_g	=	1.0

C_Δ	=	1.0
Is fastener installed in end grain?		No
C_{eg}	=	1.00
Is fastener part of a diaphragm?		No
C_{di}	=	1.0
Is fastener toe-nailed?		No
C_{tn}	=	1.00

Adjusted Design Value, Z

Z'	=	122 lbf
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Alternate Installation – Through-Frame to Steel Stud

Anchor: #10-16 TEKS Screw

Details: Through the PVC Frame
 - 0.080" thick frame at anchor location
 - 1/4" max shim space

Substrate: 18 ga steel stud (33 ksi, 0.043" thick)

Anchor Capacity (Shear of #10-16 TEKS)

$$P_{ss} / \Omega = \underline{573 \text{ lb}} \quad (\text{ESR-1976})$$

Bearing Capacity (of PVC frame)

$$P_b = D t F_{tu} = (0.190")(0.080")(10,000 \text{ psi})$$

$$P_b = \underline{152 \text{ lb}}$$

Bearing/Tilting Capacity (of steel stud)

$$P_b = 2.7 D t F_{tu} = 2.7(0.190")(0.043")(45,000 \text{ psi}) = 992 \text{ lb}$$

$$P_b = 4.2 (D t^3)^{1/2} F_{tu} = 2.7 \{ (0.190")(0.043")^3 \}^{1/2} (45,000 \text{ psi}) = 743 \text{ lb}$$

$$P_{allow} = 743 \text{ lb} / 3.0 = \underline{243 \text{ lb}}$$

Bending Capacity (of Wood Screw)

$$L = 1/4" \text{ (maximum shim space)}$$

$$S = \pi d^3 / 32 = \pi (0.139")^3 / 32 = 0.000264 \text{ in}^3$$

$$F_b = (1.3)(0.6 F_y) = (1.3)(0.6)(92,000 \text{ psi}) = 71,760 \text{ psi} \quad (1.3 \text{ for weak axis bending})$$

$$F_b = M / S = (V) (L/2) / S \quad (L/2 \text{ for guided bending})$$

$$V = 2 S F_b / L = (2)(0.000264 \text{ in}^3)(71,760 \text{ psi}) / 1/4"$$

$$V = \underline{152 \text{ lb}}$$

Design Capacity of the Connection = 152 lb

Alternate Installation – Through-Frame to Concrete

Anchor: 3/16" Tapcon Anchor
- 1-1/2" min embedment
- 2" min edge distance
- 3" min anchor spacing

Details: Through the PVC Frame
- 0.080" thick frame at anchor location
- 1/4" max shim space

Substrate: 3,000 psi Concrete

Anchor Capacity (Shear of 3/16" Tapcon)

$$P_{ss} / \Omega = \underline{186 \text{ lb}} \quad (\text{NOA-No. 16-1222.06})$$

Bearing Capacity (of PVC frame)

$$P_b = D t F_{tu} = (0.170")(0.080")(10,000 \text{ psi})$$

$$P_b = \underline{136 \text{ lb}}$$

Bending Capacity (of 3/16" Tapcon)

$$L = 1/4" \text{ (maximum shim space)}$$

$$S = \pi d^3 / 32 = \pi (0.170")^3 / 32 = 0.000482 \text{ in}^3$$

$$F_b = (1.3)(0.6 F_y) = (1.3)(0.6)(137,000 \text{ psi}) = 106,860 \text{ psi} \quad (1.3 \text{ for weak axis bending})$$

$$F_b = M / S = (V) (L/2) / S \quad (L/2 \text{ for guided bending})$$

$$V = 2 S F_b / L = (2)(0.000482 \text{ in}^3)(106,860 \text{ psi}) / 1/4"$$

$$V = \underline{412 \text{ lb}}$$

Design Capacity of the Connection = 136 lb

Qualifies 1/4" Tapcon if longer length anchor is required to achieve minimum embedment

Alternate Installation – Through-Frame to CMU Block

Anchor: 3/16" Tapcon Anchor
- 1-1/2" min embedment
- 2" min edge distance
- 3" min anchor spacing

Details: Through the PVC Frame
- 0.080" thick frame at anchor location
- 1/4" max shim space

Substrate: CMU Block (ASTM C90)

Anchor Capacity (Shear of 3/16" Tapcon)

$$P_{ss} / \Omega = \underline{135 \text{ lb}} \quad (\text{NOA-No. 16-1222.06})$$

Bearing Capacity (of PVC frame)

$$P_b = D t F_{tu} = (0.170")(0.080")(10,000 \text{ psi})$$

$$P_b = \underline{136 \text{ lb}}$$

Bending Capacity (of 3/16" Tapcon)

$$L = 1/4" \text{ (maximum shim space)}$$

$$S = \pi d^3 / 32 = \pi (0.170")^3 / 32 = 0.000482 \text{ in}^3$$

$$F_b = (1.3)(0.6 F_y) = (1.3)(0.6)(137,000 \text{ psi}) = 106,860 \text{ psi} \quad (1.3 \text{ for weak axis bending})$$

$$F_b = M / S = (V) (L/2) / S \quad (L/2 \text{ for guided bending})$$

$$V = 2 S F_b / L = (2)(0.000482 \text{ in}^3)(106,860 \text{ psi}) / 1/4"$$

$$V = \underline{412 \text{ lb}}$$

Design Capacity of the Connection = 135 lb

Qualifies 1/4" Tapcon if longer length anchor is required to achieve minimum embedment

Alternate Installation – Through-Frame to Aluminum

Anchor: #10-16 TEKS Screw

Details: Through the PVC Frame
- 0.080" thick frame at anchor location
- 1/4" max shim space

Substrate: 6063-T5 Aluminum (1/8" thick)

Anchor Capacity (Shear of #10-16 TEKS)

$$P_{ss} / \Omega = \underline{573 \text{ lb}} \quad (\text{ESR-1976})$$

Bearing Capacity (of PVC frame)

$$P_b = D t F_{tu} = (0.190")(0.080")(10,000 \text{ psi})$$

$$P_b = \underline{152 \text{ lb}}$$

Bearing/Tilting Capacity (of aluminum substrate)

$$P_b = 2 D t F_{tu} = 2(0.190")(0.125")(22,000 \text{ psi}) = 1,045 \text{ lb}$$

$$P_{\text{allow}} = 1,045 \text{ lb} / 3.0 = \underline{348 \text{ lb}}$$

Bending Capacity (of Wood Screw)

$$L = 1/4" \text{ (maximum shim space)}$$

$$S = \pi d^3 / 32 = \pi (0.139")^3 / 32 = 0.000264 \text{ in}^3$$

$$F_b = (1.3)(0.6 F_y) = (1.3)(0.6)(92,000 \text{ psi}) = 71,760 \text{ psi} \quad (1.3 \text{ for weak axis bending})$$

$$F_b = M / S = (V) (L/2) / S \quad (L/2 \text{ for guided bending})$$

$$V = 2 S F_b / L = (2)(0.000264 \text{ in}^3)(71,760 \text{ psi}) / 1/4"$$

$$V = \underline{152 \text{ lb}}$$

Design Capacity of the Connection = 152 lb

Alternate Requirements

Series/Model: 3300 Fixed Lite
Test Unit Size: 84" x 60"
Design Pressure: ± 55 psf

Through-Frame Installation Method

Anchor Quantities:

Jambs:	4 per jamb
Head:	5
Sill:	5
Total:	18

Perimeter Load at Jambs

Jamb Load Area: $(84") (60") / 144 = 35 \text{ ft}^2$

Anchor Quantity: $n = 18$

Load to the Anchors = $(35 \text{ ft}^2) (55 \text{ psf}) = 1,925 \text{ lb}$

Individual Anchor Load = $1,925 \text{ lb} / 18 \text{ anchors} = 106.9 \text{ lb}$

Least Anchor Capacity = 122 lb (Wood) > 106.9 lb

Tested Anchor Spacing is OK

**** As calculated above, the individual anchor capacity is greater than the applied load on each anchor. Therefore, the as tested anchor spacing is acceptable.**

Revision Log

Rev. #	Date	Page(s)	Revision(s)
0	3/23/2025	All	Original Report Issue
1	4/23/2026	All	Added 1/8" thick aluminum as a substrate