

	PROJECT: QUAKER M700 Fixed Windows	BY: TAD DATE: 04/22/24
	PROJECT NO.: Q9365.01-122-34-r1 M700	CKD: ARK SHEET: 1 OF 36

Window Installation Analysis

QUAKER WINDOWS & DOORS M700 Fixed Windows

Report Q9365.01-122-34-r1 M700

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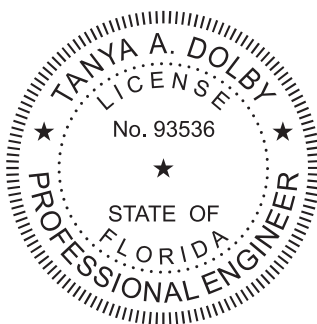
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April 22, 2024
April 29, 2024 (Revised)



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	PROJECT: QUAKER M700 Fixed Windows	BY: TAD DATE: 04/22/24
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Scope

Architectural Testing, Inc., an Intertek company, was contracted by Quaker Window & Doors to perform installation analysis for M700 Fixed Windows on test reports P4804.02-550-44-r1, J1887.01-801-44-r2, and H4940.01-801-44-r2.

The analyses performed satisfy the methods and requirements of the following:

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

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

ADM1-2020 Aluminum Design Manual. The Aluminum Association, Inc., 2020.

AISI S100-16(2020) North American Specification for the Design of Cold-Formed Steel Structural Members, 2016 Edition (Reaffirmed 2020). American Iron and Steel Institute, 2020.

ICC-ES Report ESR-1976 ITW Buildex TEKS Self-Drilling Fasteners. ICC Evaluation Service. 01/2023.

NOA 21-0628.20 Hilti Kwik-Con+ Concrete and Masonry Screw Anchor. Miami-Dade County Product Control Section. 08/19/2021.

AAMA TIR-A9-14 Design Guide for Metal Cladding Fasteners, Includes 2020 Addendum. American Architectural Manufacturers Association, 2014.

GANA Glazing Manual, 50th Anniversary Edition

The calculations presented herein are for the integrity of the window installations based on wind load only. The weather tightness of the installation is not addressed by this report. The air/water/structural performance of the individual products is not proven by this report.

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Certification of Independence

In accordance with Rule 61G20-3 Florida Administrative Code, Architectural Testing, Inc. hereby certifies the following:

- Architectural Testing 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.
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- Tanya A. Dolby, P.E. and Adam R. Kunkel do not have nor will acquire, a financial interest in any company manufacturing or distributing products for which the reports are being issued.
- Tanya A. Dolby, P.E. and Adam R. Kunkel do not have, nor will acquire, a financial interest in any other entity involved in the approval process of the product.

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Analyses

Summary of Test Results

The following table summarizes the M700 Fixed Windows and the corresponding performance level established by testing.

Table 1 Summary of Test Results

Series/Model	Test Report Number	Product Certification	Size (W x H)	Performance
M700 Fixed Window	P4804.02-550-44-r2 (03/16/23)	NI014240.03-R1	42" x 72"	+/- 50 psf
M700 Fixed Window with Louver	J1887.01-801-44 (Revision 2, 07/12/19)	NI014352-R5	60" x 94"	+/- 65 psf
M700 Fixed Window	H4940.01-801-44 (Revision 2, 07/08/19)	NI014240-R3	48" x 60"	+/- 70 psf

Testing documented in Table 1 was conducted by the Intertek Testing laboratory in Lithia Springs, Georgia (Florida Department of Business & Professional Regulation Test Lab No. TST3892, IAS Accredited Laboratory TL-338) and by the Architectural Testing laboratory in Plano, Texas (Florida Department of Business & Professional Regulation Test Lab No. TST1910, IAS Accredited Laboratory TL-331).

Additional test reports considered for anchorage:

- P6494.01-550-44-R1, 03/09/23: +/- 70 psf, 60" x 99", #8 PH Nail Fin to Wood, Located 3" from corners and 15 1/2" on center at head/sill/jambs.
- L5049.01-801-44-R3, 02/08/22: +/- 70 psf, 60" x 96", Unit #1, #12 PH Receptor to Wood, Located 3" from corners and 13" on center at jambs, 15" on center at head/sill.
- L5049.01-801-44-R3, 02/08/22: +/- 70 psf, 60" x 96", Unit #2, #12 PH Trim/Clip to Wood, Located 3" from corners and 12" on center at jambs, 14" on center at head/sill.
- J1890.01-801-44-R2, 07/12/19: +/- 70 psf, 60" x 96", #8 PH Nail Fin to Wood, Located 3" from corners and 15" on center at jambs, 18" on center at head/sill.

As-Tested Installation Analysis

The specimen was secured to a 2x Spruce-Pine-Fir wood buck with No. 12 x 2-1/2" Course Threaded Pan Head Screws or #8 x 1-5/8", Located 3" from each Corner and 15" maximum on center typical. Tested anchorage capacities are noted in Table 2.

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Table 2 As-Tested Anchorage Design Capacities

Installation	Connection	Capacity	Comments
Nailing Fin to Wood	#12 PH Wood Screw	118 lb	1. Limited by pull-over 2. 1 ½" minimum penetration 3. G = 0.55 Minimum SPF
Nailing Fin to Wood	#8 PH Wood Screw	86 lb	1. Limited by pull-over 2. 1 ½" minimum penetration 3. G = 0.55 Minimum SPF

Alternate Anchorage Requirements

Calculated alternate anchor capacities are summarized with fasteners as noted in Table 3 for Nailing Fin, Receptor, and Trim & Clip anchored into wood, metal stud, concrete, and CMU substrates.

The alternate anchorage spacing is limited by the least of the As-Tested Anchorage Design Capacities or the calculated Alternate Anchor Capacity for each condition. Maximum anchorage location and spacing is noted in Table 4A, 4B, and 4C for each condition. Maximum shim space between the window frame and surrounding substrate is 1/4" for all conditions. Anchors must be fully shimmed and supported.

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Calculated Alternate Anchorage Capacities

Table 3 Alternate Anchorage Capacity

Installation	Connection	Capacity	Comments
Nailing Fin to Wood	#10 PH Wood Screw	104 lb	1. Limited by pull-over 2. 1 ½" minimum penetration 3. G = 0.55 Minimum SPF
Nailing Fin to Wood	#10 Round Washer Head Wood Screw	178 lb	1. Limited by pull-over 2. 1 ½" minimum penetration 3. G = 0.55 Minimum SPF
Nailing Fin to Metal Stud	#10 HWH TEKS Screw	116 lb	1. Limited by pull-out 2. Full penetration +3 threads 3. Min 18 gauge 33 KSI steel
Receptor to Wood	#12 PH Wood Screw	180 lb	1. Limited by fastener bending 2. 1-1/2" minimum penetration 3. G = 0.55 Minimum SPF
Receptor to Metal Stud	#12 TEKS Screw	209 lb	1. Limited by fastener bending 2. Full penetration +3 threads 3. Min 18 gauge 33 KSI steel
Receptor to Concrete/CMU	3/16" Hilti Kwik-Con+	113 lb	1. Limited by fastener bending 2. 1" minimum embedment 3. Min 3,000 psi or C90 CMU
Trim & Clip to Aluminum Frame	#10 TEKS Screw	101 lb	1. Limited by clip to window pullout 2. Full penetration +3 threads 3. 6063-T6 Aluminum Frame
Trim & Clip to Wood	#12 PH Wood Screw	101 lb	1. Limited by clip to window pullout 2. 1" minimum embedment 3. G = 0.55 Minimum SPF
Trim & Clip to Steel	#12 TEKS Screw	101 lb	1. Limited by clip to window pullout 2. Full penetration +3 threads 3. Min 18 gauge 33 KSI steel
Trim & Clip to Concrete/CMU	3/16" Hilti Kwik-Con+	101 lb	4. Limited by clip to window pullout 5. 1" minimum embedment 6. Min 3,000 psi or C90 CMU

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Required Anchor Spacing at 50 psf, 70 psf and 65 psf Design Pressures

Calculations presented in pages 12 to 23 determine the capacities for the evaluated anchorage conditions. Anchorage locations and spacings noted in Table 4A, 4B, and 4C below are the least of the actual tested capacities or the calculated capacities shown on pages 24 and 25 of 36.

Table 4A Alternate Anchorage Requirements – 42" x 72" Window, 50 psf

Installation	Connection	Anchorage Location and Spacing
Nailing Fin to Wood	#10 PH Wood Screw	3" from corners and 14" on center short side and 15" on center long side
Nailing Fin to Wood	#10 Round Washer Head Wood Screw	3" from corners and 14" on center short side and 15" on center long side
Nailing Fin to Metal Stud	#10 HWH TEKS Screw	3" from corners and 14" on center short side and 15" on center long side
Receptor to Wood	#12 PH Wood Screw	3" from corners and 14" on center short side and 15" on center long side
Receptor to Metal Stud	#12 TEKS Screw	3" from corners and 14" on center short side and 15" on center long side
Receptor to Concrete/CMU	3/16" Hilti Kwik-Con+	3" from corners and 14" on center short side and 15" on center long side
Trim & Clip to Aluminum Frame	#10 TEKS Screw	3" from corners and 14" on center short side and 15" on center long side
Trim & Clip to Wood	#12 PH Wood Screw	3" from corners and 14" on center short side and 15" on center long side
Trim & Clip to Steel	#12 TEKS Screw	3" from corners and 14" on center short side and 15" on center long side
Trim & Clip to Concrete/CMU	3/16" Hilti Kwik-Con+	3" from corners and 14" on center short side and 15" on center long side

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Table 4B Alternate Anchorage Requirements – 48” x 60” Window, 70 psf

Installation	Connection	Anchorage Location and Spacing
Nailing Fin to Wood	#10 PH Wood Screw	3” from corners and 11” on center short side and 10” on center long side
Nailing Fin to Wood	#10 Round Washer Head Wood Screw	3” from corners and 15” on center short side and 15” on center long side
Nailing Fin to Metal Stud	#10 HWH TEKS Screw	3” from corners and 12” on center short side and 11” on center long side
Receptor to Wood	#12 PH Wood Screw	3” from corners and 14” on center short side and 15” on center long side
Receptor to Metal Stud	#12 TEKS Screw	3” from corners and 14” on center short side and 15” on center long side
Receptor to Concrete/CMU	3/16” Hilti Kwik-Con+	3” from corners and 12” on center short side and 10” on center long side
Trim & Clip to Aluminum Frame	#10 TEKS Screw	3” from corners and 10” on center short side and 9” on center long side
Trim & Clip to Wood	#12 PH Wood Screw	3” from corners and 10” on center short side and 9” on center long side
Trim & Clip to Steel	#12 TEKS Screw	3” from corners and 10” on center short side and 9” on center long side
Trim & Clip to Concrete/CMU	3/16” Hilti Kwik-Con+	3” from corners and 10” on center short side and 9” on center long side

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Table 4C Alternate Anchorage Requirements - **60" x 94" Window, 65 psf**

Installation	Connection	Anchorage Location and Spacing
Nailing Fin to Wood	#10 PH Wood Screw	3" from corners and 9" on center short side and 8" on center long side
Nailing Fin to Wood	#10 Round Washer Head Wood Screw	3" from corners and 15" on center short side and 13" on center long side
Nailing Fin to Wood	#12 Round Washer Head Wood Screw	3" from corners and 10" on center short side and 9" on center long side

Glass Analysis

Glass Analysis was conducted on pages 26 to 28 of 36 per ASTM E1300.

Reference Drawings

The reference drawings are the basis of the analysis presented herein and may not reflect the requirements established by this analysis.

- M700 Fixed Impact Installation Instructions, 04-10-2024, 42" x 72" +/- 50 psf
- M700 Fixed Impact Installation Instructions, 04-10-2024, 48" x 60" +/- 70 psf
- M700 Fixed Impact Installation Instructions, 04-11-2024, 60" x 94" +/- 65 psf

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As-Tested Installation – Nail Fin to Wood

#8 x 1-1/2" Pan Head Wood/Deck Screw (Non-Countersunk)

$D_{ws} = (0.322" + 0.306")/2 = 0.314"$ (Nominal Screw Head Diameter)

$D_H = 0.177"$ (Section 11.0, AAMA TIR-A9)

1-1/2" Minimum Penetration

1/16" thick 6063-T6 Aluminum Nailing Fin

G = 0.55 Minimum SYP 2x Wood Blocking

¼" maximum shim space

ASD Withdrawal

Withdrawal of #8 Wood Screw

$$W' = 2,850(G^2)(D)(Cd)(Cm)(Ct)(Ceg)(Ctn)(L)$$

$$W' = 2,850 (0.55^2)(0.164")(1.6)(0.7)(0.7)(1.00)(1.0)(1.50")$$

$$W' = 142 \text{ lb}$$

Adjustment Factors

Load Duration Factor - Ten Minutes, $C_d = 1.6$

Moisture Factor - Fabrication > 19% and In-Service > 19%, $C_m = 0.7$

Temperature Factor - $100^\circ\text{F} < T \leq 125^\circ\text{F}$, $C_t = 0.7$

End Grain Factor - No, $C_{eg} = 1.00$

Toe Nail Factor - No, $C_{tn} = 1.0$

Pull-Over of #8 PH Wood Screw

$$P_{nov} = C_{pov} t_1 F_{tu1} (D_{ws} - D_h) / 3.0$$

$$P_{nov} = 1.0(0.0625")(30,000 \text{ psi})(0.314" - 0.177") / 3.0$$

$$P_{nov} = 86 \text{ lb}$$

Calculated Capacity of Connection is 86 lb

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As-Tested Installation – Nailing Fin to Wood Blocking

#12 Pan Head Wood Screw

1-1/2" Minimum Penetration

1/16" thick 6063-T6 Aluminum Nailing Fin

G = 0.55 Minimum SYP 2x Wood Blocking

¼" maximum shim space

ASD Withdrawal

Withdrawal of #12 PH Wood Screw

$$\begin{aligned}
 W' &= 2,850(G^2)(D)(Cd)(Cm)(Ct)(Ceg)(Ctn)(L) \\
 W' &= 2,850 (0.55^2)(0.216")(1.6)(0.7)(0.7)(1.00)(1.0)(1.50") \\
 W' &= 219 \text{ lb}
 \end{aligned}$$

Adjustment Factors

Load Duration Factor - Ten Minutes, $C_d = 1.6$
Moisture Factor - Fabrication > 19% and In-Service > 19%, $C_m = 0.7$
Temperature Factor - $100^\circ\text{F} < T \leq 125^\circ\text{F}$, $C_t = 0.7$
End Grain Factor - No, $C_{eg} = 1.00$
Toe Nail Factor - No, $C_{tn} = 1.0$

Pull-Over of #12 PH Wood Screw

$$\begin{aligned}
 P_{nov} &= C_{pov} t_1 F_{tu1} (D_{ws} - D_h) / 3.0 \\
 P_{nov} &= 1.0(0.0625")(30,000 \text{ psi})(0.416" - 0.228") / 3.0 \\
 P_{nov} &= 118 \text{ lb}
 \end{aligned}$$

Calculated Capacity of Connection is 118 lb

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NAIL FIN ALTERNATE ANCHORAGE

Alternate Installation – #10 Pan Head Wood Screw, Nail Fin to Wood

#10 Pan Head Wood Screw

$D_{ws} = (0.373" + .0357")/2 = 0.365"$ (Nominal Screw Head Diameter)

$D_H = 0.201"$ (Nominal Hole Size, AAMA TIR-A9, Table 11.1)

1-1/2" Minimum Penetration

1/16" thick 6063-T6 Aluminum Nailing Fin

G = 0.55 Minimum SYP 2x Wood Blocking

¼" maximum shim space

ASD Withdrawal

Withdrawal of #10 PH Wood Screw

$$W' = 2,850(G^2)(D)(Cd)(Cm)(Ct)(Ceg)(Ctn)(L)$$

$$W' = 2,850 (0.55^2)(0.190")(1.6)(0.7)(0.7)(1.00)(1.0)(1.50")$$

$$W' = 192 \text{ lb}$$

Adjustment Factors

Load Duration Factor - Ten Minutes, $C_d = 1.6$

Moisture Factor - Fabrication > 19% and In-Service > 19%, $C_m = 0.7$

Temperature Factor - $100^\circ\text{F} < T \leq 125^\circ\text{F}$, $C_t = 0.7$

End Grain Factor - No, $C_{eg} = 1.00$

Toe Nail Factor - No, $C_{tn} = 1.0$

Pull-Over of #10 PH Wood Screw

$$P_{nov} = C_{pov} t_1 F_{tu1} (D_{ws} - D_h) / 3.0$$

$$P_{nov} = 1.0(0.0625")(30,000 \text{ psi})(0.365" - 0.199") / 3.0$$

$$P_{nov} = 104 \text{ lb}$$

Calculated Capacity of Connection is 104 lb

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Alternate Installation – #10 Round Washer Head Wood Screw, Nail Fin to Wood

#10 Round Washer Head Wood Screw

$D_{ws} = (0.500" + .472")/2 = 0.486"$ (Nominal Screw Head Diameter)

$D_H = 0.201"$ (Nominal Hole Size, AAMA TIR-A9, Table 11.1)

1-1/2" Minimum Penetration

1/16" thick 6063-T6 Aluminum Nailing Fin

G = 0.55 Minimum SYP 2x Wood Blocking

¼" maximum shim space

ASD Withdrawal

Withdrawal of #10 Wood Screw

$$W' = 2,850(G^2)(D)(Cd)(Cm)(Ct)(Ceg)(Ctn)(L)$$

$$W' = 2,850 (0.55^2)(0.190")(1.6)(0.7)(0.7)(1.00)(1.0)(1.50")$$

$$W' = 192 \text{ lb}$$

Adjustment Factors

Load Duration Factor - Ten Minutes, $C_d = 1.6$

Moisture Factor - Fabrication > 19% and In-Service > 19%, $C_m = 0.7$

Temperature Factor - $100^\circ\text{F} < T \leq 125^\circ\text{F}$, $C_t = 0.7$

End Grain Factor - No, $C_{eg} = 1.00$

Toe Nail Factor - No, $C_{tn} = 1.0$

Pull-Over of #10 Round Washer Head Wood Screw

$$P_{nov} = C_{pov} t_1 F_{tu1} (D_{ws} - D_H) / 3.0$$

$$P_{nov} = 1.0(0.0625")(30,000 \text{ psi})(0.486" - 0.201") / 3.0$$

$$P_{nov} = 178 \text{ lb}$$

Calculated Capacity of Connection is 178 lb

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Alternate Installation – #10 HWH TEKS Screw, Nailing Fin to Steel Stud

#10 HWH TEKS Screw

Full Penetration +3 Threads

1/16" thick 6063-T6 Aluminum Nailing Fin

Minimum 18 Gauge 33 KSI Steel Stud (Qualifies thicker and stronger steel)

¼" maximum shim space

Allowable Tension of #10-16 TEKS Screw

$$V_a = 885 \text{ lb} \quad (\text{ESR-1976})$$

Pull-Over of #10 HWH TEKS Screw in Nail Fin

$$P_{nov} = C_{pov} t_1 F_{tu1} (D_{ws} - D_h) / 3.0$$

$$P_{nov} = 1.0(0.0625")(30,000 \text{ psi})(0.400" - 0.190") / 3.0$$

$$P_{nov} = 131 \text{ lb}$$

Pull-Out of #10 HWH TEKS Screw in Steel Stud

$$P_{not} = 0.85 t_c d F_{u2} / 3.0$$

$$P_{not} = 0.85(0.0478")(0.190")(45,000 \text{ psi}) / 3.0$$

$$P_{not} = 116 \text{ lb}$$

Calculated Capacity of Connection is 116 lb

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RECEPTOR ALTERNATE ANCHORAGE

Alternate Installation – #12 x 2-1/2" Wood Screw, Receptor to Wood Blocking

#12 x 2-1/2" Wood Screw (Non-Countersunk)

1-1/2" Minimum Penetration

1/16" thick 6063-T6 Aluminum Nailing Fin

G = 0.55 Minimum SYP 2x Wood Blocking

1/4" Maximum Shim Space

0.6875" Maximum Shim Space

Allowable Shear

$$Z' = 193 \text{ lb}$$

Bending of #12 Wood Screw

$$S = \pi d^3 / 32 = \pi (0.216")^3 / 32 = 0.001 \text{ in}^3$$

$$F_b = (1.3)(0.6F_y) = (1.3)(0.6)(80,000 \text{ psi}) = 62,400 \text{ psi (1.3 factor for weak axis bending)}$$

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

$$V = 2SF_b/L = (2)(0.001 \text{ in}^3)(62,400 \text{ psi})/0.6875" = 180 \text{ lb}$$

Capacity of Connection is 180 lb

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Alternate Installation – Receptor to Steel Stud

#12-14 TEKS Screw

Full Penetration +3 Threads

1/16" thick 6063-T6 Aluminum Receptor

Minimum 18 Gauge 33 KSI Steel Stud (Qualifies thicker and stronger steel)

1/4" Maximum Shim Space

0.6875" Maximum Bending Space

Allowable Shear of #12-14 TEKS Screw

$$V_a = 724 \text{ lb} \quad (\text{ESR-1976})$$

Bearing of #12-14 TEKS Screw on Receptor

$$V_a = 2DtF_u/n_u$$

$$V_a = 2(0.216")(0.0625")(30,000 \text{ psi})/3.0$$

$$V_a = 270 \text{ lb}$$

Bearing of #12-14 TEKS Screw on Steel Stud

$$V_a = 2.7DtF_u/n_u$$

$$V_a = 2.7(0.216")(0.0478")(45,000 \text{ psi})/3.0$$

$$V_a = 418 \text{ lb}$$

Tilting of #12-14 TEKS Screw in Steel

$$V_a = 4.2(t_2^3 D)^{1/2} F_{tu}/n_s$$

$$V_a = 4.2(0.0478^3 \times 0.216)^{1/2} (45,000 \text{ psi})/3.0$$

$$V_a = 306 \text{ lb}$$

Bending of #12-14 TEKS Screw

$$S = \pi d^3/32 = \pi(0.216")^3/32 = 0.001 \text{ in}^3$$

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

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

$$V = 2SF_b/L = (2)(0.001 \text{ in}^3)(71,760 \text{ psi})/0.6875" = 209 \text{ lb}$$

Capacity of Connection is 209 lb

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Alternate Installation – Receptor to Concrete

3/16" Hilti Kwik-Con+ Anchor

1" Minimum Embedment

1-1/2" Minimum Edge Distance

2" Minimum Spacing

1/16" thick 6063-T6 Aluminum Receptor

Minimum $f'_c = 3,000$ psi Concrete

1/4" Maximum Shim Space

1/2" Maximum Bending Space at screw spline “v” groove location

Allowable Shear of 3/16" Hilti Kwik-Con+ Anchor

$$P_{ss}/\Omega = 215 \text{ lb} \quad (\text{NOA-No. 21-0628.20})$$

Bearing of 3/16" Hilti Kwik-Con+ in Receptor

$$V_a = 2DtF_u/n_u$$

$$V_a = 2(0.1875")(0.0625")(30,000 \text{ psi})/3.0$$

$$V_a = 234 \text{ lb}$$

Bending of 3/16" Hilti Kwik-Con+

$$S = \pi d^3/32 = \pi(0.145")^3/32 = 0.0003 \text{ in}^3$$

$$F_y = 120,000 \text{ psi per Miami Dade NOA 20-0427.13}$$

$$F_b = (1.3)(0.6F_y) = (1.3)(0.6)(120,000 \text{ psi}) = 93,600 \text{ psi (1.3 factor for rod bending)}$$

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

$$V = 2SF_b/L = (2)(0.0003 \text{ in}^3)(93,600 \text{ psi})/0.500" = 113 \text{ lb}$$

Capacity of Connection is 113 lb

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	PROJECT NO.: Q9365.01-122-34-r1 M700	CKD: ARK SHEET: 18 OF 36

Alternate Installation – Receptor to CMU

3/16" Hilti Kwik-Con+ Anchor

1" Minimum Embedment

1-1/2" Minimum Edge Distance

3" Minimum Spacing

1/16" thick 6063-T6 Aluminum Receptor

Minimum f'm = 1,500 psi ASTM C90 Concrete Masonry

1/4" Maximum Shim Space

1/2" Maximum Bending Space at screw spline “v” groove location

Allowable Shear of 1/4" Hilti Kwik-Con+ Anchor

$$P_{ss}/\Omega = 150 \text{ lb} \quad (\text{NOA-No. 21-0628.20})$$

Bearing of 3/16" Hilti Kwik-Con+ in Receptor

$$V_a = 2DtF_u/n_u$$

$$V_a = 2(0.1875")(0.0625")(30,000 \text{ psi})/3.0$$

$$V_a = 234 \text{ lb}$$

Bending of 3/16" Hilti Kwik-Con+

$$S = \pi d^3/32 = \pi(0.145")^3/32 = 0.0003 \text{ in}^3$$

$$F_y = 120,000 \text{ psi per Miami Dade NOA 20-0427.13}$$

$$F_b = (1.3)(0.6F_y) = (1.3)(0.6)(120,000 \text{ psi}) = 93,600 \text{ psi (1.3 factor for rod bending)}$$

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

$$V = 2SF_b/L = (2)(0.0003 \text{ in}^3)(93,600 \text{ psi})/0.500" = 113 \text{ lb}$$

Capacity of Connection is 113 lb

	PROJECT: QUAKER M700 Fixed Windows	BY: TAD DATE: 04/22/24
	PROJECT NO.: Q9365.01-122-34-r1 M700	CKD: ARK SHEET: 19 OF 36

TRIM & CLIP ALTERNATE ANCHORAGE

Alternate Anchorage – Trim & Clip to Window Frame (All substrates)

#10-16 x 5/18" TEKS Screw

Full Penetration +3 Threads

1/16" thick 6063-T6 Aluminum Trim Clip

1/16" thick 6063-T6 Aluminum Window Frame

Allowable Tension of #10-16 TEKS Screw

$$V_a = 885 \text{ lb} \quad (\text{ESR-1976})$$

Pull-Over of #10-16 TEKS Screw in Trim Clip

$$P_{nov} = C_{pov} t_1 F_{tu1} (D_{ws} - D_h) / 3.0$$

$$P_{nov} = 1.0(0.0625)(30,000 \text{ psi})(0.400" - 0.201") / 3.0$$

$$P_{nov} = 124 \text{ lb}$$

Pull-Out of #10-16 TEKS Screw in Window Frame

$$P_{not} = 96 \text{ lb} \quad (\text{AAMA TIR-19, Table 22.11})$$

Interpolate For 0.063" Thick

$$(0.072 - 0.063) / (0.072 - 0.060) = (116 - x) / (116 - 96)$$

$$P_{not} = x = 101 \text{ lb}$$

Capacity of Connection is 101 lb

	PROJECT: QUAKER M700 Fixed Windows	BY: TAD DATE: 04/22/24
	PROJECT NO.: Q9365.01-122-34-r1 M700	CKD: ARK SHEET: 20 OF 36

Alternate Installation – Trim & Clip to Wood Blocking

#12 Wood Screw (Non-Countersunk)

1-1/2" Minimum Penetration

1/16" thick 6063-T6 Aluminum Trim Clip

G = 0.55 Minimum SYP 2x Wood Blocking

1/4" Maximum Shim Space allowed

Allowable Shear of #12 Wood Screw

$$Z' = 193 \text{ lb}$$

Bearing of #12 Screw

$$V_a = 2DtF_u/n_u$$

$$V_a = 2(0.216")(0.0625")(30,000 \text{ psi})/3.0$$

$$V_a = 270 \text{ lb}$$

Bending of #12 Wood Screw

$$S = \pi d^3/32 = \pi(0.216")^3/32 = 0.001 \text{ in}^3$$

$$F_b = (1.3)(0.6F_y) = (1.3)(0.6)(80,000 \text{ psi}) = 62,400 \text{ psi (1.3 factor for weak axis bending)}$$

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

$$V = 2SF_b/L = (2)(0.001 \text{ in}^3)(62,400 \text{ psi})/0.25" = 500 \text{ lb}$$

Capacity of Connection is 193 lb
Capacity of Connection Assembly is 101 lb

	PROJECT: QUAKER M700 Fixed Windows	BY: TAD DATE: 04/22/24
	PROJECT NO.: Q9365.01-122-34-r1 M700	CKD: ARK SHEET: 21 OF 36

Alternate Installation – Trim & Clip to Steel Stud

#12-14 TEKS Screw

Full Penetration +3 Threads

1/16" thick 6063-T6 Aluminum Trim Clip

Minimum 18 Gauge 33 KSI Steel Stud (Qualifies thicker and stronger steel)

1/4" Maximum Shim Space

No Bending

Allowable Shear of #12-14 TEKS Screw

$$V_a = 724 \text{ lb} \quad (\text{ESR-1976})$$

Bearing of #12-14 TEKS Screw on Trim Clip

$$V_a = 2DtF_u/n_u$$

$$V_a = 2(0.216")(0.0625")(30,000 \text{ psi})/3.0$$

$$V_a = 270 \text{ lb}$$

Bearing of #12-14 TEKS Screw on Steel Stud

$$V_a = 2.7DtF_u/n_u$$

$$V_a = 2.7(0.216")(0.0478")(45,000 \text{ psi})/3.0$$

$$V_a = 418 \text{ lb}$$

Tilting of #12-14 TEKS Screw in Steel

$$V_a = 4.2(t_2^3 D)^{1/2} F_{tu}/n_s$$

$$V_a = 4.2(0.0478^3 \times 0.216)^{1/2} (45,000 \text{ psi})/3.0$$

$$V_a = 306 \text{ lb}$$

Capacity of Connection is 270 lb
Capacity of Connection Assembly is 101 lb

	PROJECT: QUAKER M700 Fixed Windows	BY: TAD DATE: 04/22/24
	PROJECT NO.: Q9365.01-122-34-r1 M700	CKD: ARK SHEET: 22 OF 36

Alternate Installation – Trim & Clip to Concrete

3/16" Hilti Kwik-Con+ Anchor

1" Minimum Embedment

1-1/2" Minimum Edge Distance

2" Minimum Spacing

1/16" thick 6063-T6 Aluminum Trim Clip

Minimum $f'_c = 3,000$ psi Concrete

1/4" Maximum Shim Space

No Bending

Allowable Shear of 3/16" Hilti Kwik-Con+ Anchor

$$P_{ss}/\Omega = 215 \text{ lb} \quad (\text{NOA-No. 21-0628.20})$$

Bearing of 3/16" Hilti Kwik-Con+ in Trim Clip

$$V_a = 2DtF_u/n_u$$

$$V_a = 2(0.145")(0.0625")(30,000 \text{ psi})/3.0$$

$$V_a = 181 \text{ lb}$$

Capacity of Connection is 181 lb
Capacity of Connection Assembly is 101 lb

	PROJECT: QUAKER M700 Fixed Windows	BY: TAD DATE: 04/22/24
	PROJECT NO.: Q9365.01-122-34-r1 M700	CKD: ARK SHEET: 23 OF 36

Alternate Installation – Trim & Clip to CMU

3/16" Hilti Kwik-Con+ Anchor

1" Minimum Embedment

1-1/2" Minimum Edge Distance

3" Minimum Spacing

1/16" thick 6063-T6 Aluminum Trim Clip

Minimum f'm = 1,500 psi ASTM C90 Concrete Masonry

1/4" Maximum Shim Space

No Bending

Allowable Shear of 3/16" Hilti Kwik-Con+ Anchor

$$P_{ss}/\Omega = 150 \text{ lb} \quad (\text{NOA-No. 21-0628.20})$$

Bearing of 3/16" Hilti Kwik-Con+ in Trim & Clip

$$V_a = 2DtF_u/n_u$$

$$V_a = 2(0.145")(0.0625")(30,000 \text{ psi})/3.0$$

$$V_a = 181 \text{ lb}$$

Capacity of Connection is 150 lb
Capacity of Connection Assembly is 101 lb

Note: A #10-16 TEKS screw is used to connect the trim clip to window frame. The capacity of this connection is 101 lb as shown on page 19. This connection governs the capacity of all trim clip installation methods.

	PROJECT: QUAKER M700 Fixed Windows	BY: TAD DATE: 04/22/24
	PROJECT NO.: Q9365.01-122-34-r1 M700	CKD: ARK SHEET: 24 OF 36

Anchorage Spacing Calculation

42" x 72" Window, 50 psf

Window	Description	Anchor Capacity	Short, w (inch)	Long, h (inch)	w/h	gamma	R (lb/inch)	Anchor Spacing (in)
Nail Fin								
Jamb Head	#10 PH to Wood	104.0	42.00	72.00	1.71	0.496	7.24	14
			42.00	42.00	1.00	0.420	6.12	17
Jamb Head	#10 Round Head w/ Washer to Wood	178.0	42.00	72.00	1.71	0.496	7.24	25
			42.00	42.00	1.00	0.420	6.12	29
Jamb Head	#12 PH to Wood	118.0	42.00	72.00	1.71	0.496	7.24	16
			42.00	42.00	1.00	0.420	6.12	19
Jamb Head	#10 TEKS to Metal Stud	116.0	42.00	72.00	1.71	0.496	7.24	16
			42.00	42.00	1.00	0.420	6.12	19
Receptor								
Jamb Head	#12 Wood Screw	180.0	42.00	72.00	1.71	0.496	7.24	25
			42.00	42.00	1.00	0.420	6.12	29
Jamb Head	#12 TEKS Screw	209.0	42.00	72.00	1.71	0.496	7.24	29
			42.00	42.00	1.00	0.420	6.12	34
Jamb Head	3/16" Hilti Kwik-Con+	113.0	42.00	72.00	1.71	0.496	7.24	16
			42.00	42.00	1.00	0.420	6.12	18
Trim & Clip								
Jamb Head	#10-16 TEKS Clip to Frame	101.0	42.00	72.00	1.71	0.496	7.24	14
			42.00	42.00	1.00	0.420	6.12	16
Jamb Head	#12 Wood Screw	101.0	42.00	72.00	1.71	0.496	7.24	14
			42.00	42.00	1.00	0.420	6.12	16
Jamb Head	#12 TEKS Screw	101.0	42.00	72.00	1.71	0.496	7.24	14
			42.00	42.00	1.00	0.420	6.12	16
Jamb Head	#12 TEKS Screw	101.0	42.00	72.00	1.71	0.496	7.24	14
			42.00	42.00	1.00	0.420	6.12	16

Anchor Spacing is limited to the least of the calculated spacing above or the as tested spacing of 14" on center short side and 15" on center long side.

	PROJECT: QUAKER M700 Fixed Windows	BY: TAD DATE: 04/22/24
	PROJECT NO.: Q9365.01-122-34-r1 M700	CKD: ARK SHEET: 25 OF 36

48" x 60" Window, 70 psf

Window	Description	Anchor	Short, w	Long, h	w/h	gamma	R	Anchor
Nail Fin								
Jamb Head	#10 PH to Wood	104.0	48.00 48.00	60.00 48.00	1.25 1.00	0.462 0.420	10.78 9.80	10 11
Jamb Head	#10 Round Head w/ Washer to Wood	178.0	48.00 48.00	60.00 48.00	1.25 1.00	0.462 0.420	10.78 9.80	17 18
Jamb Head	#12 PH to Wood	118.0	48.00 48.00	60.00 48.00	1.25 1.00	0.462 0.420	10.78 9.80	11 12
Jamb Head	#10 TEKS to Metal Stud	116.0	48.00 48.00	60.00 48.00	1.25 1.00	0.462 0.420	10.78 9.80	11 12
Receptor								
Jamb Head	#12 Wood Screw	180.0	48.00 48.00	60.00 48.00	1.25 1.00	0.462 0.420	10.78 9.80	17 18
Jamb Head	#12 TEKS Screw	209.0	48.00 48.00	60.00 48.00	1.25 1.00	0.462 0.420	10.78 9.80	19 21
Jamb Head	3/16" Hilti Kwik-Con+	113.0	48.00 48.00	60.00 48.00	1.25 1.00	0.462 0.420	10.78 9.80	10 12
Trim & Clip								
Jamb Head	#10-16 TEKS Clip to Frame	101.0	48.00 48.00	60.00 48.00	1.25 1.00	0.462 0.420	10.78 9.80	9 10
Jamb Head	#12 Wood Screw	101.0	48.00 48.00	60.00 48.00	1.25 1.00	0.462 0.420	10.78 9.80	9 10
Jamb Head	#12 TEKS Screw	101.0	48.00 48.00	60.00 48.00	1.25 1.00	0.462 0.420	10.78 9.80	9 10
Jamb Head	#12 TEKS Screw	101.0	48.00 48.00	60.00 48.00	1.25 1.00	0.462 0.420	10.78 9.80	9 10

Anchor Spacing is limited to the least of the calculated spacing above or the as tested spacing of 15" maximum on center.

60" x 94" Window, 65 psf

Window	Description	Anchor Capacity	Short, w (inch)	Long, h (inch)	w/h	gamma	R (lb/inch)	Anchor Spacing (in)
Jamb Head	#10 PH to to Wood	104.0	60.00	94.00	1.57	0.489	13.26	8
			60.00	60.00	1.00	0.420	11.37	9
Jamb Head	#10 Round Head w/ Washer to Wood	178.0	60.00	94.00	1.57	0.489	13.26	13
			60.00	60.00	1.00	0.420	11.37	16
Jamb Head	#12 PH to Wood	118.0	60.00	94.00	1.57	0.489	13.26	9
			60.00	60.00	1.00	0.420	11.37	10

Anchor Spacing is limited to the least of the calculated spacing above or the as tested spacing of 15" maximum on center.

	PROJECT: QUAKER M700 Fixed Windows	BY: TAD DATE: 04/22/24
	PROJECT NO.: Q9365.01-122-34-r1 M700	CKD: ARK SHEET: 26 OF 36

Glass Analysis

42" x 72" Window, 50 psf

Analysis 1

Load Resistance Report

April 18, 2024

Details

Selected standard: ASTM E1300 Extended Basic

Glazing Construction (Double Glazed Insulating Unit)

Exterior Lite Properties (1/4 in. Monolithic)

Construction: 1/4 in. (FT)

Airspace Properties

Thickness: 0.438 in.

Interior Lite Properties (1/4 in. Laminated)

Construction: 1/8 in. (AN) | 0.090 in. (PVB) | 1/8 in. (AN)

Load Resistance

Short Duration (3 Sec)

<u>Description</u>	<u>NFL</u>	<u>GTF</u>	<u>LSF</u>	<u>LR</u>
Exterior Lite	47.8 psf	3.80	1/0.500	363 psf
Interior Lite	46.2 psf	1.00	1/0.500	92.4 psf

Comparisons

Scenario 1	
50.0 psf 3.00 sec <= 92.4 psf	OK
Approximate center of glass deflection	
Exterior Lite	0.31 in.
Interior Lite	0.46 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.

	PROJECT: QUAKER M700 Fixed Windows	BY: TAD DATE: 04/22/24
	PROJECT NO.: Q9365.01-122-34-r1 M700	CKD: ARK SHEET: 27 OF 36

48" x 60" Window, 70 psf

Analysis 1

Load Resistance Report

April 18, 2024

Details

Selected standard: ASTM E1300 Extended Basic

Glazing Construction (Double Glazed Insulating Unit)

Exterior Lite Properties (1/4 in. Monolithic)

Construction: 1/4 in. (FT)

Airspace Properties

Thickness: 0.438 in.

Interior Lite Properties (1/4 in. Laminated)

Construction: 1/8 in. (AN) | 0.090 in. (PVB) | 1/8 in. (AN)

Load Resistance

Short Duration (3 Sec)

Description	NFL	GTF	LSF	LR
Exterior Lite	56.6 psf	3.80	1/0.500	430 psf
Interior Lite	50.2 psf	1.00	1/0.500	100 psf

Comparisons

Scenario 1	
70.0 psf 3.00 sec <= 100 psf	OK
Approximate center of glass deflection	
Exterior Lite	0.40 in.
Interior Lite	0.53 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.

	PROJECT: QUAKER M700 Fixed Windows	BY: TAD DATE: 04/22/24
	PROJECT NO.: Q9365.01-122-34-r1 M700	CKD: ARK SHEET: 28 OF 36

60" x 94" Window, 65 psf

Analysis 1

Load Resistance Report

April 18, 2024

Details

Selected standard: ASTM E1300 Extended Basic

Glazing Construction (Double Glazed Insulating Unit)

Exterior Lite Properties (1/4 in. Monolithic)

Construction: 1/4 in. (FT)

Airspace Properties

Thickness: 0.438 in.

Interior Lite Properties (1/4 in. Laminated)

Construction: 1/8 in. (AN) | 0.090 in. (PVB) | 1/8 in. (AN)

Load Resistance

Short Duration (3 Sec)

Description	NFL	GTF	LSF	LR
Exterior Lite	41.1 psf	3.80	1/0.500	312 psf
Interior Lite	35.0 psf	1.00	1/0.500	70.0 psf

Comparisons

Scenario 1	
65.0 psf 3.00 sec <= 70.0 psf	OK
Approximate center of glass deflection	
Exterior Lite	0.64 in.
Interior Lite	0.76 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.

	PROJECT: QUAKER M700 Fixed Windows	BY: TAD DATE: 04/22/24
	PROJECT NO.: Q9365.01-122-34-r1 M700	CKD: ARK SHEET: 29 OF 36

REFERENCE MATERIAL

Lateral Design Strength of Wood Connections

Data

Fastener	
Fastener	= #12 Wood Screw
Shank Dia	= 0.216 in.
Root Dia.	= 0.171 in.
F _{yb}	= 80,000 psi
Fastener length	= 2.500 in.
Main Member	
Material	= SPF
G	= 0.55
θ	= 90 <= (Angle of load to grain 0° ≤ θ ≤ 90°)
F _e	= 3,350 psi
Thickness	= 1.500 in.
Side Member	
Material	= 6063 T6 Aluminum
G	= N/A
θ	= 0 <= (Angle of load to grain 0° ≤ θ ≤ 90°)
F _{es}	= 37,500 psi
Thickness	= 0.063 in.

Calculations

Lateral Bearing Factors

D	=	0.171 in.
ℓ _m	=	1.500 in.
K _θ	=	1.25
K _D	=	2.21
R _e	=	0.089
R _t	=	23.81
k ₁	=	0.8593
k ₂	=	0.5564
k ₃	=	15.41

Yield Mode	R _d
I _{mv} I _s	2.21
II	2.21
III _{mv} III _{sp} IV	2.21

Lateral Design Values, Z

Mode I _m	=	389 lbf	
Mode I _s	=	183 lbf	
Mode II	=	157 lbf	
Mode III _m	=	184 lbf	
Mode III _s	=	120 lbf	<===== Minimum Value
Mode IV	=	169 lbf	
C _D	=	1.6	
Wet Service Factor			
Fabrication/In-Service		Dry/Dry	
C _M	=	1.0	
In service temperature		T ≤ 100°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	
Z'	=	193 lbf	

HILTI KWIK-CON +

DESCRIPTION

Carbon steel screw anchors have a minimum yield strength of 120 ksi and a minimum tensile strength of 150 ksi. The screw anchors have a zinc coating with a minimum thickness of 8 µm and are coated with an organic coating to resist corrosion. Three-sixteenths and 1/4-in. carbon steel screw anchors are available in 1-1/4, 1-3/4, 2-1/4, 2-3/4, 3-1/4 3-3/4 and 4 inch lengths.

PRODUCT REVISED
as complying with the Florida
Building Code
NOA-No. 21-0628.20
Expiration Date: 12/12/2024
By: *Manuel Fern*
Miami-Dade Product Control

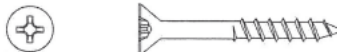
DESIGN LOADS:

Carbon steel screws					
Anchor size	Embedment depth	Concrete 300 psi		C90 Concrete block	
		Tension	Shear	Tension	Shear
3/16"	1"	112	215	116	150
3/16"	1-3/4"	217	215	-	-
1/4"	1"	198	379	122	251
1/4"	1-3/4"	393	379	-	-

GENERAL NOTES

- Design loads for concrete are based on ultimate loads divided by 4. Design loads are for light-weight or normal-weight ASTM C90 block and are based on ultimate loads divided by 5.
- In order to achieve the design load, a minimum edge distance of 1-1/2" for 3/16" ø screw, and 2-1/2" for 1/4" ø screw shall be observed.
- Minimum spacing of anchor shall be 2" in concrete and 3" in concrete blocks in order to achieve the design loads.
- Anchor installation shall be made in accordance with Hilti's published installation instructions in the Product Technical Guide.
- Anchors are restricted from use in cracked concrete as defined in ACI 355.2.

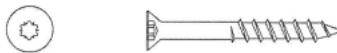
Kwik-Con+ — Phillips flat head



Kwik-Con+ — Torx hex washer head



Kwik-Con+ — Torx flat head



Nominal diameter	Shank diameter (in.)	Thread major (in.)	Diameter root (in.)
3/16"	0.170	0.217	0.145
1/4"	0.224	0.283	0.190

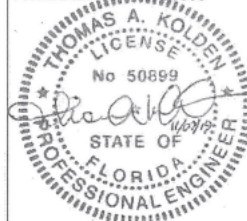
Hilti, Inc.
7250 Dallas Parkway
Plano TX 75024

Hilti Kwik-Con+ Fastening system for concrete and masonry elements
Revision date: October 31, 2019
Drawing: 1327-001
Sheet no. 1 of 1

For office use

PRODUCT APPROVED
as complying with the Florida
Building Code
NOA-No. 19-1113.04
Approval Date 12/12/2019
By: *Thomas A. Kolden*
Miami-Dade Product Control

Thomas Allan Kolden
Professional Engineer
Florida License No. 50899



	PROJECT: QUAKER M700 Fixed Windows	BY: TAD DATE: 04/22/24
	PROJECT NO.: Q9365.01-122-34-r1 M700	CKD: ARK SHEET: 31 OF 36

#10-16 TEKS Screw References

TABLE 5—FASTENER STRENGTH OF SCREWS^{1, 2, 3, 4, 5}

SCREW DESIGNATION	DIAMETER (in.)	ALLOWABLE FASTENER STRENGTH		NOMINAL FASTENER STRENGTH	
		Tensile, P_{ts}/Ω (lbf)	Shear, P_{ss}/Ω (lbf)	Tensile, P_{ts} (lbf)	Shear, P_{ss} (lbf)
10-16	0.190	885	573	2654	1718
12-14	0.216	1184	724	3551	2171
12-24	0.216	1583	885	4750	2654
$\frac{1}{8}$ -14	0.250	1605	990	4816	2970
$\frac{1}{4}$ -28	0.250	1922	1308	5767	3925

For SI: 1 inch = 25.4 mm, 1 lbf = 4.45 N.

¹For tension connections, the least of the allowable pull-out, pullover, and fastener tension strength found in Tables 2, 3, and 5, respectively, must be used for design.

²For shear connection, the lower of the allowable shear (bearing) and the allowable fastener shear strength found in Table 4 and 5, respectively, must be used for design.

³See Section 4.1 for fastener spacing and end distance requirements.

⁴Nominal strengths are based on laboratory tests

⁵To calculate LRFD values, multiply nominal strength values by the LRFD Φ factor of 0.5.

TABLE 22.11 (Spaced Threads)

6063-T6												
Nominal Thread Diameter & Thread Per Inch	D Nominal Thread Diameter (Inch)	Aluminum Thickness (Inches)										
		0.038	0.060	0.072	0.080	0.094	0.125	0.156	0.188	0.250	0.312	0.375
		Allowable Pullout (Pounds)										
#8-18	0.1640	53	83	100	132	155	235	350	468	669	835	1004
#10-16	0.1900	61	96	116	153	180	239	372	509	775	968	1163
#12-14	0.2160	--	110	132	174	204	271	374	530	833	1100	1322
1/4-14	0.2500	--	127	152	201	236	314	433	614	964	1273	1530
5/16-12	0.3125	--	--	--	--	--	--	--	809	1334	1860	2296
3/8-12	0.3750	--	--	--	--	--	--	--	971	1601	2232	2755
6063-T6							Shading indicates transition region.					
F _U (Tensile Ultimate Strength)			30000 psi									
F _Y (Tensile Yield Strength)			25000 psi									

NOTE 32:

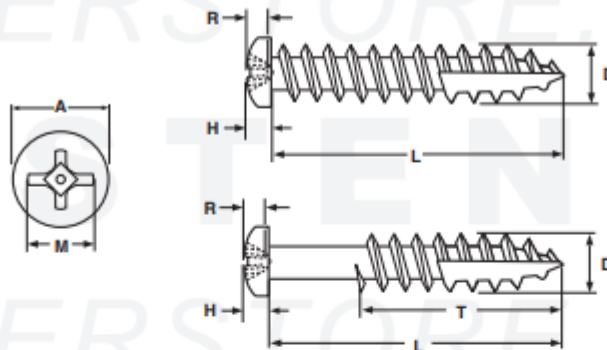
- Each table lists allowable pull-out (internal threads) values. $S_F = 3.0$ for $D \leq 0.25"$; $S_F = 2.5$ for $D \geq 0.3125"$. Fastener allowable strength (basic tension and external threads) needs to be checked separately.
- For pilot hole sizes refer to tables 21.1 to 21.7
- Fastener pullout not shown for aluminum thickness less than approximately 2 threads, unless tested at a lesser thickness.
- Multiple fastener connections and embrittlement need to be checked separately.

Appendix

WOOD SCREWS

**Pan Head w/
Phillips Recess**

TYPE-17 DEEP THREAD



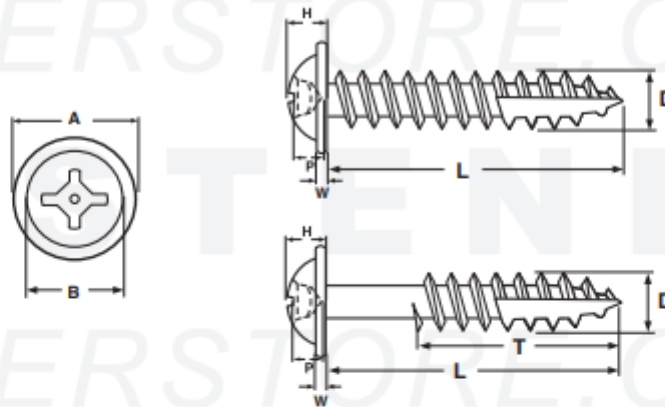
PAN PHILLIPS RECESS DEEP THREAD WOOD SCREW WITH TYPE-17 POINT													
Nominal Diameter & Threads per Inch	A		H		R		M	D		T		Torque Kg/cm (Steel screws)	Recess Size
	Head Diameter		Head Height		Recess Penetration Depth		Recess Diameter	Major Diameter		Threaded Length			
	Max	Min	Max	Min	Max	Min	Ref	Max	Min	L ≤ 1"	L > 1"	Min	
6-13	0.270	0.256	0.097	0.087	0.080	0.055	0.159	0.142	0.131	Full thread	2/3 thread	21	#2
7-12	0.296	0.281	0.106	0.096	0.089	0.064	0.170	0.158	0.147	Full thread	2/3 thread	28	#2
8-11	0.322	0.306	0.115	0.105	0.097	0.071	0.175	0.169	0.159	Full thread	2/3 thread	37	#2
10-9	0.373	0.357	0.133	0.122	0.113	0.089	0.192	0.194	0.185	Full thread	2/3 thread	55	#2
12-8	0.425	0.407	0.151	0.139	0.124	0.098	0.252	0.230	0.213	Full thread	2/3 thread	64	#3
Tolerance on Length	Up to 5/8"						± 0.03						
	Over 5/8 to 1.5"						± 0.05						
	Over 1.5 to 2.75"						± 0.06						
	Over 2.75"						± 0.09						

Description	An externally threaded fastener with a dome-shaped head, cross recess and a single lead thread. The shank has a reduced diameter and a chip cavity cut out where the final several threads end at the tip.	
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces. Popular in fastening cabinet hardware in locations that do not require the head to countersink. The chip cavity (or auger point) are designed to attach hinges to the edge of hardwood face frames.	Used in environments where corrosion resistance is necessary. The type-17 point enables the screw to more easily penetrate the material into which it's fastened. Can be used in particle board, wood and some plastics.
Material	C1018 - 1022 case-hardened steel	18-8 Stainless Steel
Surface Hardness	Vickers 450 HV minimum	-
Case Depth	0.004" - 0.009"	-
Torque	See values in above table	-
Plating	See Appendix-A for plating information	Stainless deep thread screws are usually supplied without additional finish.

WOOD SCREWS

**Round Washer Head w/
Square/Phillips Combo Recess**

TYPE-17 DEEP THREAD



ROUND WASHER SQUARE/PHILLIPS RECESS DEEP THREAD WOOD SCREW W/ TYPE-17 POINT

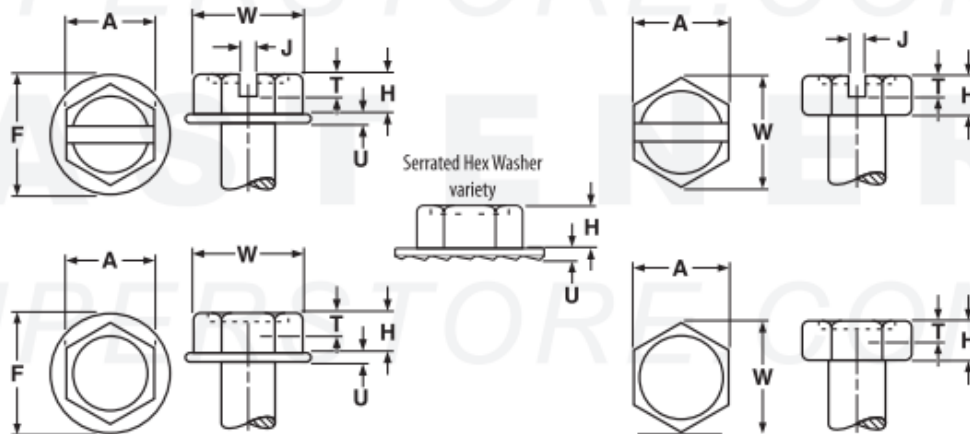
Nominal Diameter	A		B	H		P		W		D		T		Recess Size (Square & Phillips)
	Washer Diameter		Head Diameter	Total Head Height		Recess Depth		Washer Thickness		Major Diameter		Threaded Length		
	Max	Min	Ref	Max	Min	Max	Min	Max	Min	Max	Min	L ≤ 1"	L > 1"	
8	0.376	0.352	0.305	0.120	0.110	0.080	0.065	0.050	0.030	0.174	0.164	Full thread	2/3 thread	#2
10	0.500	0.472	0.300	0.130	0.118	0.073	0.049	0.060	0.040	0.197	0.183	Full thread	2/3 thread	#2
Tolerance on Length	Up to 5/8"										+0 / -0.03			
	Over 5/8 to 1.5"										+0 / -0.05			
	Over 1.5 to 2.75"										+0 / -0.06			
	Over 2.75 to 5"										+0 / -0.09			

Description	An externally threaded fastener with a dome-shaped head and an integrally formed washer; a recess that can accommodate either a Phillips or Square screwdriver; and a single lead thread. The shank has a reduced diameter and a chip cavity cut out where the final several threads, ending at the tip.
Applications / Advantages	The deeper thread design offers greater resistance to pull-out forces. The chip cavity (or auger point) enables the fastener to drive—especially in denser woods—without pre-drilling a pilot hole. The head offers a greater bearing surface than a countersunk design. Used to attach surface-mounted door hinges or master lock hasps into dense woods or when attaching two pieces of wood through a pocket hole.
Material	C1022 case-hardened steel
Surface Hardness	Rockwell C 45 minimum
Case Depth	0.004" - 0.009"
Torque	#8 Diameter: 35 kg/cm minimum #10 Diameter: 50 kg/cm minimum
Plating	See Appendix-A for plating information

SELF-TAPPING SCREWS

Hex & Hex Washer Heads

HEAD DIMENSIONS



HEX & HEX WASHER HEADS FOR SELF-TAPPING & SELF-DRILLING SCREWS												ASME B18.6.3—2013*	
Nominal Size	A		W	H		F		U		J		T	
	Width Across Flats		Width Across Corners	Height of Head		Diameter of Washer		Thickness of Washer		Width of Slot		Depth of Slot	
	Max	Min	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min
4	.188	.181	.202	.060	.049	.243	.225	.019	.011	.039	.031	.036	.025
6	.250	.244	.272	.093	.080	.328	.302	.025	.015	.048	.039	.046	.033
7	.250	.244	.272	.093	.080	.328	.302	.029	.017	.048	.039	.054	.040
8	.250	.244	.272	.110	.096	.348	.322	.031	.019	.054	.045	.066	.052
10	.312	.305	.340	.120	.105	.414	.384	.031	.019	.060	.050	.072	.057
12	.312	.305	.340	.155	.139	.432	.398	.039	.022	.067	.056	.093	.077
14	.375	.367	.409	.190	.172	.520	.480	.050	.030	.075	.064	.101	.083
1/4 (standard)	.375	.367	.409	.190	.172	.520	.480	.050	.030	.075	.064	.101	.083
1/4 (special)	.438	.428	.484	.188	.150	.618	.574	.055	.030	.084	.072	.110	.090
5/16 (special)	.438	.428	.484	.230	.172	.676	.574	.063	.040	.084	.072	.122	.090
5/16 (standard)	.500	.489	.545	.230	.208	.676	.624	.055	.035	.084	.072	.122	.100
3/8	.562	.551	.614	.295	.270	.780	.720	.063	.037	.094	.081	.156	.131
1/2*	.750	.735	.820	.400	.367	1.040	.960	.085	.050	.106	.091	.190	.165

* Slot dimensions for 1/2-inch diameter hex washer head tapping screws are independent of ASME B18.6.3

Tap & Clearance Drill Sizes				Tap Drill				Clearance Drill			
Screw Size	Major Diameter	Threads Per Inch	Minor Diameter	75% Thread for Aluminum, Brass, & Plastics		50% Thread for Steel, Stainless, & Iron		Close Fit		Free Fit	
				Drill Size	Dec. Eq.	Drill Size	Dec. Eq.	Drill Size	Dec. Eq.	Drill Size	Dec. Eq.
0	.0600	80	.0447	3/64	.0469	55	.0520	52	.0635	50	.0700
1	.0730	64	.0538	53	.0595	1/16	.0625	48	.0760	46	.0810
		72	.0560	53	.0595	52	.0635				
2	.0860	56	.0641	50	.0700	49	.0730	43	.0890	41	.0960
		64	.0668	50	.0700	48	.0760				
3	.0990	48	.0734	47	.0785	44	.0860	37	.1040	35	.1100
		56	.0771	45	.0820	43	.0890				
4	.1120	40	.0813	43	.0890	41	.0960	32	.1160	30	.1285
		48	.0864	42	.0935	40	.0980				
5	.125	40	.0943	38	.1015	7/64	.1094	30	.1285	29	.1360
		44	.0971	37	.1040	35	.1100				
6	.138	32	.0997	36	.1065	32	.1160	27	.1440	25	.1495
		40	.1073	33	.1130	31	.1200				
8	.1640	32	.1257	29	.1360	27	.1440	18	.1695	16	.1770
		36	.1299	29	.1360	26	.1470				
10	.1900	24	.1389	25	.1495	20	.1610	9	.1960	7	.2010
		32	.1517	21	.1590	18	.1695				
12	.2160	24	.1649	16	.1770	12	.1890	2	.2210	1	.2280
		28	.1722	14	.1820	10	.1935				
		32	.1777	13	.1850	9	.1960				
1/4	.2500	20	.1887	7	.2010	7/32	.2188	F	.2570	H	.2660
		28	.2062	3	.2130	1	.2280				
		32	.2117	7/32	.2188	1	.2280				
5/16	.3125	18	.2443	F	.2570	J	.2770	P	.3230	Q	.3320
		24	.2614	I	.2720	9/32	.2812				
		32	.2742	9/32	.2812	L	.2900				
3/8	.3750	16	.2983	5/16	.3125	Q	.3320	W	.3860	X	.3970
		24	.3239	Q	.3320	S	.3480				
		32	.3367	11/32	.3438	T	.3580				
7/16	.4375	14	.3499	U	.3680	25/64	.3906	29/64	.4531	15/32	.4687
		20	.3762	25/64	.3906	13/32	.4062				
		28	.3937	Y	.4040	Z	.4130				
1/2	.5000	13	.4056	27/64	.4219	29/64	.4531	33/64	.5156	17/32	.5312
		20	.4387	29/64	.4531	15/32	.4688				
		28	.4562	15/32	.4688	15/32	.4688				
9/16	.5625	12	.4603	31/64	.4844	33/64	.5156	37/64	.5781	19/32	.5938
		18	.4943	33/64	.5156	17/32	.5312				
		24	.5114	33/64	.5156	17/32	.5312				
5/8	.6250	11	.5135	17/32	.5312	9/16	.5625	41/64	.6406	21/32	.6562
		18	.5568	37/64	.5781	19/32	.5938				
		24	.5739	37/64	.5781	19/32	.5938				
11/16	.6875	24	.6364	41/64	.6406	21/32	.6562	45/64	.7031	23/32	.7188
3/4	.7500	10	.6273	21/32	.6562	11/16	.6875	49/64	.7656	25/32	.7812
		16	.6733	11/16	.6875	45/64	.7031				
		20	.6887	45/64	.7031	23/32	.7188				
13/16	.8125	20	.7512	49/64	.7656	25/32	.7812	53/64	.8281	27/32	.8438
7/8	.8750	9	.7387	49/64	.7656	51/64	.7969	57/64	.8906	29/32	.9062
		14	.7874	13/16	.8125	53/64	.8281				
		20	.8137	53/64	.8281	27/32	.8438				
15/16	.9375	20	.8762	57/64	.8906	29/32	.9062	61/64	.9531	31/32	.9688
1	1.000	8	.8466	7/8	.8750	59/64	.9219	1-1/64	1.0156	1-1/32	1.0313
		12	.8978	15/16	.9375	61/64	.9531				
		20	.9387	61/64	.9531	31/32	.9688				

	PROJECT: QUAKER M700 Fixed Windows	BY: TAD DATE: 04/22/24
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Revision Log

<u>Rev. #</u>	<u>Date</u>	<u>Page(s)</u>	<u>Revision(s)</u>
0	04/22/24	N/A	Original report issue
1	04/29/24	4	Updated Product Certification numbers