EVALUATION REPORT Number: 847

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ET&F PANELFAST® KNURLED AGS-100 SERIES PNEUMATIC FASTENERS

CSI Sections:
05 05 23—Metal Fastenings
06 05 23—Wood, Plastic and Composite Fastenings

1.0 RECOGNITION

ET&F Panelfast® Knurled AGS-100 Series pneumatically driven pins recognized in this report have been evaluated for use as fasteners connecting wood structural panel sheathing to steel frame construction. The structural properties of the fasteners were evaluated for compliance with the following codes:

- 2024, 2021, and 2018 International Building Code® (IBC)
- 2024, 2021, and 2018 International Residential Code® (IRC)

2.0 LIMITATIONS

Use of the ET&F pneumatically driven pins described in this report is subject to the following limitations:

2.1 Fasteners shall be manufactured, installed, and identified in accordance with this report and the manufacturer's published installation guidelines. Where conflicts occur, the more restrictive shall govern.

2.2 Plans and structural calculations shall be submitted to the building official demonstrating compliance with the provisions of this report and applicable code requirements. Construction documents shall be prepared by a registered design professional when required by the statutes of the jurisdiction where the project will be constructed**.**

2.3 The design wind and seismic loads to be resisted by the shear wall assemblies described in this report shall not exceed the nominal shear values noted in Table 1 of this report and reduced by applicable factors shown for allowable (ASD) (Ω) or strength (LFRD) (φ) design.

2.4 The Panelfast® Knurled AGS-100 series fasteners are limited to installation in dry locations. Use in exterior or damp environments is outside the scope of this report.

2.5 Use of Panelfast® Knurled AGS-100 series fasteners is limited to use in shear wall at a maximum height of 65 feet (19.8 m) for Seismic Design Categories D, E, and F.

2.6 The use of Panelfast® Knurled AGS-100 series fasteners in contact with preservative or fire-retardant- treated wood is outside the scope of this report.

2.7. The performance of the supporting structure, including the ability of the supporting structure to resist the applied shear loads, is outside the scope of this report

2.8 The ET&F pneumatically driven pins are manufactured in Solon, Ohio.

3.0 PRODUCT USE

3.1 General: ET&F pneumatically driven pins are high carbon, heat-treated, ballistic point knurled fasteners recognized for use for attachment of wood structural sheathing to cold-formed steel framing for shear wall applications to resist seismic and wind forces.

3.2 ET&F pneumatically driven pins are also recognized for the attachment of wood structural panel sheathing to steel framing members in accordance with Sections 2204 and 2206 of the 2024 IBC; and Sections 2210 and 2211 of the 2021 and 2018 IBC.

3.3 An engineering design shall be submitted in accordance with IRC Section 301.1.3 and Section 2.2 of this report when used where the IRC is applicable.

3.4 Framing: Steel framing members shall have the following uncoated minimum base-metal thicknesses, as applicable:

No. 54 mil (No. 16 gage): 0.0538 inch
No. 43 mil (No. 18 gage): 0.0428 inch
No. 33 mil (No. 20 gage): 0.0329 inch

Stud framing members shall be a minimum flange width of 1⅝ inches (41.3 mm), and track framing members shall have a minimum flange width of 1¼-inches (31.8 mm). Steel framing members shall comply with Section 2206.1 of the 2024 IBC and Section 2211.1 of the 2021 and 2018 IBC, as applicable, and are manufactured from steel complying with ASTM A653/A653M SS Grade 50 Class 1 and 3 or SS Grade 33; or ASTM A1003/A1003M ST50H or ST33H, or equivalent grade complying with the requirements of AISI S100 and having an elongation greater than or equal to 10 percent. Steel members with a thickness of 54 mils shall have a minimum yield strength of 50 ksi (345 MPa) and

members of 33 mil and 43 mil thicknesses have a minimum yield strength of 33 ksi (228 MPa).

3.5 Wood Structural Panel Sheathing:

Wood Structural Panel sheathing shall comply with Section 2303.1.5 of the IBC and be oriented strand board (OSB) or plywood. OSB sheathing shall be minimum $^{7}/_{16}$-inch (11.1 mm) thickness, Exposure 1, complying with U.S. Department of Commerce (DOC) Voluntary Product Standard PS2 and with a minimum span rating of 24/16. Plywood sheathing shall be a minimum of $^{15}/_{32}$-inch (11.9 mm), Structural I, Exposure 1 and comply with U.S. DOC Voluntary Product Standard PS1 with a minimum span rating of 32/16.

3.6 Design:

3.6.1 Shear Wall Design: Seismic loading shall be determined in accordance with IBC Section 1613 and ASCE/SEI 7 subject to limitations set forth for Seismic Force-Resisting Systems. The shear walls defined in Table 1 of this report may be used as an alternative to Type I shear walls detailed in Section E1 of AISI S400 as required by Section 2206.1 of the 2024 IBC; or Section 2211.1 of the 2021 and 2018 IBC, as applicable. ET&F pneumatically driven pins fasten code-complying OSB and plywood wood structural panels (WSP) to steel framing members in shear wall assemblies used in structures. Nominal shear values with use of ET&F Panelfast® Knurled AGS-100 fasteners are in Table 1 of this report for the corresponding assemblies and Seismic Design Category. The shear wall assemblies shall meet the requirements of a Type 1 shear wall as detailed in Section E1 of AISI S400. For available ASD seismic strength, table values shall be divided by Ω = 2.5. For available ASD wind strength, table values shall be divided by Ω = 2.0. For available LRFD seismic strength, table values shall be multiplied by φ = 0.60. For available LRFD wind strength, table values shall be multiplied by φ = 0.65. Panels noted in Table 1 of this report shall be capable of supporting vertical loads based on the panel span ratings indicated. Steel framing shall be designed in accordance with the IBC or IRC for the required vertical loads.

3.6.2 The maximum allowable shear wall aspect ratio is 2:1. Shear walls assemblies shall comply with Sections E1.3 and E1.4 of AISI S400.

3.6.3 ET&F Panelfast® Knurled AGS-100 fasteners used in shear wall assemblies detailed in Table 1 of this report may be used in Seismic Design Categories A through F, as applicable, when the following design coefficient and factors are used as defined in Table 12.2-1 of ASCE 7/SEI, Items A16 and A17:

Response Modification Coefficient, R = 6.5
Overstrength Factor, Ω_0 = 3.0
Deflection Amplification Factor, C_d = 4.0

And, Item B24

Response Modification Coefficient, R = 7
Overstrength Factor, Ω_o = 2.5
Deflection Amplification Factor, C_d = 4.5

3.6.4 ET&F Panelfast® Knurled AGS-100 fasteners used in shear wall assemblies, detailed in Table 1 of this report, may be used in Seismic Design Categories A and B, as applicable, when the following maximum design coefficient and factors are used as defined in Table 12.2-1 of ASCE/SEI 7, Item H:

Response Modification Coefficient, R = 3
Overstrength Factor, Ω_0 = 3.0
Deflection Amplification Factor, C_d = 3

3.6.5 Design of shear wall connections, such as uplift hold-downs, shear to base anchorage, and shear transfer for horizontal elements are beyond the scope of this report and the design professional shall provide appropriate design and detailing information to the building official.

3.6.6 Lateral Deflection: Deflection of the shear wall may be estimated for OSB and plywood shear walls, when calculated in accordance with Figure 2 of this report.

3.6.7 Hold downs shall be designed in accordance with Section 2.2 of this report. The design shall address strength, stiffness, overturning capacity due to wind and seismic loads, accumulated overturning forces applicable in multi-story applications.

3.7 Installation: Panelfast® Knurled AGS-100 pneumatically driven pins shall be installed using the pneumatic tools specified by ET&F. The heads of the fasteners shall be flush with the wood panel without overdriving. The minimum distance of the fasteners from the edge of the wood panel is ⅜ inch (9.5 mm). The fasteners shall be spaced at a maximum of 12-inches on-center within the field of the panel. The maximum spacing of the pins along the edges of shear wall assemblies is as noted in Table 1 of this report.

The ends of each shear wall assembly shall include two C-shaped studs attached to each other, joined at the webs, to create a double-stud assembly. The webs shall be attached using #8 hex head self-drilling tapping screws spaced at a maximum of 12-inches (305 mm) on-center. The studs between each set of double-studs are defined in Table 1 of this report. The studs shall be attached to the track using #8 modified truss head screws by attaching each flange to the track.

Wood structural sheathing panels shall be a minimum of 12 inches wide and may be installed parallel or perpendicular to the framing. Sheathing edges shall be supported by framing or blocking. Flat strapping used as blocking shall meet Section E1.4.1.1, Item (l), of AISI S400.

Hold-downs shall be on either end of the shear wall assembly. The track shall be anchored to the supporting structure with spacing of the anchors no greater than 2-feet (610mm) on-center.

3.8 Special Inspection: Special Inspections are required for anchoring and fastening of the shears walls as defined in the code and this section. The statement of special inspections shall be submitted to the building official in accordance with IBC Section 1704.3. Special inspections shall be as required by 2018 IBC Sections 1705.1.1, 1705.11.2 including Exception 2, and 1705.12.3 including Exception 2 or ; 2024 and 2021 IBC Sections 1705.1.1, 1705.12.2 including Exception 2, and 1705.13.3 including Exception 2, as applicable.

4.0 PRODUCT DESCRIPTION

ET&F Panelfast® Knurled AGS-100 are manufactured using a standard cold-forming process from steel wire with carbon content ranging from 0.39 percent to 0.66 percent in compliance with the chemistry requirements in the manufacturer's quality control documentation. The fasteners are heat-treated to a through hardness of RC 52 to 54, as determined in accordance with ASTM E140 and ASTM E384. The fasteners have a ballistic point, knurled shank, and are either zinc-plated or coated with a proprietary Aericote® 1000 coating. Panelfast® Knurled AGS-100 series pins have a basic shank diameter of 0.100 inch (2.54 mm) and a nominal head diameter of $^{5}/_{16}$ inch (7.87 mm).

5.0 IDENTIFICATION

The pins are packaged in containers or cartons which are identified by a stencil or label bearing the ET&F Fastening Systems, Inc. name, address and logo, fastener part number, size and description, quantity, manufacturing lot number and Evaluation Report number (ER-847) Each fastener head is stamped with the "E" head logo shown in Figure 1 of this report.

The IAPMO Uniform Evaluation Service Mark of Conformity may also be used as shown below:

IAPMO UES ER-847

6.0 SUBSTANTIATING DATA

6.1 Test reports are from laboratories in compliance with ISO/IEC 17025.

6.2 Data in accordance with the ICC-ES AC230, Acceptance Criteria for Power-Actuated Fasteners for Shear Wall Assemblies Constructed with Cold-Formed Steel Framing and Wood Structural Panels, approved September of 2015, editorially revised February 2021.

7.0 STATEMENT OF RECOGNITION

This evaluation report describes the results of research completed by IAPMO Uniform Evaluation Service on ET&F Fastening Systems, Inc.'s ET&F pneumatically driven pins to assess conformance to the codes and standards shown in Section 1.0 of this report and documents the product's certification. The products are manufactured at the location noted in Section 2.8 of this report under a quality control program with periodic inspections under the supervision of IAPMO UES.

For additional information about this evaluation report please visit www.uniform-es.org or email us at info@uniform-es.org

TABLE 1
NOMINAL LATERAL SHEAR STRENGTH FOR SHEAR WALL ASSEMBLIES USING ET&F PANELFAST® AGS-100 SERIES PNEUMATIC FASTENERS

Sheathing Material[1,2]	Minimum Nominal Panel Thickness (in)	Minimum Steel Stud, Track, and Blocking thickness[3] (mils)	Maximum Stud Spacing (in)	Nominal Shear Strength for Seismic Design (plf)			Applicable Seismic Design Categories	Nominal Shear Strength for Wind Design (plf)			v_{defl} [4] (lb/ft)
				Fastener Spacing at Panel Edges (in)				Fastener Spacing at Panel Edges (in)			
				4	3	2	A Through F	4	3	2	
OSB	7/16	33	24	-	-	919	A and B	-	-	1033	1314
		43	24	586	-	-	A Through F	595	-	-	796
		43	16	-	795	-		-	861	-	1109
		43	16	-	-	1087		-	-	1196	1616
Plywood	15/32	43	16	-	921	-		-	1020	-	1440
		43	16	-	-	1336		-	-	1467	2235
		54	16	-	-	1840		-	-	2007	2850

SI Units: 1 inch=25.4 mm, 1 plf =14.6 N/M, 1 mil = 0.001 inch, 1 lb/ft plf =14.6 N/m

[1] OSB and Plywood to be in accordance with Section 3.5 of this report and the assembly shall be in accordance with Section 3.7 of this report.
[2] Thicker Panels may be used for Nominal Panel thickness with no extrapolation of Nominal Shear Strength.
[3] Thicker Framing may be used with no increase of Nominal Shear Values.
[4] Figure 2 of this report includes the deflection calculation formula.

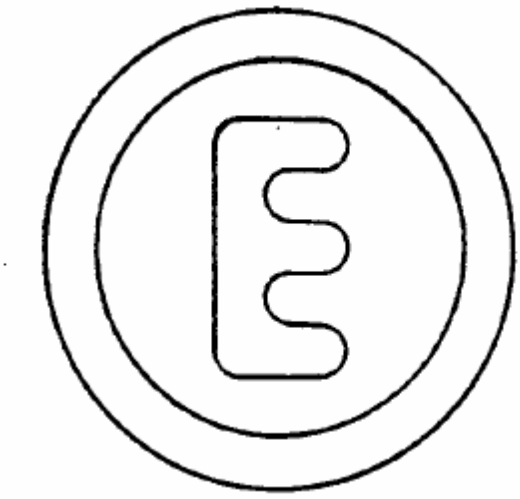

FIGURE 1 -Top of Fastener with "E" Logo

$$\Delta osb = \frac{2}{3}\frac{vh^3}{E_s A_c b} + \omega_1\omega_2\frac{vh}{1.05Gt_{sheathing}} + \omega_1^{1.1}\omega_2\left(\frac{v^{2.129}}{\eta v_{defl}^{1.129}}\right) + \frac{h}{b}\Delta anchorage$$

$$\Delta ply = \frac{2}{3}\frac{vh^3}{E_s A_c b} + \omega_1\omega_2\frac{vh}{1.85Gt_{sheathing}} + \omega_1^{0.75}\omega_2\left(\frac{v^{2.129}}{\eta v_{defl}^{1.129}}\right) + \frac{h}{b}\Delta anchorage$$

A_c = gross cross-sectional area of the shear wall chord/boundary studs, in^2(mm^2)
b = width/length of the shear wall, in (mm)
E_s = elastic modulus of steel, psi (MPa)
h = height of shear wall, in (mm)
s = spacing of the fasteners at the panel edge, in (mm).
$t_{sheathing}$ = thickness (nominal) of sheathing, in (mm)
t_{stud} = design thickness of cold-formed steel framing, in (mm)
v = design shear, lb/in (N/mm)
v_{defl} = deflection at the peak strength of the shear wall, lb/in
Δanchorage = vertical uplift due to deformation of anchorage attachment, in. (mm)
η = 22.351 psi (0.154 MPa) for plywood and 14.407 psi (0.099 MPa) for OSB.
ω_1 = s/6 (s/152.4)
ω_2 = $0.0346/t_{stud}$ ($0.879/t_{stud}$)

FIGURE 2 -Deflection Calculation