

ICC-ES Evaluation Report

ESR-3145

Issued February 1, 2012

This report is subject to renewal in one year.
www.icc-es.org | (800) 423-6587 | (562) 699-0543

A Subsidiary of the International Code Council®

DIVISION: 05 00 00—METALS
Section: 05 05 23—Metal Fastenings
**DIVISION: 06 00 00—WOOD, PLASTICS AND
COMPOSITES**
**Section: 06 05 23—Wood, Plastic, and Composite
Fastenings**
REPORT HOLDER:
AEROSMITH FASTENING SYSTEMS
5621 DIVIDEND ROAD
INDIANAPOLIS, INDIANA 46241
(317) 243-5959
www.aerosmithfastening.com
EVALUATION SUBJECT:
AEROSMITH BRAND FASTENERS

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2009 *International Building Code*® (IBC)
- 2009 *International Residential Code*® (IRC)

Property evaluated:

Structural

2.0 USES

Aerosmith Brand Fasteners are used to attach wood structural panels to cold-formed steel wall framing for shear wall applications under the IBC, to resist in-plane wind or seismic forces in Seismic Design Categories A and B, in Occupancy Categories I through IV. The fasteners may be used in structures regulated under the IRC when an engineered design is submitted in accordance with IRC Section R301.1.3.

3.0 DESCRIPTION

3.1 Aerosmith Brand Fasteners:

The Aerosmith Brand Fasteners are power-driven fasteners with dimensions as shown in Table 1. The fasteners are formed from steel wire complying with ASTM A 510 Grade 1060 and heat-treated to a Rockwell C core hardness of 52 to 55. The fasteners have a straight, knurled shank with a nominal diameter of 0.1 inch (2.5 mm) and a flat head with a nominal dimension of 0.3 inch (7.9 mm). The standard fasteners are galvanized in accordance with ASTM B 633, Type 1, SC 1; or ASTM B 695, Type 1, Class 5. The fasteners are also available with a nickel alloy plating, designated by the letter "G" in the suffix of the product number. Fasteners are supplied in collated coils or strips.

3.2 Shear Wall Assemblies:

3.2.1 General: Recognized shear wall assemblies are constructed of wood structural panels attached to one side of cold-formed steel framing using the Aerosmith Brand Fasteners. At each end of the shear wall and at interior panel joints, a double stud must be used. Each double stud must be comprised of two studs placed web-to-web and fastened together as shown in Figure 2. Intermediate studs must be spaced no more than 24 inches (610 mm) on center. All studs must be fastened to the tracks with one screw through each stud flange. Wood panels must have a minimum width of 12 inches (305 mm). One hold-down must be installed at each end of the shear wall, and the bottom wall track must be attached to the supporting structure.

3.2.2 Wood Structural Panels: Wood structural panels must be ¹⁵/₃₂-inch-thick (11.9 mm) Exposure 1 plywood sheathing with a minimum span rating of 32/16, complying with DOC PS-1; or ⁷/₁₆-inch-thick (11.1 mm) Structural 1 OSB sheathing complying with DOC PS-2, as indicated in Table 2.

3.2.3 Cold-formed Steel (CFS) Framing Members: CFS framing members must be formed from steel complying with ASTM A 1003, Grade 50, Type H (ST50H); or ASTM A 653 SS, Grade 50, with a minimum G60 coating. CFS wall studs must be C-shaped members with a thickness designation as shown in Table 2. The studs must have a minimum flange width of ¹/₈ inches (41 mm), a minimum nominal depth of 3 ¹/₂ inches (89 mm) and a minimum flange stiffener (lip) length of ³/₈ inch (9.5 mm). The CFS tracks must be channel-shaped members with a thickness designation as shown in Table 2. The tracks must have a minimum flange width of 1 ¹/₄ inches (32 mm) and a minimum nominal depth of 3 ¹/₂ inches (89 mm).

3.2.4 Framing Fasteners: Screws used to join doubled studs together and to fasten tracks to studs must be minimum #8-18 pan head, self-drilling, tapping screws complying with ASTM C 1513 or recognized in an ICC-ES evaluation report. The screws must have lengths sufficient to penetrate a minimum of three threads past the receiving member.

4.0 DESIGN AND INSTALLATION

4.1 Design:

Recognized shear wall assemblies are alternatives to the Type I shear walls prescribed in Section C2 of AISI S213 and must comply with all applicable requirements of Section C2 of AISI S213. The shear walls are limited to a maximum height-to-width aspect ratio of 2:1.

For seismic design, the response modification coefficient, R , the system overstrength factor, Ω_o , and the deflection amplification factor, C_d , must be no greater than 3. Available unit shear strengths for shear walls subjected to seismic loads and wind loads are shown in Table 2.

Hold-downs and chord studs must be able to resist the wind or seismic uplift load at the end of the wall. Fasteners or anchors must attach the bottom wall track to the supporting structure at a maximum of 4 feet (1220 mm) on center and must be capable of transferring the applied shear from the bottom wall track to the supporting structure.

Horizontal deflection of the shear walls due to the applied shear load may be calculated using the following equations, as applicable:

$$\delta = \frac{8vh^3}{E_s A_c b} + \omega_1 \omega_2 \frac{vh}{\rho G t_{sheathing}} + \omega_3 \left(-1.5 + 0.082s + \frac{0.071}{t_{stud}} + \frac{v^2}{2,690,000} + \frac{900}{F_e} \right) + \frac{h}{b} \delta_v$$

For SI:

$$\delta = \frac{8vh^3}{E_s A_c b} + \omega_1 \omega_2 \frac{vh}{\rho G t_{sheathing}} + \omega_3 \left(-37.8 + 0.082s + \frac{45.99}{t_{stud}} + \frac{v^2}{22.59} + \frac{152}{F_e} \right) + \frac{h}{b} \delta_v$$

The variables and constants in the equations are defined in Section C2.1.1 of AISI S213, with the following exceptions:

- Values for $G t_{sheathing}$ may be taken from IBC Table 2305.2(2).
- F_e is the dowel bearing strength and is equal to 4650 psi (32.06 MPa) for plywood and 6000 psi (41.37 MPa) for OSB.

4.2 Installation:

The Aerosmith Brand Fasteners must be installed in accordance with the Aerosmith published installation instructions, the approved plans and this report. A copy of the Aerosmith published installation instructions and the approved plans must be available on the jobsite at all times during fastener installation.

The wood structural panels must be attached to the framing with the Aerosmith Brand Fasteners spaced as noted in Table 2. The Aerosmith Brand Fasteners must be installed using a pneumatic or fuel-powered tool, as recommended by Aerosmith. The fasteners must be driven flush with the face of the wood panel and must penetrate the steel framing a minimum of $\frac{5}{16}$ inch (7.9 mm). Fasteners must be installed a minimum of $\frac{3}{8}$ inch (9.5 mm) from the edge of the wood panel. At doubled studs at the end of the wall, the fasteners must be staggered between the two studs as shown in Figure 3.

Fasteners must be installed in dry, interior locations. In accordance with IBC Section 2304.9.5.4 and the Exception to IBC Section 2304.9.5.1, the nickel alloy plated Aerosmith fasteners may be used in SBX/DOT and zinc borate preservative-treated wood and fire-retardant-treated wood, based on the Aerosmith recommendations.

Hold-downs, track anchors, and other connections to the shear walls must be installed in accordance with the approved plans.

4.3 Special Inspection:

Periodic special inspection of the fastening and anchoring of the shear walls described in this report is required in accordance with IBC Section 1706.3, unless there is an exemption under IBC Section 1706.1. When special inspections are required, a Statement of Special Inspections must be submitted in accordance with IBC Section 1705.

5.0 CONDITIONS OF USE

The Aerosmith Brand Fasteners described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1 The fasteners are manufactured and identified in accordance with this report.
- 5.2 The other components of the shear walls must comply with this report, the applicable code and applicable ICC-ES evaluation reports.
- 5.3 Fastener installation complies with this report and the Aerosmith instructions. In the event of conflict between this report and Aerosmith published instructions, the more restrictive requirements govern.
- 5.4 Installation is limited to Seismic Design Categories A and B.
- 5.5 Installation is limited to structures four stories [65 feet (19.8 m)] or less in height, with interior walls, partitions, ceilings and exterior wall systems that have been designed to accommodate the story drifts.
- 5.6 The aspect ratio (wall height/wall length) of the shear wall must not exceed 2:1. Shear walls with greater aspect ratios are outside the scope of this report.
- 5.7 Type II shear walls constructed with the Aerosmith Brand Fasteners are outside the scope of this report.
- 5.8 Calculations demonstrating that the applied in-plane shear loads are less than the available shear wall strength must be submitted to the code official for approval. The calculations must be prepared by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.
- 5.9 Calculations and details showing that the sheathing, the CFS framing and the foundation anchorage are adequate to resist the applied transverse loads, and comply with the applicable provisions in Section C2 of AISI S213, must be submitted to the code official. The CFS framing must also be adequate to support the applied gravity loads. These calculations and details must be signed and sealed by a registered design professional, when required by the statutes of the jurisdiction in which the project is to be constructed.
- 5.10 Calculations and details must be submitted to the code official showing how the lateral loads are transferred from the roof or floor diaphragm into the shear wall. These calculations and details must be signed and sealed by a registered design professional, when required by the statutes of the jurisdiction in which the project is to be constructed.
- 5.11 When the shear wall assemblies are used above the first story, calculations and details must be submitted to the code official showing the load path for the transfer of lateral and overturning forces from the upper story shear walls to the foundation. These calculations and details must be signed and sealed by a registered design professional, when required by the statutes of the jurisdiction in which the project is to be constructed.
- 5.12 An approved weather-resistant exterior wall envelope must be installed to protect weather-exposed surfaces (defined in IBC Section 202 and IRC Section R703) of the wood structural panels.
- 5.13 Use of fasteners in contact with preservative-treated or fire-retardant-treated wood is not allowed, except for nickel alloy plated fasteners installed as described in Section 4.2.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Power-driven Pins for Shear Wall Assemblies with Cold-formed Steel Framing and Wood Structural Panels (AC230), dated October 2010.

7.0 IDENTIFICATION

7.1 Fasteners:

Each package of fasteners must be labeled with the fastener designation, report holder's name (Aerosmith) and the evaluation report number (ESR-3145). Packages of nickel alloy plated fasteners are also identified by the words "PT2000". The head of each fastener is imprinted with one of the marks shown in Figure 1.

7.2 CFS:

Each CFS stud and track must be identified with the minimum base steel thickness in decimal inches or mils, the minimum specified yield strength, and the galvanized coating designation.

7.3 Wood Structural Panels:

Wood structural panels must be identified in accordance with DOC PS-1 or DOC PS-2, as applicable.

7.4 Hold-downs:

Hold-downs must be identified in accordance with an applicable ICC-ES evaluation report.

TABLE 1—AEROSMITH BRAND FASTENERS

FASTENER DESIGNATION	NOMINAL SHANK DIAMETER (in.)	FASTENER LENGTH (in.)	HEAD DIAMETER (in.)	SHANK STYLE
2325Z	0.1	1.25	0.3	Knurled
2385Z	0.1	1.50	0.3	Knurled
2635Z	0.1	2.50	0.3	Knurled

For SI: 1 inch = 25.4 mm.

TABLE 2—AVAILABLE STRENGTHS FOR SHEAR WALLS SUBJECTED TO SEISMIC LOADS OR WIND LOADS^{1,2,3,4,5}

FASTENER	WOOD STRUCTURAL PANEL	MINIMUM FRAMING THICKNESS DESIGNATION (mils)	SPACING OF FASTENERS AT PERIMETER OF WOOD PANEL (inches)	NOMINAL UNIT SHEAR STRENGTH ⁶ (lb/ft)	ALLOWABLE SEISMIC UNIT SHEAR STRENGTH (ASD) ⁷ (lb/ft)	DESIGN SEISMIC UNIT SHEAR STRENGTH (LRFD) ⁷ (lb/ft)	ALLOWABLE WIND UNIT SHEAR STRENGTH (ASD) ⁷ (lb/ft)	DESIGN WIND UNIT SHEAR STRENGTH (LRFD) ⁷ (lb/ft)
2325Z 2385Z 2635Z	¹⁵ / ₃₂ " Plywood	54	2	1653	602	903	819	1065
	¹⁵ / ₃₂ " Plywood	54	4	—	462	693	623	809
	¹⁵ / ₃₂ " Plywood	54	6	853	322	483	427	554
	⁷ / ₁₆ " OSB	54	2	1608	611	916	804	1045
	⁷ / ₁₆ " OSB	54	4	—	464	696	604	786
	⁷ / ₁₆ " OSB	54	6	811	317	476	405	527
	⁷ / ₁₆ " OSB	43	4	1011	405	607	506	657
	⁷ / ₁₆ " OSB	68	2	1912	765	1147	956	1243

For SI: 1 inch = 25.4 mm, 1 lb/ft = 14.6 N/m, 1 ksi = 6.895 Mpa.

¹Studs shall have a minimum specified yield strength of 50 ksi and shall be spaced a maximum of 24 inches on center.

²Tabulated values are for short-term loads due to seismic forces. For shear loads of normal and permanent load duration as defined by the AF&PA NDS, the tabulated values must be multiplied by 0.63 and 0.56, respectively.

³Fasteners must penetrate a minimum of ⁵/₁₆ inch through the steel framing.

⁴Fasteners must be spaced a maximum of 12 inches on center in the field of the panels.

⁵Thicker wood structural panels may be used, provided the required fastener penetration is achieved, but provide no increase in available unit shear strength.

⁶Nominal unit shear strength is the average tested peak strength for the assembly, adjusted for the cold-formed steel framing properties in accordance with Section 3.3.4 of AC230. A "—" indicates the assembly was not tested. Available strengths have been determined by interpolation between results for tested configurations.

⁷Allowable and design strengths have been derived in accordance with AC230.

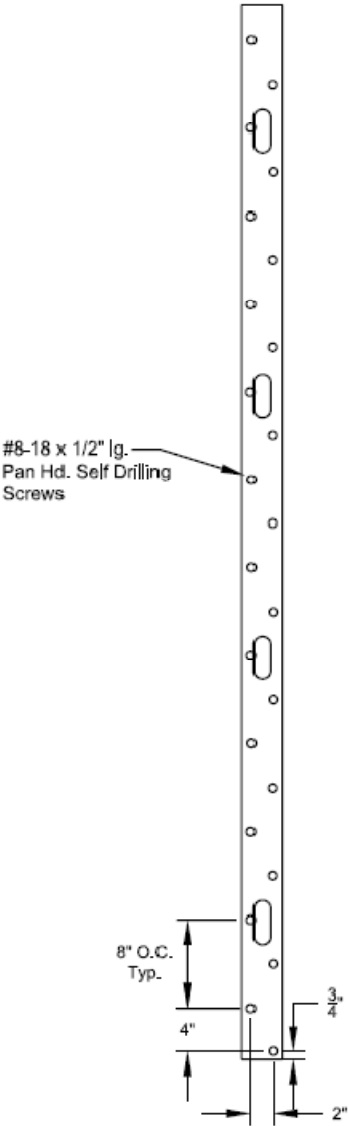


FIGURE 2—FASTENING PATTERN FOR DOUBLED STUDS

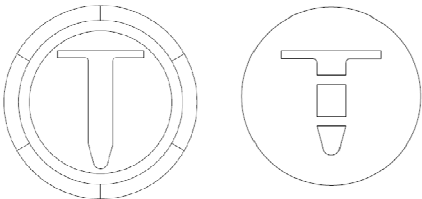


FIGURE 1—HEAD MARKINGS FOR AEROSMITH BRAND FASTENERS

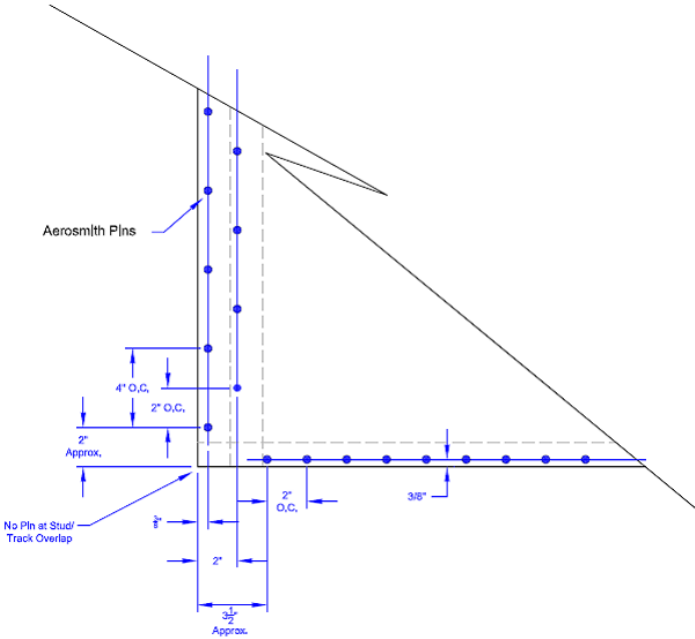


FIGURE 3—FASTENING PATTERNS FOR WOOD STRUCTURAL PANELS ATTACHED TO DOUBLED STUDS AT WALL ENDS