



DIVISION: 06—WOOD AND PLASTICS
SECTION: 06090—WOOD AND PLASTICS FASTENINGS

SUBJECT: EZ-STAIR BRACKET ER-6161

COMPANY: EZ STAIRS, INC. Issued September 1, 2003
ADDRESS: 26892 ROCKING HORSE LANE
LAGUNA HILLS, CALIFORNIA 92653

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1 **1.0 SUBJECT**

2 EZ-Stair Bracket.

3 **2.0 DESCRIPTION**

4 **2.1 General:**

5 The EZ-Stair bracket is a connector used to construct wood-framed stairs using
6 wood stringers, treads, and risers. The brackets described in this evaluation report
7 are an alternative method of construction to that specified in Section 2304.3 of the
8 1997 *Uniform Building Code*[™] (UBC), Section 1715.1 of the 2000 *International*
9 *Building Code*[®] (IBC) and Section R502.6 of the 2000 *International Residential*
10 *Code*[®] (IRC). Additionally, this evaluation report recognizes allowable stairway
11 widths and stair stringer lengths for stairways constructed with the EZ-Stair bracket.

12 The left-hand and right-hand EZ-Stair brackets are illustrated in Figure 1.

13 **2.2 Materials:**

14 **2.2.1 EZ-Stair Bracket:** The connectors are fabricated from steel conforming to JIS
15 G 3302-98 (Japanese Industrial Standard for Hot-dip Zinc-coated Steel Sheets and
16 Coils), Class SGH340; and having a minimum yield stress, F_y , of 35.5 ksi (245 MPa),
17 and a minimum tensile stress, F_u , of 49.3 ksi (340 MPa). The base-metal thickness of

18 the EZ-Stair bracket is 0.0787 inch (2 mm). Refer to Figure 1 for bracket
19 dimensions.

20 **2.2.2 Wood:** Stair risers and treads shall be either nominal 2-inch-thick (51 mm)
21 lumber having a minimum specific gravity as noted in Table 1, or 1¹/₈-inch-thick (28.6
22 mm) plywood complying with UBC Standard 23-2 (Product Standard PS-1).
23 Prefabricated wood-based products are permitted provided they have an equivalent
24 specific gravity of 0.50. Use of the brackets is limited to wood that has not been
25 treated with fire-retardant chemicals.

26 **2.2.3 Fasteners:** Fasteners used with the EZ-Stair bracket must be minimum No. 8
27 gage [0.164-inch (4.2 mm) diameter] wood screws, complying with ANSI/ASME
28 Standard B18.6.1-1981. Minimum length of wood screws shall be 1¹/₄ inches (32
29 mm) for connecting the bracket to solid-sawn lumber, and 1 inch (25.4 mm) when
30 connecting the bracket to plywood. Minimum length of wood screws for connecting
31 stair treads to stair risers shall be 2¹/₂ inches (63.5 mm). Fasteners required to be
32 corrosion-resistant shall be either zinc-coated or stainless steel fasteners.

33 **2.3 Design:**

34 **2.3.1 General:** The allowable downward load capacity of an EZ-Stair bracket is 610
35 pounds (2.733 kN), and is permitted to be increased to a maximum of 640 pounds
36 (2.867 kN) for duration of load, such as snow loads on exterior stairs. The allowable
37 downward load capacity is based on the EZ-Stair bracket's being connected to
38 lumber having a specific gravity of 0.50 or greater, and a moisture content of 19
39 percent or less at time of bracket installation, and used under continuously dry
40 interior conditions. The allowable vertical load capacity shall be adjusted by the wet-

41 service factor, C_m , specified in the NDS¹, for lumber having a moisture content
42 greater than 19 percent at time of bracket installation, or where wet in-service is
43 expected for a sustained period of time. The allowable vertical load capacity shall be
44 adjusted using the temperature adjustment factor, C_t , specified in Section 7.3.4 of
45 the NDS when the installed brackets are exposed to sustained temperatures greater
46 than 100°F (37.8°C).

47 Stairs using the EZ-Stair bracket shall be designed and constructed with structural
48 members of sufficient size and capacity to carry the applied loads without exceeding
49 the allowable design values specified in the applicable code and without exceeding
50 the code-specified deflection limits. In lieu of calculations, compliance with Section
51 2.3.2 of this report is permitted.

52 **2.3.2 Allowable Stairway Width:**

53 **2.3.2.1** In lieu of calculations required by Section 2.3.1 of this evaluation report,
54 maximum allowable stairway widths and unsupported stringer lengths for stairs
55 constructed with the EZ-Stair bracket as noted in Tables 1, 2 and 3 may be used.
56 The tabulated allowable stairway widths are based on the lowest value determined
57 from the following:

- 58 1. Results of testing in accordance with the ICC-ES Interim Criteria for Joist
59 Hangers and Similar Devices (AC13), dated January 2002.
- 60 2. The bracket direct load capacity rating calculated in accordance with the NDS

¹NDS refers to the National Design Specification for Wood Construction and its Supplement. The ANSI/AF&PA NDS-97 is adopted by reference in Section 2306 of the IBC, and applicable sections of the 2000 IRC; and the ANSI/NFoPA, revised NDS-91 is adopted by reference in Division III, Part I, Chapter 23, of the UBC.

61 for screws used to attach the bracket to the wood members.

62 3. The direct load capacity rating of the treads and risers determined in
63 accordance with the NDS.

64 **2.3.2.2** Compliance with the following conditions is mandatory when using

65 Table 1:

- 66 1. Stairways shall be constructed with treads consisting of minimum nominal 2-
67 inch-thick (51 mm) solid-sawn lumber having a species and grade shown in
68 Table 1 or 1¹/₈-inch-thick (28.6 mm) plywood complying with UBC Standard
69 23-2 (Product Standard PS-1). Maximum stair tread depth is 12 inches (305
70 mm). The tabulated allowable stairway widths are based on the design
71 assumption that the stair treads distribute the code-prescribed 100 psf (4.79
72 kN/m²) uniform load and the 300 pounds (1.344 kN) concentrated load to
73 adjacent risers by direct bearing at one stair riser edge and wood screws into
74 a stair riser at the other edge.
- 75 2. Stairways shall always be constructed with risers consisting of minimum
76 nominal 2-by-8 solid-sawn lumber having the species and grade shown in
77 Table 1, or with 1¹/₈-inch-thick (28.6 mm) plywood. The allowable interior and
78 exterior stairway widths shown in Table 1 are based on the 2-by-8 stair risers
79 acting as joists, spanning between the EZ Stair brackets, that carry the
80 applied loads without exceeding the allowable design values specified in the
81 applicable code and without exceeding the code-specified deflection limits.
82 Maximum allowable stairway width is 5 feet (1524 mm) when plywood risers
83 are used.

- 84 3. An interior stair condition refers to lumber having a moisture content of 19
85 percent or less at time of bracket installation, and having an in-service
86 moisture content less than 19 percent. An exterior stair condition refers to
87 lumber having a moisture content of 19 percent or more at time of bracket
88 installation, or lumber having an in-service moisture content greater than 19
89 percent, or both.
- 90 4. Each bracket shall be connected to wood stair stringers with nine No. 8 by
91 1¹/₄-inch-long (32 mm) wood screws. Each stringer consists of 2-2×6 or 2-
92 2×8 solid-sawn lumber. The bracket shall be connected to one 2× member
93 with four screws, and the other with five screws. Allowable unsupported
94 stringer length for interior and exterior conditions are shown in Tables 2 and 3,
95 respectively.
- 96 5. The stair risers shall be connected to the bracket with five No. 8 wood screws.
- 97 6. The stair treads shall be connected to the bracket with three No. 8 wood
98 screws from the bottom, or with three No. 12 by 2-inch-long (51 mm) sheet
99 metal screws from the top.
- 100 7. The stair treads shall be connected to the stair risers with No. 8 by 2¹/₂-inch-
101 long wood screws spaced a maximum of 9 inches (229 mm) on center.
- 102 8. The wood stair stringers, treads and risers are not permitted to be exposed to
103 sustained temperatures greater than 100°F (37.8°C), unless calculations are
104 submitted to the building official showing the lumber and fastener capacities
105 have been adjusted using the temperature adjustment factor, C_t , specified in
106 Sections 2.3.4 and 7.3.4 of the NDS, respectively.

107 **2.4 Installation:**

108 The allowable downward load capacity of an EZ-Stair bracket noted in Section 2.3.1
109 of this report is based on following installation requirements:

- 110 1. Each EZ-Stair bracket is connected to a stair stringer with nine No. 8 by 1¹/₄-
111 inch-long wood screws.
- 112 2. Stair risers are connected to the bracket with five No. 8 by 1¹/₄-inch-long wood
113 screws.
- 114 3. Stair treads are connected to the bracket with three No. 8 by 1¹/₄-inch-long
115 wood screws from the bottom.

116 The allowable stairway widths shown in Table 1 are based on the installation
117 requirements specified in Section 2.3.2.2 of this evaluation report.

118 **2.5 Identification:**

119 The brackets are identified by a die stamp specifying the name of the company (EZ
120 Stairs), the product name (Adjustable Stair Bracket), and the evaluation report
121 number (ER-6161).

122 **3.0 EVIDENCE SUBMITTED**

123 Data in accordance with the ICC-ES Interim Criteria for Joist Hangers and Similar
124 Devices (AC13), dated January 2002; and a quality control manual.

125 **4.0 FINDINGS**

126 That the EZ-Stair Bracket described in this report complies with the 1997 *Uniform*
127 *Building Code*[™], the 2000 *International Building Code*[®], and the 2000 *International*
128 *Residential Code*[®], subject to the following conditions:

129 **4.1** The brackets are manufactured, identified and installed in accordance with

130 this report.

131 **4.2** The brackets are limited to use on stairs constructed with risers complying
132 with the requirements of this report.

133 **4.3** The brackets are not installed in lumber that has been treated with fire-
134 retardant chemicals.

135 This report is subject to re-examination in one year.

PB:ns

TABLE 1–MAXIMUM ALLOWABLE STAIRWAY WIDTH^{1,2}

WOOD STAIR TREADS AND RISERS		MAXIMUM ALLOWABLE STAIRWAY WIDTH ³ (inches)	
Species	Grade	Interior	Exterior
Red oak	No. 2	108	108
Mixed maple	No. 2	108	108
Douglas fir–larch	No. 2	108	108
Hem–fir	No. 2	108	96
Spruce-pine-fir	No. 2	108	96
Spruce-pine-fir (South)	No. 2	108	84
Redwood	No. 2, open grain	108	84
Western cedar	No. 2	96	84
Plywood ⁴	UBC Std. 23-2 (PS-1)	60	60

For **SI**: 1 inch = 25.4 mm.

¹Compliance with the following conditions is mandatory when using Table 1:

- Stairways shall be constructed with treads consisting of minimum nominal 2-inch thick solid-sawn lumber or 1¹/₈-inch-thick (28.6 mm) plywood. Maximum stair tread depth is 12 inches (305 mm). The tabulated allowable stairway widths are based on the design assumption that the stair treads distribute the code-prescribed 100 psf (4.79 kN/m²) uniform load and the 300-pound (1.344 kN) concentrated load to adjacent risers by direct bearing at one stair riser edge and wood screws into a stair riser at the other edge.
- Stairs shall always be constructed with risers consisting of minimum nominal 2-by-8 solid-sawn lumber having the species and grade shown in Table 1. The tabulated allowable stairway widths are based on the 2-by-8 or 1¹/₈-inch-thick plywood stair risers acting as joists, spanning between the EZ Stair brackets, that carry the applied loads without exceeding the allowable design values specified in the applicable code and without exceeding the code-specified deflection limits.
- Each EZ Stair bracket shall be connected to wood stair stringers with nine No. 8 by 1¹/₄-inch-long wood screws. Each stringer consists of 2-2×6 or 2-2×8 solid-sawn lumber. The bracket shall be connected to one 2× member with four screws, and to the other with five screws. Allowable unsupported stringer length for interior and exterior conditions is shown in Tables 2 and 3.
- Fasteners shall be minimum No. 8 gage [0.164-inch (4.2 mm) diameter] wood screws, complying with ANSI/ASME Standard B18.6.1-1981. Minimum length of wood screws shall be 1¹/₄ inches (32 mm) for connecting the bracket to solid-sawn lumber, and 1 inch (25.4 mm) when connecting the bracket to plywood. Minimum length of wood screws for connecting stair treads to stair risers shall be 2¹/₂ inches (63.5 mm).
- The stair risers shall be connected to the bracket with five No. 8 wood screws.
- The stair treads shall be connected to the bracket with three No. 8 wood screws from the bottom.
- The stair treads shall be connected to the stair risers with No. 8 by 2¹/₂-inch-long wood screws spaced a maximum of 9 inches (229 mm) on center.
- The wood stair stringers, treads and risers are not permitted to be exposed to sustained temperatures greater than 100°F (37.8°C), unless calculations are submitted to the building official showing that the lumber and fastener capacities have been adjusted using the temperature adjustment factor, C_t, specified in Sections 2.3.4 and 7.3.4 of the NDS, respectively.

² Allowable unsupported stringer length for interior and exterior conditions are shown in Tables 2 and 3, respectively.

³ Interior stair condition refers to lumber having a moisture content of 19 percent or less at time of bracket installation, and having an in-service moisture content less than 19 percent. Exterior stair condition refers to lumber having a moisture content of 19 percent or more at time of bracket installation, or lumber having an in-service moisture content greater than 19 percent, or both.

⁴ Plywood risers and treads shall be minimum 1¹/₈ inches thick (28.6 mm).

TABLE 2—ALLOWABLE UNSUPPORTED STRINGER LENGTH FOR INTERIOR CONDITIONS^{1,2}

STAIR WIDTH (inches)	STAIR STRINGER WOOD SPECIES AND GRADE									
	DF-L No. 2		Hem-Fir No. 2		Spruce-Pine-Fir No. 2		Redwood No. 2, Open Grain		Western Cedars No. 2	
	Stair Stringer Size									
	2-2x6	2-2x8	2-2x6	2-2x8	2-2x6	2-2x8	2-2x6	2-2x8	2-2x6	2-2x8
	Allowable Unsupported Stringer Length (inches)									
36	103	130	96	126	98	129	88	116	88	116
48	89	112	87	111	88	112	80	102	79	100
60	79	100	75	99	70	93	72	91	71	90
72	72	92	63	83	59	77	66	83	63	82
84	67	85	54	71	50	66	57	76	54	71
96	60	79	47	62	44	58	50	66	47	62
108	53	70	42	55	39	52	45	59	—	—

For **SI**: 1 inch = 25.4 mm.

¹ Interior stair condition refers to lumber having an in-service moisture content of 19 percent or less.

² Each EZ-Stair bracket shall be connected to wood stair stringers with nine No. 8 by 1¹/₄-inch-long wood screws. Each stringer consists of 2-2x6 or 2-2x8 solid-sawn lumber. The bracket shall be connected to one 2x member with four screws, and to the other with five screws.

TABLE 3—ALLOWABLE UNSUPPORTED STRINGER LENGTH FOR EXTERIOR CONDITIONS^{1,2}

STAIR WIDTH (inches)	STAIR STRINGER WOOD SPECIES AND GRADE									
	DF-L No. 2		Hem-Fir No. 2		Spruce-Pine-Fir No. 2		Redwood No. 2, Open Grain		Western Cedars No. 2	
	Stair Stringer Size									
	2-2x6	2-2x8	2-2x6	2-2x8	2-2x6	2-2x8	2-2x6	2-2x8	2-2x6	2-2x8
	Allowable Unsupported Stringer Length (inches)									
36	103	130	96	126	98	129	88	116	88	116
48	89	112	87	111	85	112	80	102	79	100
60	79	100	73	97	68	90	72	91	71	90
72	72	92	61	81	57	75	65	83	61	81
84	66	85	52	69	49	64	56	74	52	69
96	58	76	46	60	43	56	—	—	—	—
108	51	68	—	—	—	—	—	—	—	—

For **SI**: 1 inch = 25.4 mm.

¹ Exterior stair condition refers to lumber having an in-service moisture content greater than 19 percent.

² Each EZ-Stair bracket shall be connected to wood stair stringers with nine No. 8 by 1¹/₄-inch-long wood screws. Each stringer consists of 2-2x6 or 2-2x8 solid-sawn lumber. The bracket shall be connected to one 2x member with four screws, and to the other with five screws.

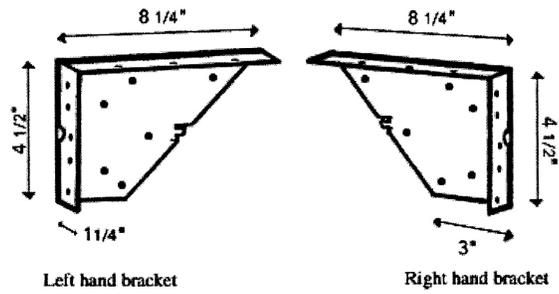


FIGURE 1—EZ-STAIR BRACKET

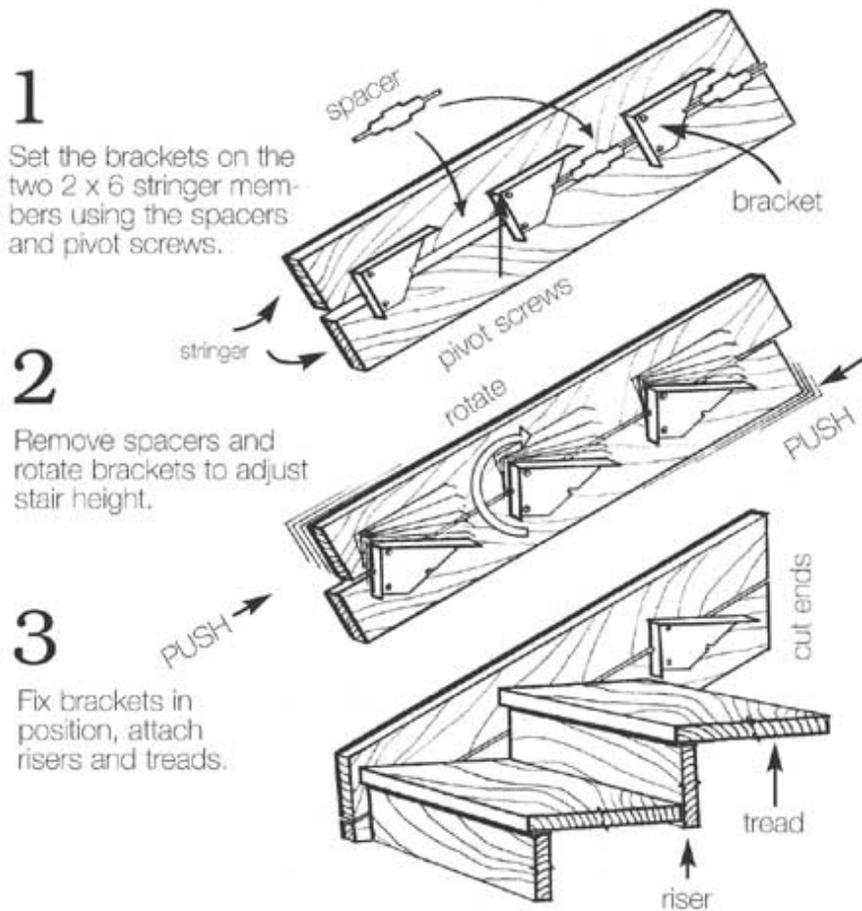


FIGURE 2—TYPICAL INSTALLATION