

# ICC-ES Evaluation Report

ESR-4171

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Subject to renewal March 2025

This report also contains:



- CBC Supplement

- FBC Supplement



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<p><b>DIVISION: 06 00 00—</b> Wood, Plastics and Composites</p> <p><b>Section: 06 16 00—</b> Sheathing</p> <p><b>Section: 06 16 23—</b> Subflooring</p>	<p><b>REPORT HOLDER:</b> MCFLY, LLC</p> 	<p><b>EVALUATION SUBJECT:</b> STEADFAST™ SHEATHING PANELS</p>	
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## 1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2021, 2018, 2015, and 2012 [International Building Code® \(IBC\)](#)
- 2021, 2018, 2015, and 2012 [International Residential Code® \(IRC\)](#)

Properties evaluated:

- Structural
- Durability
- Surface-burning characteristics
- Fire-resistance-rated floor-ceiling assembly
- Sound Transmission

## 2.0 USES

STEADFAST™ sheathing panels are fiber-reinforced magnesium-oxide (MgO) sheathing panels, intended for use as interior structural floor sheathing or as floor underlayment in floor assemblies in Type III and V construction, and in structures regulated under the IRC, provided an engineered design is submitted in accordance with IRC Section R301.1.3.

The STEADFAST™ sheathing panels can be installed with cold-formed steel framing to construct structural floors, which resist the gravity loads and act as horizontal diaphragms to resist loads resulting from wind or seismic forces.

## 3.0 DESCRIPTION

### 3.1 The STEADFAST™ Sheathing Panels:

The STEADFAST™ sheathing panels described in this report are manufactured in a nominally 5/8 inch (16 mm) thickness reinforced with the multiple embedded fiberglass mesh layers and tongue and groove profiles along the long edges of the sheathing panels. The sheathing panels have a smooth-side and a rough-side and are available in nominally 4-foot (1.22 m) width and nominally 8-foot (2.44 m) length.

The STEADFAST™ sheathing panel achieves a Class A surface burning classification in accordance with IBC Section 803.1.2 when tested in accordance with ASTM E84.

### 3.2 Floor Framing:

Cold-formed steel (CFS) floor framing members including joists, chords, web stiffeners, and strap or track blocking, must be formed from steel complying with AISI S100 and AISI S240, having a minimum yield strength of 50 ksi (345 MPa) with a minimum G60 galvanized coating and a specified base steel thickness of 54 mils [0.0538 inch (1.37 mm)]. The CFS joists must be C-shaped members having a minimum flange width of 1<sup>5</sup>/<sub>8</sub> inches (41 mm) and a minimum flange stiffener (lip or return) length of 1/2 inch (12.7 mm). The CFS chords must be channel-shaped members having a minimum flange width of 1<sup>1</sup>/<sub>4</sub> inches (32 mm).

### 3.3 Sheathing Fasteners:

**3.3.1 Screws:** The screws used to attach the STEADFAST™ sheathing panels to CFS framing members are Grabber Construction Products, Inc.'s #8-18 x 1<sup>5</sup>/<sub>8</sub> inch (41 mm) long, wafer head with countersinking nibs and winged self-drilling screws (Model Number CGH8158LG), as described in the ICC-ES ESR-4223. The screws must be installed perpendicular to the work surface by using a variable speed, high-torque screw driving tool set not to exceed 2,500 rpm.

**3.3.2 Pins:** The pins used to attach the STEADFAST™ sheathing panels to CFS framing members are Aerosmith VersaPin 2359NG, as described in the ICC-ES ESR-5030. The pins are pneumatically-driven using the prescribed tool and procedures found in installation procedures by Aerosmith Fastening Systems.

### 3.4 Fire-resistance-rated Assembly:

A floor assembly, when constructed with the STEADFAST™ sheathing panels in accordance with [Figure 2](#), has a two-hour fire resistance rating when tested, with a superimposed load of 54 psf applied to the tested floor assembly, in accordance with ASTM E119. See **Notes** in [Figure 2](#) for installation details.

### 3.5 Sound Transmission:

A floor assembly, when constructed with the STEADFAST™ sheathing panels covered with a floor finishing material in accordance with [Figure 3](#), complies with IBC Section 1206 and has a sound transmission class (STC) of 53 and an impact insulation class (IIC) of 72, when tested in accordance with ASTM E90 and ASTM E492, respectively. See **Notes** in [Figure 3](#) for installation details.

## 4.0 DESIGN AND INSTALLATION

### 4.1 Design:

**4.1.1 General:** The floor framing must be designed by a registered design professional to comply with the strength and deflection requirements of the code, the code referenced design standards, and the specifications of the projects.

**4.1.2 Uniform Gravity Load:** The allowable uniform gravity load for the STEADFAST™ sheathing panels used as floor sheathing is 153 psf (7.3 kPa) for floor joist spans up to 24 inches (610 mm) at a deflection of L/360, where L is the floor joist spacing.

**4.1.3 Floor Diaphragm Application:** When constructed in accordance with Section 4.2.2 of this report, the STEADFAST™ sheathing panels may be used as a component of a simple beam floor diaphragm assembly that is limited to Seismic Design Categories A, B and C. The diaphragm assembly must be designed by a registered design professional in accordance with the applicable requirements of IBC Chapter 16 and Chapter 22 for cold-formed steel light-frame construction. The length to width aspect ratio of the diaphragm must be no greater than 2:1 for unblocked diaphragms. The diaphragm classification as flexible or rigid must be determined in accordance with Section 12.3.1 of ASCE 7.

The nominal unit shear capacities for the unblocked diaphragms constructed with screws and pins are given in [Table 1](#) of this report. The diaphragms must be designed for loads applied parallel to the floor framing, as shown for Case 1 in IBC Figure 2306.2(1).

The deflection of the simple beam diaphragm with the lateral load applied parallel to the framing members (joists) must be calculated as follows:

$$\Delta = \left( \frac{5vL^3}{8EAW} \right) + \left( \frac{vL}{4G_a} \right)$$

Where:

$\Delta$  = Total diaphragm deflection (in)

$v$  = Unit shear parallel to the framing (plf)

$L$  = Diaphragm Length perpendicular to the direction of the applied load (ft)

$W$  = Diaphragm width parallel to the direction of the applied load (ft)

$G_a$  = Shear modulus of the diaphragm:

= 49,750 lb<sub>f</sub>/in. for screw connections

= 17,400 lb<sub>f</sub>/in. for pin connections.

$E$  = 29,500,000 psi, the modulus of elasticity of cold-formed steel chord members of the diaphragm.

$A$  = the minimum net cross-sectional area of cold formed steel chord members of the diaphragm (in<sup>2</sup>).

## 4.2 Installation:

**4.2.1 General:** Installation of STEADFAST™ sheathing panels and framing must be in accordance with the IBC, this report, McFly LLC's published installation instructions and the approved plans. Copies of this report, McFly LLC's published installation instructions and the approved plans must be available at the jobsite at all times during installation of the sheathing panels.

**4.2.2 Floor Framing:** The floor framing must be supported on a foundation that is uniform and level, or by bearing wall studs or headers when installed over the top of the bearing walls.

Web stiffeners must be provided at the locations of reactions and concentrated loads as specified in the approved plans, based on the framing manufacturer's requirements and the applicable ICC-ES evaluation report on the floor framing members. End blocking must be provided where joists ends are not otherwise restrained from rotation. All blocking or bridging for the floor framing should be installed prior to the installation of the sheathing panels.

The STEADFAST™ sheathing panels must be installed with rough side facing up in a running bond pattern with long, tongue and groove edges perpendicular to the floor framing and the sheathing joints staggered 4 ft (1.22 m) on center. As needed, the sheathing panels must be cut to proper length and width in accordance with installation instructions. All cut-out ends and edges exceeding 6 inches in any dimension must be supported by the floor framing.

**4.2.3 Floor Diaphragm Assembly:** The STEADFAST™ sheathing panels must be installed with the rough side facing up on the floor framing and fasteners specified in Sections 3.3.1 or 3.3.2, respectively, of this report. The floor framing must be spaced no more than 24 inches (610 mm) on center. The square edges and ends of the sheathing panels that are not supported by a tongue and groove profile must be supported by floor framing. Fasteners must be installed 6 inches (152.4 mm) on center for screws and 4 inches (101.6 mm) for pins, respectively, around the sheathing panel perimeters with a 1/2 inch (12.7 mm) edge distance and 12 inches (304.8 mm) on center in the field of the sheathing panels. Fasteners must not be installed within 2 inches (50.8 mm) from any corner of the sheathing panels.

Diaphragm boundary elements shall be provided to transfer the design tension and compression forces. Design of the boundary elements shall be performed by a registered design professional and is outside of the scope of this report. Diaphragm sheathing panels must not be used to splice boundary elements. Additional framing members must be provided under parallel partitions and around all openings that interrupt one or more spanning framing members.

[Figure 1](#) provides an illustration of typical installation of sheathing panel and fastener layout in a floor diaphragm.

## 5.0 CONDITIONS OF USE:

The STEADFAST™ sheathing panels described in this report comply with, or are suitable alternatives to what is specified in, those codes listed in Section 1.0 of the report, subject to the following conditions:

- 5.1** The STEADFAST™ sheathing panels must be installed in accordance with this report and the manufacturer's published installation instructions. In the event of a conflict between this report and the manufacturer's published installation instructions, this report governs.
- 5.2** Calculations and details showing that the applied gravity and uplift loads do not exceed the applicable uniform load capacity, and that the applied diaphragm loads do not exceed the available diaphragm

capacities specified in this report, 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.

- 5.3 Supporting framing members must be designed for a maximum allowable assembly deflection of  $L/360$  under live loads. Design of the supporting building foundation system or walls is outside the scope of this report.
- 5.4 Fasteners and cold-formed framing in contact with the STEADFAST™ sheathing panels shall be inherently resistant to corrosion, coated for corrosion resistance or permanently separated by a non-metallic material.
- 5.5 The STEADFAST™ sheathing panels must not be used in applications where exposed to the weather such as breezeways, balconies, or similar applications and must not be used in wet areas as defined in IBC Section 2509.
- 5.6 The STEADFAST™ sheathing panels may not be used in single span applications and may not be cut to a width less than 24 inches.
- 5.7 The STEADFAST™ sheathing panels are manufactured under a quality-control program with inspections by ICC-ES.

## 6.0 EVIDENCE SUBMITTED

- 6.1 Data in accordance with the [ICC-ES Acceptance Criteria for Fiber-reinforced Magnesium-oxide-based Sheets \(AC386\)](#), dated February 2023.
- 6.2 Data in accordance with applicable sections of the [ICC-ES Acceptance Criteria for Structural Cementitious Floor and Roof Sheathing Panels \(AC318\)](#), dated March 2018 (editorially revised March 2021)
- 6.3 Data in accordance with the [ICC-ES Acceptance Criteria for Horizontal Diaphragms Consisting of Structural Cementitious Sheathing Panels Attached to Cold-formed Steel Framing \(AC319\)](#), dated March 2018 (editorially March 2021).
- 6.4 Reports of tests in accordance with ASTM E90 and ASTM E492 for a sound transmission class (STC) and an impact insulation class (IIC).

## 7.0 IDENTIFICATION

- 7.1 The ICC-ES mark of conformity, electronic labeling, or the evaluation report number (ICC-ES ESR-4171), along with the name, registered trademark, or registered logo of the report holder must be included in the product label.
- 7.2 Each sheathing panel shall be identified by a stamp or label on the panel, bearing the product name (STEADFAST™), production date and/or lot number.
- 7.3 The report holder's contact information is the following:

**MCFLY, LLC**  
**POST OFFICE BOX 6661**  
**SAN MATEO, CALIFORNIA 94403**  
**(650) 374-7419**  
[info@mcflymaterials.com](mailto:info@mcflymaterials.com)  
[www.mcflymaterials.com](http://www.mcflymaterials.com)

TABLE 1—NOMINAL SHEAR STRENGTH FOR SIMPLE-BEAM DIAPHRAGM<sup>1</sup>

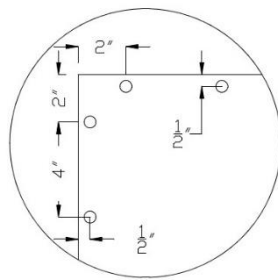
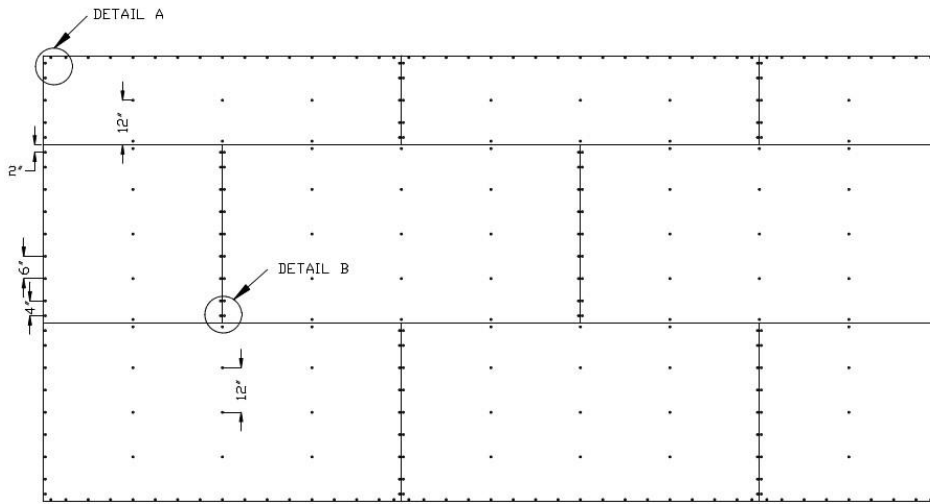
JOIST SPACING (inches)	BLOCKING	MAXIMUM FASTENER SPACING (inches)		FASTENER <sup>2</sup> TYPE AND FASTENER CONFIGURATION	SHEAR STRENGTH <sup>3</sup> S <sub>u</sub> (plf)
		Perimeter	Field		
24	No	6	12	Screws ( <a href="#">Figure 1</a> Details A and B)	1,100
24	No	4	12	Pins ( <a href="#">Figure 1</a> Details C and D)	1,185

For SI: 1 inch = 25.4 mm, 1 plf = 14.6 N/m

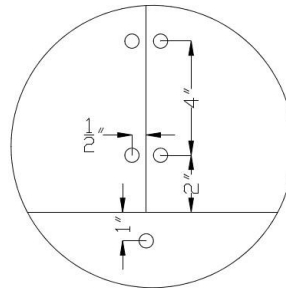
<sup>1</sup>Refer to [Figure 1](#) for sheathing panel and fastener layouts in floor diaphragm.

<sup>2</sup>Refer to Section 3.3.1 and 3.3.2 for fastener requirements.

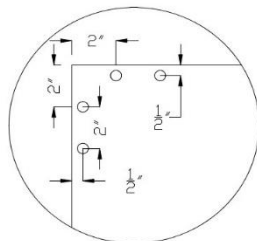
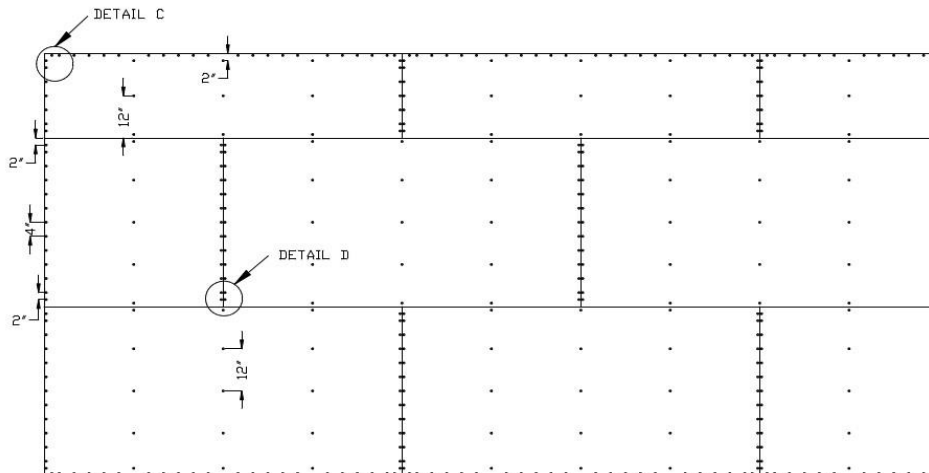
<sup>3</sup>For Allowable Stress Design (ASD), the ASD allowable unit shear must be determined by dividing the nominal unit shear capacity by ASD reduction factor of 2.8. For Load and Resistance Factor Design (LRFD), The LRFD factored shear resistance must be determining by multiplying the nominal unit shear capacity by a resistance factor of 0.50. No further increases are permitted.



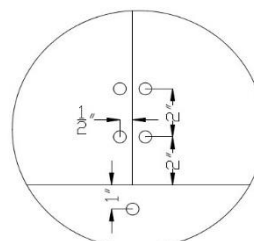
Detail A



Detail B

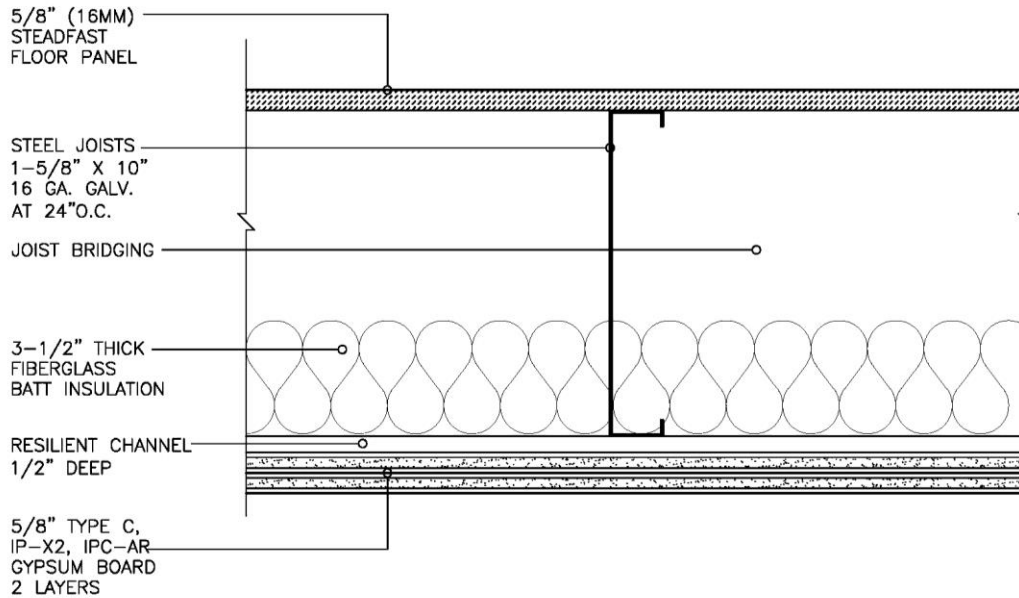


Detail C



Detail D

**FIGURE 1—ILLUSTRATION FOR STEADFAST™ SHEATHING PANEL LAYOUT AND FASTENER SCHEDULES FOR SCREW ATTACHMENT (ABOVE) AND PIN ATTACHMENT (BELOW) IN A FLOOR DIAPHRAGM**

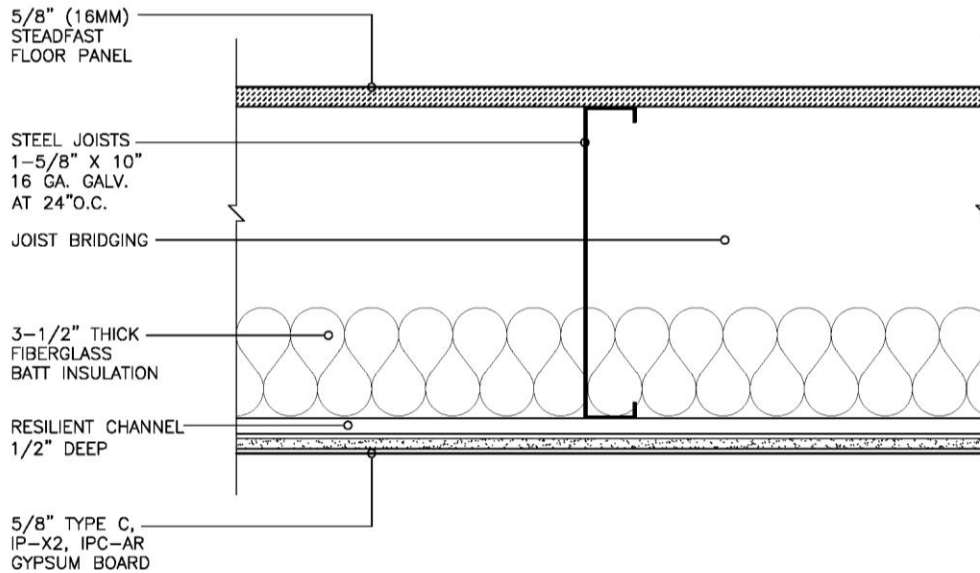


**FIGURE 2—TWO-HOUR FIRE-RESISTANCE-RATED FLOOR-CEILING ASSEMBLY**

**Notes:**

1. Single Floor—One layer of STEADFAST™ sheathing panels with tongue-and-groove edges installed with long dimension of sheathing panel (strength axis) perpendicular to joists with end joints staggered. The sheathing panels are attached to joists by using screws spaced at 8 inches ( $1/2$  inch from edge and 2 inches from corner) on center spacing at the panel edges and 12 inches (1 inch from edge) in the field, respectively. The screws comply with Section 3.3.1 of the report.
2. Floor Joist—Cold-formed steel joists spaced at the 24 inches on center and connected to a continuous track placed at the joist ends with clips (2-inch-by-2-inch-by- $9^{3/4}$ -inch) with 4 #10- $3/4$ " long hex-head screws into each end of the joist and 4 #10- $3/4$ " long hex-head screws into track at the spacing of 1 inch from the edge of the clip and 1 inch on center spacing for the rest of screws.
3. Bridging—Cold-formed steel bridging cut to the cavity spacing and spaced 8 feet on center. Each bridging is fastened at the mid-span to the floor joist with two clips (2-inch-by-2-inch-by- $9^{3/4}$ -inch) using hex-head screws, 4 on each side of the clip. Additional support cold-formed strapping (2-inch-wide-by-0.031-inch-thick) is attached to the bottom of the floor joists as the mid-span, fastened at each floor joist with  $1/2$ -inch-long pan-head screws. Splicing of the strapping is done at the mid-bridging with additional screws on the underside of the bridging 1 inch from the splice and midway between the splice and the floor joist.
4. Insulation— $3^{1/2}$ -inch-thick unfaced R-11 fiberglass insulation batts (minimum 0.61 lb/ft<sup>3</sup> density) laid loosely on top of the resilient channels. Each  $3^{1/2}$ -inch-thick by 24-inch-long insulation batt is filled each cavity.
5. Resilient Channels—25 gauge resilient channels fastened with  $1/2$ -inch pan-head screws perpendicular to the underside of the joists at 12 inches on center. Resilient channels were located so that the perpendicular gypsum butt joints (both face and base layers) can be fastened 3 inches in both direction (6 inches total). Resilient splices are overlapped 4 inches at the alternating joists with a single screws through both resilient channel legs.
6. Type C Gypsum Boards—Two layers of approved  $5/8$ -inch-thick-by-48-inch-wide Type C gypsum boards (CertainTeed), installed perpendicular to the furring channels. The base layer gypsum boards are fastened with 1-inch-long Type S drywall screws at 12 inches on center with 3 inches and  $1^{1/2}$  inches spacing to the butt and tapered joints, respectively. The face layer gypsum boards are fastened with  $1^{5/8}$ -inch-long Type S drywall screws at 8 inches on center with 3 inches and  $1^{1/2}$  inches spacing to the butt and tapered joints, respectively. The base and face layers were staggered by 2 feet along the tapered joint and 4 feet along the butt joint. Drywall screws must be driven so that the screws are flush with the face and do not damage the core of the gypsum boards. All exposed gypsum joints must be taped and covered with two layers of dry mix joint compound. The exposed screw heads must be covered with two layers of compound.

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm and 1 lb/ft<sup>3</sup> = 16 kg/m<sup>3</sup>



**FIGURE 3—ILLUSTRATION FOR FLOOR-CEILING ASSEMBLY FOR SOUND TRANSMISSION CLASS (STC) AND IMPACT INSULATION CLASS (IIC)**

**Notes:**

1. Floor Finishing (not shown)—Shaw ECO Beauty Carpet with 6 lbs Carpet Pad.
2. Single Floor—One layer of STEADFAST™ sheathing panels with tongue-and-groove edges installed with long dimension of sheathing panel (strength axis) perpendicular to joists with end joints staggered. The sheathing panels are attached to joists by using screws spaced at 6 inches ( $\frac{1}{2}$  inch from edge and 2 inches from corner) on center spacing at the panel edges and 12 inches (1 inch from edge) in the field, respectively. The screws comply with Section 3.3.1 of the report.
3. Floor Joist—Cold-formed steel joists spaced at the 24 inches on center and connected to a continuous track placed at the joist ends with clips (2-inch-by-2-inch-by- $\frac{9}{16}$ -inch) with 4 #10- $\frac{3}{4}$ " long hex-head screws into each end of the joist and 4 #10- $\frac{3}{4}$ " long hex-head screws into track at the spacing of 1 inch from the edge of the clip and the 1 inch on center spacing for the rest of screws.
4. Bridging—Cold-formed steel bridging cut to the cavity spacing and spaced 8 feet on center. Each bridging is fastened at the mid-span to the floor joist with two clips (2-inch-by-2-inch-by- $\frac{9}{16}$ -inch) using hex-head screws, 4 on each side of the clip. Additional support cold-formed strapping (2-inch-wide-by-0.031-inch-thick) is attached to the bottom of the floor joists as the mid-span, fastened at each floor joist with  $\frac{1}{2}$ -inch-long pan-head screws. Splicing of the strapping is done at the mid-bridging with additional screws on the underside of the bridging 1 inch from the splice and midway between the splice and the floor joist.
5. Insulation— $3\frac{1}{2}$ -inch-thick unfaced R-13 fiberglass insulation batts (minimum 0.61 lb/ft<sup>3</sup> density) laid loosely on top of the resilient channels. Each  $3\frac{1}{2}$ -inch-thick by 24-inch-long insulation batt is filled each cavity.
6. Resilient Channels—25 gauge resilient channels fastened with  $\frac{1}{2}$ -inch pan-head screws perpendicular to the underside of the joists at 12 inches on center. Resilient channels were located so that the perpendicular gypsum butt joints (both face and base layers) can be fastened 3 inches in both direction (6 inches total). Resilient splices are overlapped 4 inches at the alternating joists with a single screws through both resilient channel legs.
7. Ceiling Sheathing—One layer of  $\frac{5}{8}$ -inch-thick-by-48-inch-wide Type C gypsum boards, installed perpendicular to the resilient channels. The gypsum boards are fastened with 1-inch-long Type S drywall screws at 8 inches on center with 3 inches and  $1\frac{1}{2}$  inches spacing to the butt and tapered joints. The gypsum boards were staggered by 4 feet along the butt joints. Drywall screws must be driven so that the screws are flush with the face and do not damage the core of the gypsum boards. All exposed gypsum joints must be taped and covered with two layers of dry mix joint compound. The exposed screw heads must be covered with two layers of compound.

For SI: 1 inch = 25.4 mm, 1 foot = 304.8 mm, 1 lb = 0.454 kg, and 1 lb/ft<sup>3</sup> = 16 kg/m<sup>3</sup>



**DIVISION: 06 00 00—Wood, Plastics and Composites****Section: 06 16 00—Sheathing****Section: 06 16 23—Subflooring****REPORT HOLDER:**

MCFLY, LLC

**EVALUATION SUBJECT:****STEADFAST™ SHEATHING PANELS****1.0 REPORT PURPOSE AND SCOPE****Purpose:**

The purpose of this evaluation report supplement is to indicate that the STEADFAST™ sheathing panels, described in ICC-ES evaluation report ESR-4171, have also been evaluated for compliance with the codes noted below.

**Applicable code editions:**

## ■ 2022 California Building Code (CBC)

For evaluation of applicable chapters adopted by the California Office of Statewide Health Planning and Development (OSHPD) AKA: California Department of Health Care Access and Information (HCAI) and the Division of State Architect (DSA), see Sections 2.1.1 and 2.1.2 below.

## ■ 2022 California Residential Code (CRC)

**2.0 CONCLUSIONS****2.1 CBC:**

The STEADFAST™ sheathing panels, described in Sections 2.0 through 7.0 of the evaluation report ESR-4171, comply with 2022 CBC Chapters 8 and 23 provided the design and installation are in accordance with the 2021 *International Building Code*® (IBC) provisions noted in the evaluation report and the additional requirements of 2022 CBC Chapters 16, 17 and 23 as applicable.

**2.1.1 OSHPD:** The applicable OSHPD Sections and Chapters of the CBC are beyond the scope of this supplement.

**2.1.2 DSA:** The applicable DSA Sections and Chapters of the CBC are beyond the scope of this supplement.

**2.2 CRC:**

The STEADFAST™ sheathing panels, described in Sections 2.0 through 7.0 of the evaluation report ESR-4171, comply with 2022 CRC Chapter 5, provided the design and installation are in accordance with the 2021 *International Residential Code*® (IRC) provisions noted in the evaluation report and the additional requirements of CRC Chapter 5, as applicable.

This supplement expires concurrently with the evaluation report ESR-4171, reissued March 2024 and revised July 2024.

**DIVISION: 06 00 00—Wood, Plastics and Composites****Section: 06 16 00—Sheathing****Section: 06 16 23—Subflooring****REPORT HOLDER:**

MCFLY, LLC

**EVALUATION SUBJECT:**

STEADFAST™ SHEATHING PANELS

**1.0 REPORT PURPOSE AND SCOPE****Purpose:**

The purpose of this evaluation report supplement is to indicate that the STEADFAST™ sheathing panels, described in ICC-ES evaluation report ESR-4171, have also been evaluated for compliance with the codes noted below.

**Applicable code editions:**

- 2020 *Florida Building Code—Building*
- 2020 *Florida Building Code—Residential*

**2.0 CONCLUSIONS**

The STEADFAST™ sheathing panels, described in Sections 2.0 through 7.0 of ICC-ES evaluation report ESR-4171, comply with the *Florida Building Code—Building* or the *Florida Building Code—Residential*. The design requirements must be determined in accordance with the *Florida Building Code—Building* or the *Florida Building Code—Residential*, as applicable. The installation requirements noted in ICC-ES evaluation report ESR-4171 for the 2018 *International Building Code*® meet the requirements of the *Florida Building Code—Building* or the *Florida Building Code—Residential*, as applicable.

Use of the STEADFAST™ sheathing panels for compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code—Building* or the *Florida Building Code—Residential* has not been evaluated and is outside the scope of this supplemental report.

For products falling under Florida Rule 61G20-3, verification that the report holder's quality assurance program is audited by a quality assurance entity approved by the Florida Building Commission for the type of inspections being conducted is the responsibility of an approved validation entity (or the code official when the report holder does not possess an approval by the Commission).

This supplement expires concurrently with the evaluation report ESR-4171, reissued March 2024 and revised July 2024.