

ICC-ES Evaluation Report

ESR-4250

Reissued April 2024

This report also contains:


- CBC Supplement

Subject to renewal April 2025

- FBC Supplement

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<p>DIVISION: 03 00 00— CONCRETE</p> <p>Section: 03 11 00— Concrete Forming</p>	<p>REPORT HOLDER: EPI 04 INC. DBA EXTRUTECH PLASTICS INC.</p>	<p>EVALUATION SUBJECT: EXTRUTECH FORM – MODELS P624 AND P824</p>	
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1.0 EVALUATION SCOPE

Compliance with the following codes:

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

Properties evaluated:

- Structural (for concrete wall assemblies)
- Weather resistance
- Surface-burning characteristics
- Fire separation
- Fire Resistance
- Dampproofing

2.0 USES

Extrutech Form – Models P624 and P824 components are used as stay-in-place formwork for plain and reinforced concrete load-bearing and non-load-bearing walls. Walls formed with Models P624 and P824 components are also used as foundation walls.

3.0 DESCRIPTION

3.1 General:

Extrutech Form - Models P624 and P824 are a permanent formwork system for concrete walls and consists of hollow, rigid polymer, flat profile, interlocking components that are filled with either reinforced or plain structural concrete. Models P624 and P824 formwork serves as the exterior and interior wall finish for the concrete walls.

3.2 Formwork:

Model P624 formwork components are available for wall designs that are nominally 6 inches (152.4 mm) thick with a nominal interior cell wall thickness of 0.075 inch (1.91 mm) and nominal wall panel thickness of 0.110 inch (2.79 mm).

Model P824 formwork components are available for wall designs that are nominally 8 inches (200 mm) thick with a nominal interior cell wall thickness of 0.075 inch (1.91 mm) and nominal wall panel thickness of 0.120 inch (3.05 mm).

Each Model P624 and P824 formwork is primarily comprised of multi-cell panel components. The multi-cell panel connectors interlock with each other panels to form a monolithic wall formwork. The panel components must be used to construct the Model P624 and P824 system.

The panel components are manufactured in lengths (i.e., wall height) up to 24 feet (7315 mm); and are manufactured in 24-inches-wide (609 mm) sections which can be interlocked to create the applicable wall length. Accessory components include corner units, male/female interlocking joints, spline inserts, and cap channels for creating interlocking wall panels. See [Figures 1, 2 and 3](#) for details.

3.3 Materials:

3.3.1 PVC Formwork: Extrutech Form components are manufactured by an extrusion and co-extrusion process, from a rigid polymer-based composite material that is a proprietary blend. The specified yield tensile strength is 5,440 psi (37.5 MPa) and the modulus of elasticity is 0.613×10^6 psi (4226 MPa). The PVC material is a Class CC1 plastic in accordance with Section 2606.4 of the IBC and has a flame-spread index of 25 or less and a smoke-developed index of 450 or less, when filled with concrete and tested in accordance with ASTM E84. The maximum thickness is 0.120 inch (3.05 mm).

3.3.2 Concrete: The Extrutech Forms must be filled with normal-weight concrete having a maximum aggregate size of $\frac{3}{8}$ inch (9.5 mm), a minimum slump of 5 inches (127 mm), a minimum 28-day compressive strength of 4,000 psi (27.6 MPa), and must comply with Chapter 19 of the IBC or Section R608.5.1 of the 2018 and 2015 IRC [Section R611.5.1 of the 2012 IRC].

3.3.3 Steel Reinforcement: Deformed steel reinforcement bars must have a minimum yield stress of 40 ksi (275 MPa) and must comply with the applicable code.

3.4 Properties of Concrete-filled Forms:

Walls comprised of Model P624 and P824 forms are noncombustible in accordance with Section 703.5.2 of the IBC. The walls have a Class A interior finish rating when tested in accordance with ASTM E84 and may be left exposed to the interior of the building.

Walls formed using Models P624 and P824 forms may be left exposed to the exterior or may be covered with an approved exterior wall covering. Installation of a water-resistive barrier over the formwork is optional, based on testing in accordance with Section 1402.2, exception 2 of the 2018 IBC [Section 1403.2, exception 2 of the 2015 and 2012 IBC]. Installation of a vapor retarder is also optional.

For below-grade installations, the Models P624 and P824 formwork provides dampproofing for the concrete in accordance with Section 1805 of the IBC and Section R406 of the IRC. An additional vapor barrier or dampproofing is optional.

4.0 DESIGN AND INSTALLATION

4.1 General:

Design and installation of Models P624 and P824 formwork, reinforcing steel and concrete must comply with this report and the manufacturer's published installation instructions. The manufacturer's published installation instructions must be available at the jobsite at all times during installation.

4.2 Design:

4.2.1 PVC Formwork: Models P624 and P824 formwork must be braced in accordance with the applicable code to resist wind, seismic and construction loads, including hydrostatic pressures from the placement of concrete, until the permanent supporting roof and floor diaphragms are installed.

4.2.2 Concrete Walls: Design must comply with Sections 4.2.2.1 and 4.2.2.2.

4.2.2.1 Design in Accordance with the IBC: Concrete walls formed with Models P624 and P824 components must be designed in accordance with Chapters 16 and 19 of the IBC, using the section properties found in Table 1. Foundation walls may be designed in accordance with IBC Section 1807.1.5 or prescriptive requirements in IBC Section 1807.1.6.

4.2.2.2 Design in Accordance with the IRC: Above-grade concrete walls formed with Models P624 and P824 components must be designed in accordance with the provisions of ACI 318. Alternatively, if all the applicability provisions of Section R608.2 of the 2018 and 2015 IRC [Section R611.2 of the 2012 IRC] are met, the walls may be designed as flat insulating concrete form (ICF) walls in accordance with Section R608 of the 2018 and 2015 IRC [Section R611 of the 2012 IRC], including the requirements for wall openings and lintels. Foundation walls formed with Models P624 and P824 components must be designed in accordance with the provisions of ACI 318 or in accordance with Section R404.1.3 of the 2018 and 2015 IRC [Section R404.1.2 of the 2012 IRC], as applicable.

4.2.2.3 Lintels:

4.2.2.3.1 IBC: The concrete wall above the opening must be designed as a concrete beam in accordance with the code; or a lintel comprised of back-to-back steel angles, specified in the structural design, must be cast into the concrete.

4.2.2.3.2 IRC: The lintels may be designed in accordance with the IBC or, if all the applicability provisions of Section R608.2 of the 2018 and 2015 IRC [Section R611.2 of the 2012 IRC] are met, the lintels may be designed in accordance with Section R608.8 of the 2018 and 2015 IRC [Section R611.8 of the 2012 IRC].

4.2.3 Connections: Connections to the wall assembly, including attachment of interior and exterior wall coverings, must be into the concrete core, and must be approved by the code official. For walls designed in accordance with the IRC, the connections must comply with Section R608.9 of the 2018 and 2015 IRC [Section R611.9 of the 2012 IRC].

4.2.4 Fire-resistance Rating: Concrete walls constructed with the Model P824 components have a one-hour fire-resistance rating as limited load-bearing walls. The applied factored load (P_u) is limited to the lesser of the following:

- a. 15 kips/ft (20.3 kN/m).
- b. 1.5% of the design strength (ϕP_n) determined in accordance with Section 11.5 or Section 14.5 of ACI 318-14, as applicable.

4.2.5 Exterior Walls of Type I, II, III, and IV Construction: Walls comprised of concrete-filled Models P624 and P824 forms are noncombustible in accordance with IBC Section 703.5.2 and may therefore also be used as exterior walls of buildings of Type I, II, III or IV construction of any height.

4.2.6 Fire Separation Distance: The Models P624 and P824 formwork may be used for exterior walls with a fire separation distance of 5 feet (1525 mm) or less, in accordance with IBC Section 1406.2. Required fire separation based on fire-resistance rating must be determined in accordance with IBC Table 602. For buildings constructed in accordance with the IRC, walls formed with the Model P624 and P824 components are not permitted to be used as exterior walls with a fire separation distance of less than 5 feet (1525 mm), in accordance with IRC Section R302.1.

4.3 Installation:

4.3.1 Formwork: The Models P624 and P824 formwork must be installed on footings and foundations complying with Chapter 18 of the IBC or Chapter 4 of the IRC. Reinforcing dowels connecting the walls to the footing are to be cast in place or post installed prior to the erection of the Models P624 and P824 formwork and must extend into the base of the wall system for the minimum developed length necessary for compliance with Chapter 25 of ACI 318-14 for the 2018 and 2015 IBC and IRC [Chapter 12 of ACI 318-11 for the 2012 IBC and IRC]. Each piece of Models P624 and P824 formwork may be installed independently. Formwork is to be installed with the label end up to ensure that the holes in the component webs align. Two splines must be inserted into each slotted end of the conjoining male/female interlocking joints of the formwork.

4.3.2 Steel Reinforcing Bars: Vertical bars are installed in the box connectors and the cells of the, as required by the structural design. Vertical bars must be installed prior to horizontal bars, except at corners. If specified, the vertical bars are tied to the dowels, either by lifting the installed formwork, or by installing the formwork after the vertical bars are installed. To ensure proper placement in the wall, wire hoops that match the diagonal dimension of the open cells are tied to the vertical bars. Horizontal bars are installed through the holes in the webs of the Models P624 and P824 components. When horizontal reinforcing is required to continue around corners, bars with 180-degree standard hooks, complying with ACI 318, are installed in both directions and lapped with the straight bars as specified. A vertical bar is then installed through the two overlapping hooked bars. To ensure proper placement in the wall, vertical alignment spacers are attached to the vertical bar to hold in place. Horizontal bars are installed through the 3-inch-diameter (76.2 mm) holes in the wall webs and will self-center. For plain concrete and reinforced concrete walls designed in accordance with Chapter 19 of the IBC, not less than two No. 5 (16 mm) bars must be provided around all door and window openings. Such bars must be extended beyond the corners of the openings not less than 24 inches (610 mm). For walls designed in accordance with the IRC, the steel reinforcing must comply with Section R608.5.2 of the 2018 and 2015 IRC [Section R611.5.2 of the 2012 IRC].

4.3.3 Concrete: Concrete is to be placed in the forms in accordance with the applicable code and the manufacturer's installation instructions. The concrete must be allowed to cure in accordance with Section 26.5.3 of ACI 318-14 for the 2018 and 2015 IBC and IRC [Section 5.11 of ACI 318-11 for the 2012 IBC and IRC], before the installation of floor and roof framing.

4.4 Special Inspection:

Special inspections in accordance with IBC Section 1705.3 are required; except for P824 walls constructed using the prescriptive requirements of IBC Section 1807.1.6. In jurisdictions adopting the IRC, walls constructed in accordance with ACI 318 are subject to the special inspections required by IBC Section 1705.3. Under the IRC, walls constructed in accordance with Section 4.2.2.2 are not subject to special inspections.

5.0 CONDITIONS OF USE:

The Extrutech Form - Models P624 and P824 described in this report complies with, or is a suitable alternative to what is specified in, those codes listed in Section 1.0 of this report, subject to the following conditions:

- 5.1 Installation complies with this report, the manufacturer's published installation instructions and the applicable code. If there is a conflict between the manufacturer's published installation instructions and this report, this report governs.
- 5.2 Structural calculations and plans, showing compliance with this report and the code, must be submitted to the code official for approval. The calculations and plans must be prepared by a registered design professional when required by the statutes of the jurisdiction in which the project is to be constructed.
- 5.3 Walls must be supported by footings and foundations complying with Chapter 18 of the IBC or Chapter 4 of the IRC.
- 5.4 Walls constructed using the Models P624 and P824 formwork are not permitted to be installed where the surface temperature of the wall is expected to exceed 185°F (85°C).
- 5.5 Bearing walls constructed using the Models P624 and P824 formwork are limited to use in the construction types defined in IBC Table 601 having non-fire-resistance ratings.
- 5.6 Walls must satisfy requirements described in Section 3.4 of this report.
- 5.7 The Extrutech Form - Models P624 and P824 is produced in Manitowoc, Wisconsin under a quality control program with inspections by ICC-ES

6.0 EVIDENCE SUBMITTED

- 6.1 Report of testing of tensile properties in accordance with ASTM D638.
- 6.2 Report of testing of weatherability in accordance with ASTM D4226.
- 6.3 Report of testing of flash ignition and self-ignition in accordance with ASTM D1929.
- 6.4 Report of rate of burning testing in accordance with ASTM D635.
- 6.5 Report of fire-resistance testing in accordance with ASTM E119.
- 6.6 Report of testing of surface-burning characteristics in accordance with ASTM E84.
- 6.7 Report of air leakage testing in accordance with ASTM E283.
- 6.8 Report of water penetration testing in accordance with ASTM E331.
- 6.9 Report of ignitability testing in accordance with NFPA 268.
- 6.10 Report of potential heat testing in accordance with NFPA 259.
- 6.11 Report of heat and visible smoke release rate testing in accordance with ASTM E1354.
- 6.12 Report of accelerated weathering testing in accordance with ASTM G154.
- 6.13 Quality documentation in accordance with the [ICC-ES Acceptance Criteria for Quality Documentation \(AC10\)](#), dated January 2019.

7.0 IDENTIFICATION

7.1 Each component of the Models P624 and P824 formwork is identified with a label indicating the manufacturer's name and address, the product name, the part number of the component, and the evaluation report number (ESR-4250).

7.2 The report holder's contact information is the following:

EPI 04 INC. DBA EXTRUTECH PLASTICS INC.

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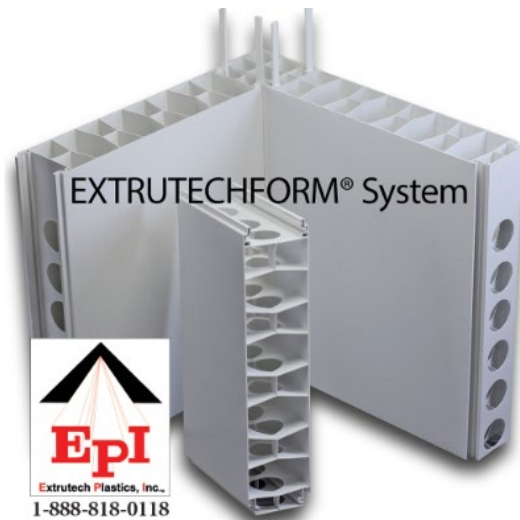


FIGURE 1—EXTRUTECH FORM - MODELS P624 AND P824

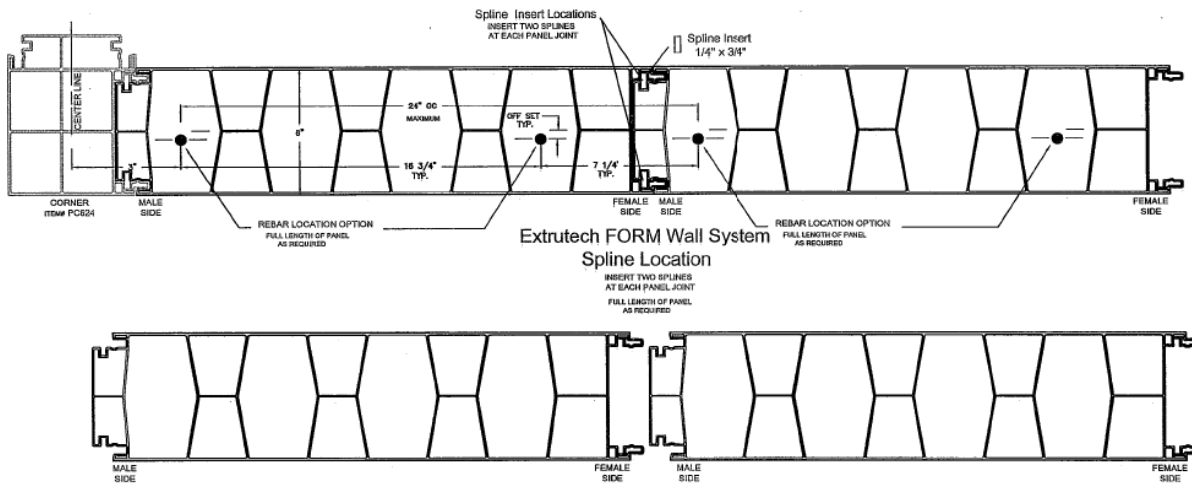


FIGURE 2—EXTRUTECH FORM - MODELS P624 AND P824 WALL SYSTEM WITH SPLICE LOCATION

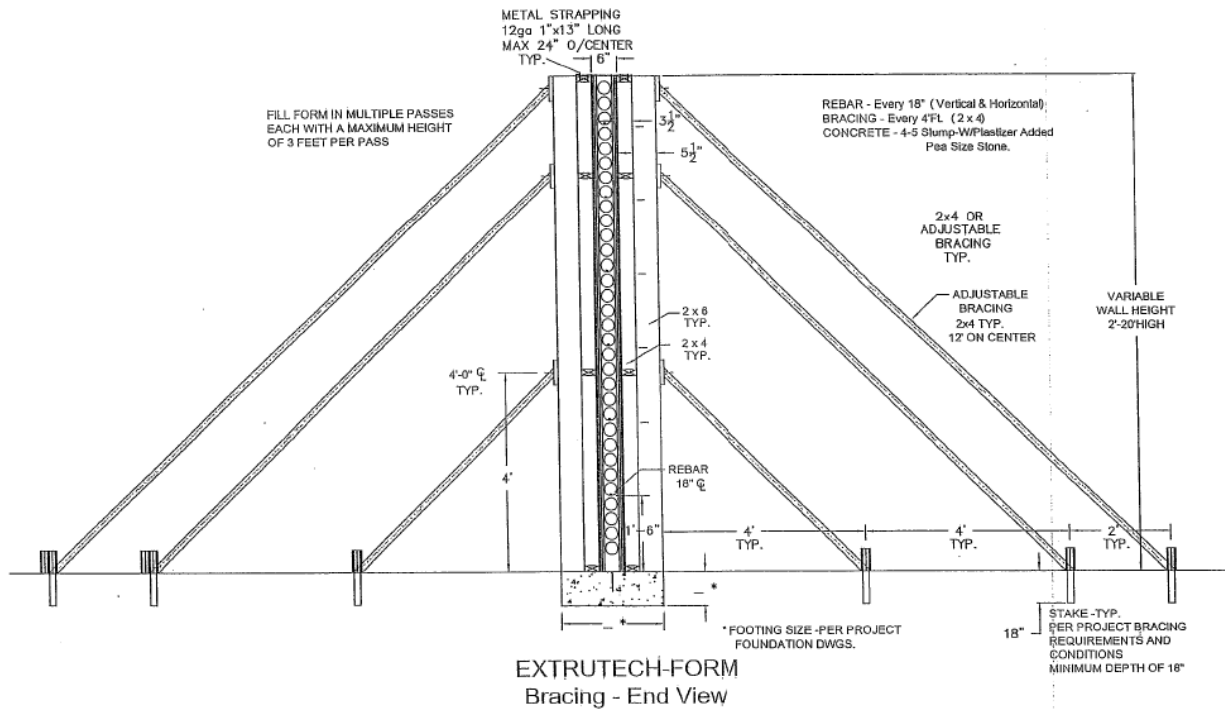


FIGURE 3—EXTRUTECH FORM - MODELS P624 AND P824 BRACING DETAIL

DIVISION: 03 00 00—CONCRETE

Section: 03 11 00—Concrete Forming

REPORT HOLDER:

EPI 04 INC. DBA EXTRUTECH PLASTICS INC.

EVALUATION SUBJECT:

EXTRUTECH FORM – MODELS P624 AND P824

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that Extrutech Form – Models P624 and P824, described in ICC-ES evaluation report ESR-4250, has also been evaluated for compliance with the codes noted below.

Applicable code editions:

- 2019 *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.

- 2019 *California Residential Code* (CRC)

2.0 CONCLUSIONS

2.1 CBC:

The Extrutech Form – Models P624 and P824, described in Sections 2.0 through 7.0 of the evaluation report ESR-4250, complies with CBC Chapters 7, 14, 16, 17, 18, 19 and 26, provided the design and installation are in accordance with the 2018 *International Building Code*® (IBC) provisions noted in the evaluation report.

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

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

2.2 CRC:

The Extrutech Form – Models P624 and P824, described in Sections 2.0 through 7.0 of the evaluation report ESR-4250, complies with CRC Chapters 3, 4, and 6, provided the design and installation are in accordance with the 2018 *International Residential Code*® (IRC) provisions noted in the evaluation report.

This supplement expires concurrently with the evaluation report, reissued April 2024.

DIVISION: 03 00 00—CONCRETE

Section: 03 11 00—Concrete Forming

REPORT HOLDER:

EPI 04 INC. DBA EXTRUTECH PLASTICS INC.

EVALUATION SUBJECT:

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1.0 REPORT PURPOSE AND SCOPE

Purpose:

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Applicable code editions:

- 2017 Florida Building Code—Building
- 2017 Florida Building Code—Residential

2.0 CONCLUSIONS

The Extrutech Form - Models P624 and P824, described in Sections 2.0 through 7.0 of ICC-ES evaluation report ESR-4250, complies with the *Florida Building Code—Building* and the *Florida Building Code—Residential*, provided the design requirements are 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-4250 for the 2015 *International Building Code*® meet the requirements of the *Florida Building Code—Building* or the *Florida Building Code—Residential*, as applicable.

Use of the Extrutech Form - Models P624 and P824 has also been found to be in compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code—Building* and the *Florida Building Code—Residential*, provided the Extrutech Form - Models P624 and P824 are covered with an approved exterior veneer.

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).

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