



ESR-4362 Reissued June 2021 This report is subject to renewal June 2022.

www.icc-es.org | (800) 423-6587 | (562) 699-0543

DIVISION: 03 00 00—CONCRETE Section: 03 41 10—Precast Concrete Design

DIVISION: 05 00 00—METALS Section: 05 12 00—Structural Steel Framing

REPORT HOLDER:

VERTI-BLOCK SAN DIEGO, INC.

EVALUATION SUBJECT:

VERTI-CRETE SOUND BARRIER FENCE WALL SYSTEM

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2018 and 2015 International Building Code[®] (IBC)
- 2018 and 2015 International Residential Code[®] (IRC)

For evaluation for compliance with codes adopted by the Los Angeles Department of Building and Safety (LADBS), see the <u>ESR-4362 LABC and LARC Supplement</u>.

Properties evaluated:

- Structural
- Sound Transmission

2.0 USES

The Verti-crete Sound Barrier Fence Wall System (Verti-Crete SFW) is a free-standing fence wall, or partial retaining fence wall capable of resisting lateral out-of-plane wind, earthquake (Seismic Design Categories A through F), and active soil pressure loads. The Verti-crete SFW is also used to provide sound insulation as a sound barrier fence wall system.

The Verti-crete SFW must be designed by a registered design professional in accordance with ACI 318-14 Section 4.12.1, IBC Section 1901.2 and Section 4.1.2 of this report.

Under the IRC, an engineered design in accordance with IRC Section R301.1.3 must be submitted to the code official for approval.

3.0 DESCRIPTION

3.1 General:

The Verti-Crete Sound Barrier Fence Wall System (Verti-Crete SFW) consists of precast reinforced concrete panels, precast reinforced concrete or wide-flange structural steel cantilever columns, and concrete caisson foundations. The precast panels are reinforced with one layer of vertical and horizontal steel reinforcing bars and have ends that are A Subsidiary of the International Code Council®

tapered, as illustrated in Figure 1. The precast reinforced concrete columns have a hollow core and grooves on opposite faces of the column as illustrated in Figure 2, and structural steel columns as illustrated in Figure 3. The cast-in-place concrete caisson foundations are outside the scope of this report.

The precast concrete columns and structural steel columns are supported on cast-in place concrete caisson foundations. The precast concrete column is set with two vertical reinforcing dowels from the foundation to the hollow core of the column. Partial grout is then placed and vibrated within the hollow core for the development length of the vertical reinforcing dowels. The steel column is to be embedded directly into the cast-in place concrete caisson foundation. The panels are installed with the tapered ends bearing on the cast-in place concrete caisson foundation and fit within the grooves of the precast concrete columns, as applicable, as illustrated in Figures 4 and 5.

For gravity loads, the panel is simply-supported, between the cast-in place concrete caissons. For lateral loads due to wind, seismic or soil pressure, the panels span horizontally out-of-plane between columns. The out-of-plane loads are transferred from the panel through bearing to the columns, the columns resist lateral loads as cantilevered columns and are supported by the caisson foundation.

3.1.1 Verti-Crete Precast Concrete Panels: The Verti-Crete precast concrete panels are 4 feet to 8 feet (1.22 m to 2.45 m) tall and 6 feet to 12 feet (1.83 m to 3.66 m) long reinforced with steel reinforcing bars and must be designed in accordance with Section 4.1.2 of this report. The precast panels have a smooth or patterned face on one side resembling rock surfaces, stucco, masonry façade, etc. Smooth panels and panels with stucco or similar type pattern finishes, are 4.5 inches (11.4 mm) thick. Panels with patterned faces have a maximum nominal panel thickness of 6 inches (153 mm), an average panel thickness of 5 inches (127 mm), and a minimum net or design panel thickness of 4 inches (102 mm). The panel ends are tapered to allow the panels to fit between the grooves of a precast concrete column or the flanges of a steel column, as applicable, as illustrated in Figures 4 and 5.

3.1.2 Verti-Crete Precast Concrete Columns: The Verti-Crete precast concrete columns have square sections with two side grooves and a hollow, tapered, inner core, and are to be designed in accordance with Section 4.1.3 of this report. The dimensions of the hollow core are 8 inch x 8 inch ($203 \times 203 \text{ mm}$) and 6 inch x 6 inch ($152 \times 152 \text{ mm}$) at the top and bottom of the column, respectively. The hollow core is to be partially filled with grout after it is set in place. The columns are reinforced with four vertical steel reinforcing

ICC-ES Evaluation Reports are not to be construed as representing aesthetics or any other attributes not specifically addressed, nor are they to be construed as an endorsement of the subject of the report or a recommendation for its use. There is no warranty by ICC Evaluation Service, LLC, express or implied, as to any finding or other matter in this report, or as to any product covered by the report.



bars hoop ties over the height of the column, as illustrated in Figure 2.

3.1.3 Verti-Crete Steel Columns: The Verti-Crete steel columns must be rolled with W6x sections, and must be designed in accordance with Section 4.1.3 of this report.

3.2 Materials:

3.2.1 Concrete: The Verti-Crete precast concrete panels and **precast** concrete columns are manufactured from normal-weight concrete with a minimum compressive strength of 5,000 psi (35 MPa) at 28-days.

3.2.2 Grout: Grout used to infill precast concrete columns must comply with ASTM C476. Minimum grout compressive strength must be 2,000 psi at 28 days.

3.2.3 Steel Columns: Rolled wide-flange steel members must conform to ASTM A992.

3.2.4 Steel Reinforcing Bars: The deformed steel reinforcing bars must comply with ASTM A615 Grade 60 or ASTM A706 Grade 60.

4.0 DESIGN AND INSTALLATION

4.1 Structural Design:

4.1.1 General:

The Verti-crete SFW system must be designed to resist wind, seismic and active soil pressure loads in accordance with the applicable sections of the IBC. Site-specific wind and seismic loads are to be determined in accordance with Section 1609 and 1613 of the IBC, respectively. Seismic loads must consider vertical seismic-induced forces. A site-specific soils investigation report in accordance with IBC Section 1803 or IRC Section R401.4, as applicable, is required. The soils report must include soil properties, active soil pressure, and the information required by IBC for seismic and wind design parameters.

The Verti-crete SFW system must be designed by a registered design professional in accordance with Section 4.1.2 of this report.

4.1.2 Engineering Design: Structural calculations in accordance with the applicable codes must be submitted to the code official for each wall system installation. Design calculations to be submitted must include the following:

- 1. Verti-Crete Precast Concrete Panels: The precast concrete panels must be designed in accordance with Chapter 11 of ACI 318-14 and must satisfy the minimum reinforcing required by code. The panel must be designed as simply supported, between cast-in place concrete caisson foundation, considering the total design dead load of the panel. The design dead load of the panel must include the self-weight of the concrete as well as the weight superimposed by the patterned finish, if applicable. For lateral loads, the precast concrete panels are to be designed to resist the loads determined in accordance with Section 4.1.1 and must span horizontally between columns. The flexural strength capacity must be determined in accordance with Section 22.2 of ACI 318-14. The shear strength of the of the panel must be determined in accordance with equations 22.5.1.1, 22.5.5.1 and 22.5.10.5.3 of ACI 318-14. Minimum reinforcing must satisfy the minimum wall reinforcing requirements in Table 11.6.1 of ACI 318-14.
- Verti-Crete Precast Concrete Columns: The precast concrete columns must be designed as a cantilevered column to resist the lateral loads transferred from the precast concrete panels. The flexural strength capacity must be determined in accordance with Section 22.2 of ACI 318-14. In addition, the depth of the compression

zone, a, as shown in the figure below, must be less than the distance d_1 , defined as the distance from the maximum compressive strain to the hollow core.



d = DISTANCE FROM CENTROID OF COMPRESSION ZONE TO REINFORCING IN TENSION.

Shear strength must be determined in accordance with equations 22.5.1.1, 22.5.5.1 and 22.5.10.5.3 of ACI 318-14, except that the shear area, b_wd , specified in equation 22.5.5.1, may be taken as 176.5 in² (1.14x10⁵ mm²). Reinforcing detailing must comply with Section 10.7 ACI 318-14.

- 3. Verti-Crete Steel Columns: The structural steel columns must be designed as a cantilevered column to resist the lateral loads transferred from the precast concrete panels. The flexural and shear strength capacities must be determined in accordance with Sections F2 and G2 of AISC 360-16 for the 2018 IBC (AISC 360-10 for the 2015 IBC), respectively.
- 4. Verti-Crete Precast Panel to Column Connection: When precast concrete columns are utilized, the lateral loads applied to the precast panels are transferred from the panel to the column through bearing of the panel end on a notch created by the groove in the precast concrete column. The shear capacity of the column notch may be taken conservatively as 2,100 lbs/in (370 N/mm).

When structural steel columns are utilized, the local bending strength of the flange must exceed the load applied to the flange by the panel ends.

- Column to Concrete Caisson Foundation Connection: When precast concrete columns are utilized, two reinforcing dowels are to be designed to transfer loads between the precast concrete column and the concrete caisson. The flexural and shear strength capacities of the connection must be designed conservatively assuming the grouted precast column behaves as a solid grouted reinforced concrete masonry pilaster in accordance with Chapter 9 of the TMS 402/602-16 and -13 for the 2018 and 2015 IBC, respectively. The minimum grout compressive strength f'_m to be used in design may be taken as 2,000 psi (14 MPa) and the development length of the reinforcing dowel into the precast column must be designed in accordance with Section 6.1.9 of TMS 402/602-16 for the 2018 IBC (Section 6.1 of TMS 402/602-13 for the 2015 IBC). When steel columns are utilized, the steel column is to be embedded in the concrete caisson.
- 6. **Concrete Caisson Foundations:** Concrete caissons and their reinforcing are beyond the scope of this report and must be designed by the registered design professional in accordance with the IBC, IRC and ACI 318-14, as applicable.

4.1.3 Sound Transmission: Verti-crete SFW panels measuring 48 inch x 60 inch in planar dimensions and 6 inch (153 mm) nominal thickness provide a Sound Transmission

Class (STC) and Outdoor Indoor Transmission Class (OITC) of 50 and 45, respectively, when tested in accordance with ASTM E90.

4.2 Installation:

4.2.1 General: Verti-Crete SFWs must be installed in accordance with the applicable code, this report, and the approved construction documents prepared by a registered design professional. A copy of the installation instructions and the approved drawings must be available at all times on the jobsite during installation.

4.2.2 Precast Concrete Panel to Column Installation: The Verti-Crete precast fence panels are installed directly on the approved foundation, with the tapered ends set within the side grooves or flanges, as applicable, of the columns. Mortar, or similar material, must comply with ASTM C270, and must be used to set the Verti-Crete precast panels on the footing.

Panels may be dry stacked within the precast concrete column grooves or steel column flanges, as applicable. Gaps between the panel ends and precast concrete column groove greater than $^{1}/_{16}$ inch (1.5 mm), or between the panel ends and steel column flanges, as applicable, must be filled with non-shrink low modulus joint filler conforming to ASTM C881.

4.2.3 Precast Concrete Column to Foundation Installation: Precast concrete columns are to be installed over two cast-in-place reinforcing dowels on top of the approved foundation on a bed of mortar conforming to ASTM C270. Grout is to be placed and vibrated within the hollow core of the column in accordance with the design drawings.

4.3 Special Inspection:

4.3.1 IBC: Special inspection must be provided in accordance with IBC Section 1705.3. Duties of the special inspector include verifying field preparation in materials, installation of components, curing of components, and installation of mortar and joint fillers.

4.3.2 IRC: For walls designed in accordance with the IBC for use under the IRC, special inspection in accordance with Section 4.3.1 is required.

5.0 CONDITIONS OF USE

The Verti-Crete SFWs 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 panels must be installed in accordance with this report and the building plans approved by the code official.
- **5.2** Calculations and details justifying that the use of the Verti-Crete SFWs is in compliance with the applicable

- **5.3** A site-specific soils report according to IBC or CBC Section 1803 or IRC Section R401.4, as applicable, as noted in Section 4.1.1 of this report, is required for each wall.
- **5.4** Special inspection is required and must be in accordance with Section 4.3 of this report.
- **5.5** In areas where repeated freezing and thawing under saturated conditions occur, the registered design professional must verify the mix design is acceptable for freeze-thaw applications.
- **5.6** Where panels is designed to retain earth pressure, the registered design professional must include a drainage system and all panel surfaces exposed to earth must be waterproofed. Drainage system and water proofing materials must be designed by the registered design professional and approved by the building official.
- **5.7** Steel columns, when applicable, must be protected against corrosion in accordance with the IBC designed by the registered design professional and approved by the building official.
- **5.8** The Verti-Crete SFWs are manufactured under a quality control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

- **6.1** Design calculations in accordance with ACI 318, TMS 402/602 and AISC 360.
- **6.2** Reports of acoustical testing in accordance with ASTM E90(04).
- **6.3** Quality documentation in accordance with ICC-ES Acceptance Criteria for Quality Documentation (AC10), dated January 2019.

7.0 IDENTIFICATION

- **7.1** Each Verti-Crete SFWs precast concrete panel and precast concrete column shall be identified with the manufacturer's name, name of product, unit type and evaluation report number (ESR-4362).
- 7.2 The report holder's contact information is the following:

VERTI-BLOCK SAN DIEGO, INC. P.O. BOX 1217 LAKESIDE, CALIFORNIA 92040 www.verti-crete.com



Figure 1—Precast Concrete Panel Elevation and Section



Figure 2—Precast Concrete Column and Footing





Figure 5—Precast Concrete Panel to Steel Column Connection



ESR-4362 LABC and LARC Supplement

Reissued June 2021 This report is subject to renewal June 2022.

www.icc-es.org | (800) 423-6587 | (562) 699-0543

A Subsidiary of the International Code Council®

DIVISION: 03 00 00—CONCRETE Section: 03 41 10—Precast Concrete Design

DIVISION 05 00 00—METALS Section: 05 12 00—Structural Steel Framing

REPORT HOLDER:

VERTI-BLOCK SAN DIEGO, INC.

EVALUATION SUBJECT:

VERTI-CRETE SOUND BARRIER FENCE WALL SYSTEM

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Verti-crete Sound Barrier Fence Wall System, described in ICC-ES evaluation report <u>ESR-4362</u>, has also been evaluated for compliance with the codes noted below as adopted by the Los Angeles Department of Building and Safety (LADBS).

Applicable code editions:

- 2020 City of Los Angeles Building Code (LABC)
- 2020 City of Los Angeles Residential Code (LARC)

2.0 CONCLUSIONS

The Verti-crete Sound Barrier Fence Wall System, described in Sections 2.0 through 7.0 of the evaluation report <u>ESR-4362</u>, complies with the LABC Chapters 19 and 22, and the LARC, and is subjected to the conditions of use described in this supplement.

3.0 CONDITIONS OF USE

The Verti-crete Sound Barrier Fence Wall System described in this evaluation report supplement must comply with all of the following conditions:

- All applicable sections in the evaluation report ESR-4362.
- The design, installation, conditions of use and labeling are in accordance with the 2018 International Building Code[®] (IBC) provisions noted in the evaluation report <u>ESR-4362</u>.
- The design, installation and inspection are in accordance with additional requirements of LABC Chapter 19 and 22, as applicable.
- Under the LARC, an engineered design in accordance with LARC Section R301.1.3 must be submitted.

This supplement expires concurrently with the evaluation report, reissued June 2021.





ESR-4362 CBC and CRC Supplement

Reissued June 2021 This report is subject to renewal June 2022.

www.icc-es.org | (800) 423-6587 | (562) 699-0543

A Subsidiary of the International Code Council®

DIVISION: 03 00 00—CONCRETE Section: 03 41 10—Precast Concrete Design

DIVISION: 05 00 00—METALS Section: 05 12 00—Structural Steel Framing

REPORT HOLDER:

VERTI-BLOCK SAN DIEGO, INC.

EVALUATION SUBJECT:

VERTI-CRETE SOUND BARRIER FENCE WALL SYSTEM

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that Verti-crete Sound Barrier Fence Wall System described in ICC-ES evaluation report ESR-4362 has also been evaluated for compliance with the codes noted below.

Applicable code edition(s):

■ 2019 California Building Code (CBC)

For evaluation of applicable chapters adopted by the California Office of Statewide Health Planning and Development (OSHPD) and 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 Verti-crete Sound Barrier Fence Wall System, described in Sections 2.0 through 7.0 of the evaluation report ESR-4362, complies with CBC Chapters 19 and 22, provided the design and installation are in accordance with the 2018 *International Building Code*[®] (IBC) provisions noted in the evaluation report and the additional requirements of 16 and 17, as applicable.

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 Verti-crete Sound Barrier Fence Wall System, described in Sections 2.0 through 7.0 of the evaluation report ESR-4362, complies with the CRC, 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 June 2021.





ESR-4362 FBC and FRC Supplement

Reissued June 2021 This report is subject to renewal June 2022.

www.icc-es.org | (800) 423-6587 | (562) 699-0543

A Subsidiary of the International Code Council®

DIVISION: 03 00 00—CONCRETE Section: 03 41 10—Precast Concrete Design

DIVISION: 05 00 00—METALS Section: 05 12 00—Structural Steel Framing

REPORT HOLDER:

VERTI-BLOCK SAN DIEGO, INC.

EVALUATION SUBJECT:

VERTI-CRETE SOUND BARRIER FENCE WALL SYSTEM

1.0 REPORT PURPOSE AND SCOPE

Purpose:

The purpose of this evaluation report supplement is to indicate that the Verti-crete Sound Barrier Fence Wall System, described in ICC-ES evaluation report ESR-4362, has also been evaluated for compliance with the codes noted below.

Applicable code editions:

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

2.0 CONCLUSIONS

The Verti-crete Sound Barrier Fence Wall System, described in Sections 2.0 through 7.0 of the evaluation report ESR-4362, complies with the *Florida Building Code—Building*, and the *Florida Building Code—Residential*, provided the design and installation are in accordance with the 2015 *International Building Code*[®] (IBC) provisions noted in the evaluation report.

Use of the Verti-crete Sound Barrier Fence Wall System for compliance with the High-Velocity Hurricane Zone provisions of the *Florida Building Code—Building* and 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, reissued June 2021.

