



ICC-ES Evaluation Report

ESR-4424

Issued January 2022

This report is subject to renewal January 2023.

DIVISION: 04 00 00—MASONRY
Section: 04 01 00—Maintenance of Masonry
Section: 04 01 20—Maintenance of Unit Masonry

REPORT HOLDER:

STABLWALL

EVALUATION SUBJECT:

STABLWALL STRUCTURAL STRENGTHENING SYSTEM

1.0 EVALUATION SCOPE

Compliance with the following codes:

- 2021 and 2018 *International Building Code*® (IBC)
- 2021 and 2018 *International Residential Code*® (IRC)

Properties evaluated:

- Structural
- Durability

2.0 USES

The StablWall Structural Strengthening System is used to externally strengthen existing unreinforced masonry walls out-of-plane flexural strengths as an alternative to those systems permitted in the IBC, as described in Section 4.1 of this report. For structures regulated under the IRC, the StablWall Structural Strengthening System may be used where an engineering design is submitted in accordance with Section R301.1.3 and where approved by the code official in accordance with Section R104.11.

3.0 DESCRIPTION

3.1 General:

The StablWall Structural Strengthening System is externally bonded carbon fiber-reinforced polymer (FRP) composites applied to unreinforced masonry substrates. The StablWall Structural Strengthening System Carbon FRP Composite consists of carbon fabric adhered to the substrate with StablWall SW epoxy to create an FRP composite system.

3.2 Material:

3.2.1 General: All materials must comply with the approved specifications outlined in the StablWall Structural Strengthening System Quality Documentation.

3.2.2 StablWall Carbon Fabric: The StablWall Structural Strengthening System is composed of unidirectional 12K yield (800 gr) carbon fiber fabric, available in various widths.

3.2.3 StablWall SW Saturant & Primer: The StablWall SW primer and adhesive epoxy saturant are two-component, ambient cure, epoxy resin systems used to adhere StablWall carbon fabric to the substrate. The StablWall adhesive systems are mixed at the jobsite prior to application. The mixing ratio is 3:1 by volume for components A and B, respectively.

3.3 StablWall Structural Strengthening System Carbon FRP Composite: In the primary direction, the StablWall Structural Strengthening System Carbon FRP Composite has a design ultimate tensile strength of 152 ksi (1048 MPa), design tensile modulus of 11,170 ksi (77 GPa), and a corresponding design elongation of 1.36 percent. The layer thickness is 0.04 inches (1.02 mm).

3.4 Storage Recommendations: The materials must be stored in temperatures between 50°F and 90°F (10°C and 32°C) with no exposure to moisture. When properly stored under these conditions, unopened adhesive epoxy saturant has a shelf life of 18 months, and carbon fabric has an unlimited shelf life.

4.0 DESIGN AND INSTALLATION

4.1 Design:

4.1.1 General: Design of the composite system must be based on required tensile loads at designated masonry strain values. The strength design requirements for masonry must be in accordance with Chapter 21 of the IBC, as applicable. The registered design professional must be responsible for determining, through analysis, the strengths and demands of the structural elements to be strengthened by the StablWall Structural Strengthening System, subject to the approval of the code official.

4.1.2 Composite Design Properties: Structural design properties for the StablWall Structural Strengthening System can be found in the StablWall Structural Strengthening System Design Manual, dated December 15, 2021.

4.1.3 Design Details: Structural design provisions for the composite system, as described in the StablWall Structural Strengthening System Design Manual, are based on test results and principles of structural analysis as prescribed in

IBC Section 1604.4. Bases of design include strain compatibility, load equilibrium and limit states. All designs must follow procedures as detailed in the IBC; in the ICC-ES Acceptance Criteria for Concrete and Reinforced and Unreinforced Masonry Strengthening Using Externally Bonded Fiber-Reinforced Polymer (FRP) Composite Systems (AC125), dated October 2019 (editorially revised December 2020); and applicable procedures detailed in the StablWall Structural Strengthening System Design Manual, dated December 15, 2021.

4.1.4 Design Strength: The design strengths must be taken as the nominal strength, computed in accordance with Section 4.1.3 of this report, multiplied by the strength reduction factors as prescribed in Chapter 21 of the IBC, as applicable.

4.1.5 Load Combination: The load combinations used in design must comply with Section 1605 of the IBC, as applicable.

4.1.6 Walls:

4.1.6.1 Potential Applications: The StablWall Structural Strengthening System is applied to unreinforced masonry walls to enhance out-of-plane flexural strengths.

4.1.6.2 Structural Design Requirements: Masonry design must comply with the StablWall Structural Strengthening System Design Manual and with Chapter 21 of the IBC, as applicable.

4.1.7 Bond Strength: Where the performance of the FRP composite material depends on bond, as determined by the registered design professional, the bond strength of the StablWall Structural Strengthening System to a properly prepared surface must exceed the tensile strength of the masonry substrate and must not be less than $2.5 \times (f'_m)^{0.5}$. Testing in accordance with ASTM C237, D7234 or D7522 may be used to estimate the bond strength of bond-critical installations. The test must indicate failure in the masonry wall substrate. Sufficient bond area must be used to prevent bond failure.

4.2 Installation:

4.2.1 General: The StablWall Structural Strengthening System Carbon FRP Composite System must be installed on unreinforced masonry walls, as detailed in Installation Manual, dated July 21, 2020. A copy of the Installation Manual must be submitted to the code official for approval of each project that uses the StablWall Structural Strengthening System Carbon FRP Composite System. Installation must be performed by approved applicators trained by the manufacturer in accordance with the published literature. Installation of the system is detailed in Installation Manual.

4.2.2 Saturation: The StablWall Structural Strengthening System must be saturated with StablWall SW epoxy saturant in accordance with Section 3.2.3 of this report and StablWall Installation Manual.

4.2.3 Application: The StablWall Structural Strengthening System is applied to the unreinforced masonry wall substrate using manual methods. Surface preparation, fiber orientation and removal of air bubbles and voids must be done in accordance with the StablWall Installation Manual.

4.2.4 Finishing: The StablWall Structural Strengthening System are fully adhered and covered with the StablWall SW adhesive epoxy saturant which may be coated with paints that may be required for environmental and/or aesthetic reasons.

4.2.5 Cure Time Prior to Loading: The StablWall Structural Strengthening System must be allowed a minimum of 48 hours of cure time (depending on temperatures) prior to application of superimposed loading onto the structural element. Final determination of required cure time must be made by the registered design professional.

4.3 Special inspection:

Special inspection during the installation of the system must be in accordance with the ICC-ES Acceptance Criteria for Inspection and Verification of Concrete and Unreinforced Masonry Strengthening Using Fiber-reinforced Polymer (FRP) Composite Systems (AC178), dated October 2017 (editorially revised December 2020). A statement of special inspection must be prepared in accordance with Sections 1704.3 of the IBC. Inspection must also comply with Sections 1704 and 1705 of the IBC, as applicable.

5.0 CONDITIONS OF USE

The StablWall Structural Strengthening System 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** Design and installation must be in accordance with this report, the manufacturer's Installation Manual dated July 21, 2020, the StablWall Structural Strengthening System Design Manual dated December 15, 2021, and the IBC, or IRC, as applicable.
- 5.2** Copies of the StablWall Structural Strengthening System Design Manual and Installation Manual must be submitted to the code official for approval with each project using the system.
- 5.3** Complete construction documents, including plans and calculations verifying compliance with this report, must be submitted to the code official for each project at the time of permit application. The construction documents must be prepared and sealed by a registered design professional where required by the statutes of the jurisdiction in which the project is to be constructed.
- 5.4** Use of StablWall Structural Strengthening System in interior applications where Flame Spread and Smoke Developed Index are required have not been evaluated and is outside the scope of this evaluation report.
- 5.5** Use of StablWall Structural Strengthening System in fire-resistance-rated assemblies has not been evaluated and is outside the scope of this evaluation report.
- 5.6** Use of StablWall Structural Strengthening System in full contact with drinking water has not been evaluated and is outside the scope of this evaluation report.
- 5.7** Special inspection must be provided in accordance with Section 4.3 of this report.
- 5.8** Application of StablWall Structural Strengthening System to unreinforced masonry walls at a fabricator's facility must be by an approved fabricator complying with Chapter 17 of the IBC, or at a jobsite with continuous special inspections in accordance with Chapter 17 of the IBC and Section 4.3 of this report.
- 5.9** StablWall Structural Strengthening System is provided by StablWall under a quality control program with inspections by ICC-ES.

6.0 EVIDENCE SUBMITTED

Data in accordance with the ICC-ES Acceptance Criteria for Concrete and Reinforced and Unreinforced Masonry

Strengthening Using Fiber-reinforced Polymer (FRP) Composite Systems (AC125), dated October 2019 (editorially revised December 2020).

7.0 IDENTIFICATION

7.1 The components of the StablWall Structural Strengthening System described in this report are identified with a label indicating the name and address of the manufacturer (StablWall Structural Strengthening System), product names (fabric, primer & saturant), primer and saturant expiration date, and evaluation report number (ESR-4424).

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

STABLWALL
349 HIGHLAND ROAD, EAST
MACEDONIA, OHIO 44056
(877) 782-5925
www.stablwall.com
info@stablwall.com

DIVISION: 04 00 00—MASONRY**Section: 04 01 00—Maintenance of Masonry****Section: 04 01 20—Maintenance of Unit Masonry****REPORT HOLDER:****STABLWALL****EVALUATION SUBJECT:****STABLWALL STRUCTURAL STRENGTHENING SYSTEM****1.0 REPORT PURPOSE AND SCOPE****Purpose:**

The purpose of this evaluation report supplement is to indicate that masonry strengthening using the StablWall Structural Strengthening System Composite Systems, described in ICC-ES evaluation report ESR-4424, have also been evaluated for compliance with the code 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) 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:**

Masonry strengthening using the StablWall Structural Strengthening System, described in Sections 2.0 through 7.0 of the evaluation report ESR-4424, comply with CBC Chapter 21 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 CBC Chapters 16, 17 and 21, 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:

Masonry strengthening using the StablWall Structural Strengthening System, described in Sections 2.0 through 7.0 of the evaluation report ESR-4424 comply with CRC Part III, Chapter 3, provided the design and installation are in accordance with the 2018 *International Residential Code*® (IRC) provisions noted in the evaluation report and the additional requirements of CRC Part III, Chapter 3.

This supplement expires concurrently with the evaluation report, issued January 2022.