

# CSS V-Wrap™ C400HM

High-Modulus Code-Listed Unidirectional Carbon Fabric



## DESCRIPTION

CSS V-Wrap C400HM is a high-modulus unidirectional carbon fiber fabric with fibers oriented in the 0° direction. The CSS V-Wrap C400HM system is field laminated using a two-part, 100% solids and high-strength CSS V-Wrap-approved structural adhesives to form a carbon-fiber-reinforced polymer (CFRP) system used to reinforce and strengthen structural elements.

## CODE REPORTS AND COMPLIANCE



ICC-ES ESR-4930

## MATERIAL PROPERTIES

### Typical Data

Storage Conditions	Store dry at 40°F – 90°F (4°C – 32°C)
Color	Black
Primary Fiber Direction	0° (unidirectional)
Weight	38 oz./yd. <sup>2</sup> (1,300 g/m <sup>2</sup> )
Shelf Life	10 years

Dry Fiber Properties	
Tensile Strength	790,000 psi (5,440 MPa)
Tensile Modulus	42 x 10 <sup>6</sup> psi (289,550 MPa)
Elongation at Break	1.9%

Cured Laminate Properties	Average Values	Design Values*
Tensile Strength	180,000 psi (1,240 MPa)	155,000 psi (1,070 MPa)
Modulus of Elasticity	14.24 x 10 <sup>6</sup> psi (98,100 MPa)	14.0 x 10 <sup>6</sup> psi (96,500 MPa)
Elongation at Break	1.27%	1.1%
Thickness	0.08 in. (2.03 mm)	0.08 in. (2.03 mm)
Strength per Unit Width	14,400 lb./in. (2.52 kN/mm)	12,400 lb./in. (2.17 kN/mm)

\*Design properties are based on ACI 440.2R using average minus three standard deviations.



## PERFORMANCE FEATURES

- ICC-ES ESR-4930 listed product
- UL Listed (ul.com/database)
- NSF/ANSI Standard 61 listed product for drinking water systems
- 0% VOC
- 100% solvent-free
- Noncorrosive reinforcement system
- Lightweight flexible fabric can be wrapped around complex shapes
- Used for shear, confinement or flexural strengthening
- High strength and high modulus
- Lightweight
- Reduces crack width
- Low aesthetic impact

## APPLICATIONS

CSS V-Wrap fabrics can be used to resolve strength deficiencies and increase the load-carrying capacity of buildings, bridges, silos, chimneys and other structures.

- Load increases
- Seismic strengthening
- Repair structural elements
- Change in structural system
- Design or construction defects

## PACKAGING

Roll Size (Width x Length)	Model No.
12 in. x 50 yd. (305 mm x 45.7 m)	CV-C400HM12-50
24 in. x 50 yd. (610 mm x 45.7 m)	CV-C400HM24-50

## HOW TO USE

### Design

Design should comply with ACI 440.2R or another recognized design/specification entity and is typically based on CFRP contribution determined by detailed analysis. Design values will vary based on project requirements and applicable environmental and strength reduction factors.

### Surface Preparation

Surfaces to receive CSS V-Wrap C400HM must be clean and sound. They must be dry and free of frost. All dust, laitance, grease, curing compounds, waxes, deteriorated materials and other bond-inhibiting materials must be removed from the surface prior to application. Existing uneven surfaces must be filled with appropriate epoxy putty or repair mortar. Use abrasive blasting, pressure washing, shotblasting, grinding or other approved mechanical means to achieve an open-pore texture with a concrete surface profile of not less than CSP-3 (ICRI). In certain applications and at the engineer's discretion, the bond between the substrate and the fabric may be determined to be non-critical (such as in column confinement applications). All corners must be rounded to 1/2" radius minimum. The adhesive bond strength of the concrete may be verified after surface preparation by random pull-off testing (ASTM C1583) at the discretion of the engineer. Minimum tensile strength of 200 psi must be achieved for concrete.

### Handling

Approved personal protection equipment should be worn at all times. Particle mask is recommended for possible airborne particles. Gloves are recommended when handling fabrics and resins to avoid skin irritation. Safety glasses are recommended to prevent eye irritation. Wear chemical-resistant clothing/gloves/goggles. Ventilate area. In absence of adequate ventilation, use a properly fitted NIOSH respirator.

### Cutting

Fabric can be cut to appropriate length by using commercial quality heavy-duty scissors.

### Application

Installation of the CSS V-Wrap strengthening system should be performed only by a specially trained, approved contractor. The CSS V-Wrap strengthening system shall consist of CSS V-Wrap carbon fabric and CSS V-Wrap 770 epoxy.

Note the specified number of plies, ply widths and fiber orientation. Mix resin components using recommended procedures on product data sheet. Apply one coat of CSS V-Wrap 770 epoxy as a primer to the surface using a nap roller. Fill minor concrete defects such as bug holes and other imperfections using CSS V-Wrap 770 epoxy mixed with fumed silica (thickened epoxy) or CSS V-Wrap PF putty filler. Apply thickened epoxy or putty using a trowel. Adjust the gap between saturator rollers to approximately 84 mil. Using a saturator machine, pre-saturate the appropriate length of CSS V-Wrap fabric with CSS V-Wrap 770 epoxy as a saturant. Install the saturated CSS V-Wrap fabric. Use a rib roller to remove all air pockets and ensure intimate contact with the surface. If a splice is needed, a minimum 6" overlap is required to achieve continuity. On multiple plies with splices, stagger the splice locations. If required, apply topcoat material.

### Limitations

- Design calculations must be approved by a licensed professional engineer.
- Concrete deterioration and steel corrosion must be resolved prior to application.
- System is a vapor barrier.
- Minimum application temperature is 40°F.

### Storage

Store material in a cool, dark space. Low humidity is recommended.

## CAUTION

**Protective Measures:** The use of safety glasses and chemically-resistant gloves is recommended. Use appropriate clothing to minimize skin contact. The use of a NIOSH-approved respirator is required to protect respiratory tract when ventilation is not adequate to limit exposure below the PEL. Refer to Safety Data Sheets (SDS) available at [strongtie.com/sds](http://strongtie.com/sds) for detailed information.

## FIRST AID

**Skin:** Wash fibers off skin with water and soap. If fibers are embedded in the skin, remove with tweezers. Discard clothing that may contain embedded fibers. Seek medical advice if exposure results in adverse effects.

**Eyes:** Immediately flush with a continuous water stream for at least 20 minutes. Washing immediately after exposure is expected to be effective in preventing damage to the eyes. Seek medical advice.

**Inhalation:** If there is inhalation exposure to the fibers of this product, remove source of exposure and move affected person to fresh air. If not breathing, give artificial respiration. If there is breathing difficulty, give oxygen. Seek medical advice for any respiratory problems.

**Ingestion:** Not expected to occur since ingestion is not a likely route of exposure for this product. If ingestion does occur, DO NOT INDUCE VOMITING. Nothing by mouth if unconscious. Seek medical advice.

## CLEAN-UP

### Environmental Precautions

**Spill/Release and Cleanup Procedures:** In case of spill, collect (e.g., sweep up, vacuum, etc.) spilled material and either reuse or dispose of properly. Chopped or milled carbon fibers may be slippery if spilled, posing an accident risk. Wear personal protective equipment as described in the SDS during cleanup activities.

## LIMITED WARRANTY

This product is covered by the Simpson Strong-Tie RPS Product Limited Warranty, which is available at [strongtie.com/limited-warranties](http://strongtie.com/limited-warranties) or by calling Simpson Strong-Tie at (800) 999-5099.

### IMPORTANT INFORMATION

It is the responsibility of each purchaser and user of each Product to determine the suitability of the Product for its intended use. Prior to using any Product, consult a qualified design professional for advice regarding the suitability and use of the Product, including whether the capacity of any structural building element may be impacted by a repair. As jobsite conditions vary greatly, a small-scale test patch is required to verify product suitability prior to full-scale application. The installer must read, understand, and follow all written instructions and warnings contained on the product label(s), Product Data Sheet(s), Safety Data Sheet(s) and the [strongtie.com](http://strongtie.com) website prior to use. For industrial use only by qualified applicators. KEEP OUT OF REACH OF CHILDREN!

 **WARNING!** Cancer and reproductive harm — [www.P65Warnings.ca.gov](http://www.P65Warnings.ca.gov).