

FRCM Gives Unreinforced Concrete Basement Walls a Strengthening Makeover



PROJECT INFORMATION

Category

Concrete

Market

Restoration and Retrofit

Application

Reinforce concrete foundation and walls

Simpson Strong-Tie Products

CSS-CM cementitious matrix;
CSS-UCG carbon grid;
URFP universal retrofit foundation plates

THE CHALLENGE Reinforce concrete walls without detracting from basement appearance or square footage

Like many homes built in Portland, Oregon, in the early 20th century, this Reed District home was constructed with a full basement consisting of unreinforced concrete foundation and walls. Shortly after the current owners purchased the home, they knew they wanted to add structural integrity to the home in order to better withstand a seismic or wind event. While the home's overall strength and durability were of course the owners' main concern, they also wanted an upgrade that wouldn't detract from the home's appearance.

THE SOLUTION Use FRCM to strengthen concrete, and foundation plates to secure the wood framing



The unreinforced concrete walls before FRCM treatment.

Western Construction Systems, an installer trained by Simpson Strong-Tie, assisted the owner in selecting fabric-reinforced cementitious matrix (FRCM) as the best solution for strengthening the home's unreinforced concrete basement walls. The contractor discussed the possibilities with the owner and proposed the Simpson Strong-Tie FRCM product. Not only would the product improve the strength of the existing basement walls, it would also create a smooth new cementitious finish in the space. Additionally, FRCM was

chosen in lieu of adding shotcrete walls because the new owners didn't want to lose space in the basement area. With shotcrete, they could have lost as much as 4" to 6" of interior space along each wall, as compared to only 3/4" per wall with the FRCM.

The existing basement walls consisted of sound unreinforced concrete with multiple rock pockets.

CHALLENGE

Reinforce concrete basement walls without diminishing usable space or impairing the home's aesthetic.

SOLUTION

Secure the mudsills to the foundation with retrofit foundation plates; reinforce the basement walls with a few thin applications of fabric-reinforced cementitious matrix.

RESULTS

The contractors were pleased with the ease and quickness of installation; the homeowners were satisfied that the product was installed so quickly and smoothly while ensuring they would continue to have a strong, safe home to live in.



Spray-applying water to the concrete to create a saturated surface-dry (SSD) condition for the cementitious matrix (CSS-CM) installation.



Installers pressing the carbon grid (CSS-UCG) into the first layer of the wet-set cementitious matrix (CSS-CM).



Preparing carbon grid for second layer of cementitious matrix.



The final surface of the FRCM with a trowel finish.

The first stage of the retrofit consisted of repairing the basement walls before the FRCM system was applied. Rock pockets and cracks were repaired with a vertical repair mortar to create a suitable substrate for the FRCM.

After the first phase, the following procedure was used to apply the FRCM product:

1. The substrate was prepared by creating a saturated surface-dry (SSD) state to provide optimal surface conditions for the cementitious matrix (CSS-CM) base layer.
2. Western Construction Systems sprayed a first layer of CSS-CM.
3. The same installers then wet-set the Simpson Strong-Tie unidirectional carbon grid (CSS-UCG) by pressing the fabric into the first layer of CSS-CM mortar.
4. Shortly afterwards, a second layer of the CSS-CM was spray-applied.
5. After the second layer of CSS-CM was applied, the surface was troweled to a smooth finish.

6. Full cure time was observed with a curing compound applied right after the CM was installed. After full cure time had elapsed, the walls were ready for painting, installing drywall or leaving bare.

Not shown here, several Simpson Strong-Tie URFP universal retrofit foundation plates were installed connecting the wood walls above to the basement walls. In order to provide code-compliant lateral resistance to a seismic or wind event, the mudsills of the existing wood frame needed to be better connected to the foundation walls below. The URFP is an ideal solution to ensure a load path to the foundation in cases where there is minimal vertical clearance, or when the mudsill is offset or inset from the foundation edge, as was the case in the Reed District home.

All in all, the preparation work took four days for crack repair installation and to achieve the proper surface profile. The FRCM installation itself took only one day for the entire basement, plus one day of cleanup.

THE RESULTS Quick, smooth installation ensures strong, durable foundation

After installation, Western Construction Systems said, "The install of the FRCM was great... The overall process allowed us to complete the installation of approximately 300+ bags of the CM and about 1,200 square feet of the carbon fiber grid in just one day. Typically, if we were to hand-trowel this amount of mortar, it could have taken nearly a week."

They continued: "We were also impressed with the finishing ability of the CM. The mortar troweled smooth and held its form and stuck to the foundation well. Another huge benefit was the long workability of the CM. Although the mortar is high PSI, it has a slow set time, which is nice on the job because it means not having to fight to keep the mortar from setting during application."

After reinforcing the basement walls with Simpson Strong-Tie FRCM, the homeowners were extremely

pleased with the quick installation of the FRCM product and the updated look of the basement. The additional strength that the FRCM product gave the unreinforced concrete foundation assured them that the house would be able to keep them safe even in the event of a wind or seismic event for many years to come.

Simpson Strong-Tie Can Help

We recognize that specifying Simpson Strong-Tie Composite Strengthening Systems™ (CSS) is unlike choosing any other product we offer. Leverage our expertise to help with your FRP strengthening designs. Our experienced technical representatives and licensed professional engineers provide complimentary design services and support — serving as your partner throughout the entire project cycle.

MORE INFO

For complete information regarding specific products suitable to your unique situation or condition, please visit strongtie.com/frcm or call your local Simpson Strong-Tie RPS Specialist at **(800) 999-5099**.