RICHTECH INDUSTRIES

Richtech Carbon Fiber System

INSTALLATION GUIDE

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INTRODUCTION

This manual is designed to give you a basic understanding of the Richtech Carbon Fiber System. With Richtech Carbon Fiber you'll learn when to use it, and what conditions it is not meant for. It will also provide you with an understanding of the installation basics, so that you can effectively install it.

WHAT IS RICHTECH CARBON FIBER?

When water sits outside a foundation wall it can create pressure on the wall. When that pressure becomes more than the wall is designed to take it creates cracks, followed by bowing of the wall itself. In the past, companies used steel beams to reinforce those bowed walls. Other methods were:

- Reinforcing through steel rods inside the blocks
- Installing earth anchors to hold the wall
- Removing and rebuilding the damaged area

All of these methods had varying degrees of effectiveness. One of the major problems with all these methods was that they either required part or all of the wall to be removed to install it, or, in the case of beams and earth anchors, were unsightly, bulky, and required periodic maintenance.

Then Richtech Carbon Fiber came along. Richtech Carbon Fiber is carbon fiber sheeting that has been used in the aerospace industry, on bridges and tunnels and has had other heavy industrial uses, but until now never been used to reinforce basement walls. The benefits of it are many:

- It is ten times stronger than steel beams
- It is very thin – when placed on a wall and then painted, it is almost invisible
- It is very easy to install
- It works on poured, block, and brick walls

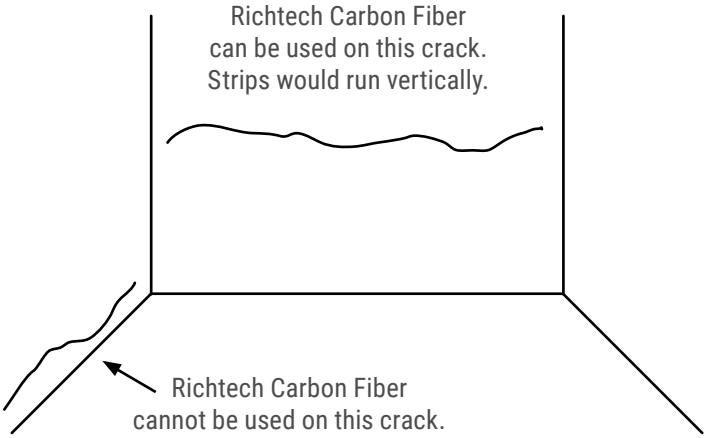
HOW RICHTECH CARBON FIBER WORKS

Richtech Carbon Fiber is composed of thousands of thin carbon fibers lined up parallel to each other. When it is installed, it is impregnated with an epoxy bonding adhesive to bond the carbon fibers to each other and the wall. Those fibers are very resistant to stretching (10 times the resistance of steel at the same thickness). If the wall tries to continue to bow after it has been installed, it cannot because the fibers that are now bonded to the wall won't stretch. To make sure it is effective, a number of parameters and conditions must be followed and it must be installed correctly. We will look at these factors in the following sections.

WHEN TO USE IT AND WHEN NOT TO

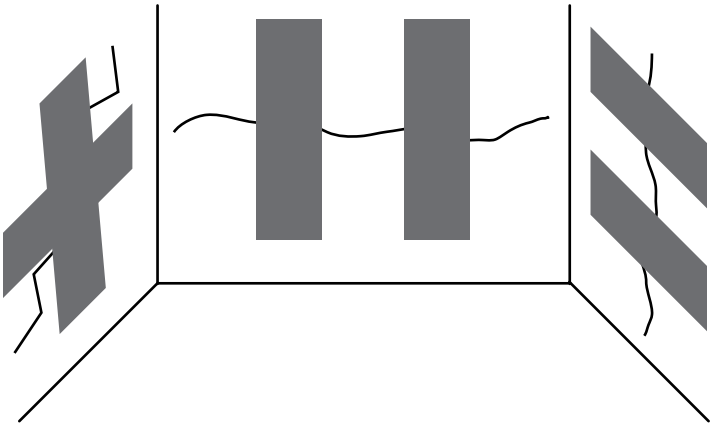
Engineering specs say that Richtech Carbon Fiber can be used on cracks/bows up to 2". We recommend using it only if the crack or bow is about 1.5" or less in total deflection. You can check this by hanging a string (with a weight attached at the bottom) from the top of the wall that extends to just above the floor. If the widest width to the wall is 1.5" or less when the string is touching the outer edge of the bow, then Richtech Carbon Fiber can be used. If a wall is deflected more than 2", the homeowner should consider pushing or rebuilding that wall, which you could then waterproof.

Secondly, you must have the ability to attach Richtech Carbon Fiber a minimum of 2 feet on each side of the crack for it to have the proper strength.



In either case, do not install Richtech Carbon Fiber if either of these conditions cannot be met.

Remember that Richtech Carbon Fiber is always installed PERPENDICULAR to whichever way the crack is going, except if the crack is at an angle. In other words, if you are reinforcing a vertical crack, the sheets would be installed horizontally. If you are reinforcing a horizontal crack, the sheets would be installed vertically.



If there is a crack that runs at an angle, like shown in the picture above, you'll need two sheets – one running horizontally, and the other vertically.

If the wall has slipped off the sill plate – in other words, if the wall is relatively straight but leaning in - or if the wall has pushed itself off the bottom course of block, Richtech Carbon Fiber will **not** add enough strength (there is not 2 feet on either side of it.). Use beams, or let the homeowner know they need that wall rebuilt.

Wrapping Richtech Carbon Fiber sheets around a corner does **not** count in the 2 foot rule, nor will it add stability to that corner. Remember that the sheets are 24 inches wide, and should be left that wide, not cut lengthwise. It must also be installed perpendicular to the crack for it to be effective.

TYPES OF WALL CONSTRUCTION

Richtech Carbon Fiber can be used on:

1. Block walls
2. Poured concrete walls
3. Brick walls
4. Some stone walls

For clay tile walls, Richtech Carbon Fiber is typically not installed. Why? Because the surface of those tiles is thin, brittle and glazed – and there is not enough porous surface area to bond the epoxy effectively to the wall.

How do you determine if Richtech Carbon Fiber can be used on the wall you are looking at? The conditions are:

1. The wall must be relatively flat – that is, smooth stone walls with occasional irregularities can be Richtech Carbon Fibered. Stone walls with large protruding rocks cannot.
2. Michigan walls are suspect – you need to have a flat plane to bond the sheets to.

HOW AND WHEN TO USE BACKING MATERIAL

Backing rod is a poly foam rope, typically found in the window section of your local improvement store. It is used to seal around windows, and can be used to fill larger cracks in the wall. We use 3/8" backing rod. To use it, push it into a crack to make it possible to fill the crack with paste filler without losing the filler into the block cavities. Push the rod in so that the space that is left to fill is similar to the depth of a normal mortar joint.

A WORD ABOUT THE EPOXY

Two part epoxies form an extremely strong bond with almost any surface. When the two parts are mixed together, a chemical reaction unites those parts and the surface they're applied to into a new substance. This bond is dramatically weakened if the chemical formula is altered. For that reason, you must use 3 parts A to 1 part B mixture every time, and you must mix it thoroughly!

Secondly, a chemical reaction occurs when you mix Part A and Part B together. Mix them in the pan provided, not in a bucket. A bucket limits the surface area of the mixture, and will heat up the mix without enough surface area to expel the heat. Mix in a pan, and apply it as soon as it is thoroughly mixed! (Note: the video shows the tech mixing in a bucket. Notice that as soon as it was mixed, he poured it in the tray!)

WEATHER AND TEMPERATURE

Please be aware that for the Richtech Carbon Fiber to cure properly, the ambient temperature in the work area must be 50°F or higher. If you are installing the product in an unconditioned space and use heat to raise the temperature, do not use space heaters that run on propane or petroleum products. The fumes from these types of units will interfere with the curing process of the epoxies.

INSTALLATION

Note: Richtech Carbon Fiber is usually installed by teams of two. Also, if kits are used the proper proportions are already calculated. Mix all of the A to all of the B.

1: Decide where your sheets will be placed.

2: Measure and mark the wall 1" wider than and 1" above and below each sheet location.

3: Scrape the marked areas thoroughly. If the wall is painted, grind the paint off with a wire wheel bit.

4: If you are going to use paste filler, mix enough paste filler to fill all the cracks and holes in the marked areas, and let it set up for a few minutes. This is because it takes a bit for paste filler to thicken adequately to hold it in the cracks. Use a putty knife to fill all the cracks and holes. Make sure you feather the edges.

The paste filler is mixed 3 parts (A) to 1 part (B)

5: Mix enough primer to thickly coat all marked areas. (The primer is mixed in 3 parts of (A) to 1 part of (B).)

6: Roll the primer within all the marked areas and let that soak in for 15- 20 minutes.

7: Mix enough bonding adhesive to put 2 thick coats on all the marked areas. The bonding adhesive is mixed – 3 parts (A) to 1 part (B).

8: Roll a thick coat of bonding adhesive onto all marked areas.

9: Take pre-cut carbon-fiber sheets and place them over the bonding adhesive.
Press and smooth them out by hand.

10: Take the ribbed roller and firmly roll from the middle to the top and from the middle to the bottom, to squeeze the bonding adhesive in-between the fibers and to eliminate air bubbles. Roll in one direction only – not back and forth.

11: Roll on a second thick coat of bonding adhesive.

12: Apply the ribbed roller again.

13: Clean all the tools and dispose of all pre-mixed leftovers promptly.

14: Advise the homeowner to wait at least 48 hours before painting. Remember that the lower the temperature, the longer it will take to cure.

INSTALLATION FORMULA

The average amount of material needed to install one sheet of Richtech Carbon Fiber is:

Primer	15 ounces of A	5 ounces of B
Paste Filler	30 ounces of A	10 ounces of B
Bonding Adhesive	90 ounces of A	30 ounces of B

These are averages. The real variable is the paste filler, because you use the paste filler to fill the cracks and deeply tooled mortar joints, and the amount you need will vary. In any case, the mixture is always 3 to 1. For kits, the proper amounts are pre-set at a 3 to 1 ratio.

INSTRUCTIONS AND GUIDANCE FOR THE HOMEOWNER

Make sure that they know there is absolutely no maintenance required on this product. Also remember to tell the homeowner that they must wait at least 48 hours before painting over the Richtech Carbon Fiber, and longer if it is colder. At that point, they can paint over it with any good quality latex paint of their choosing.

FREQUENTLY ASKED QUESTIONS

Make sure that they know there is absolutely no maintenance required on this product. Also remember to tell the homeowner that they must wait at least 48 hours before painting over the Richtech Carbon Fiber, and longer if it is colder. At that point, they can paint over it with any good quality latex paint of their choosing.

Q: How do I know how many Richtech Carbon Fiber sheets it will take?

A: Richtech Carbon Fiber sheets are 2 feet wide and required to be 6 foot on center, or no more than 4' between sheets. In other words – an 8' long crack requires 2 sheets. Every subsequent 6' requires another.

Total Length of Crack	# of Sheets Necessary
1' – 4'	1
5' – 8'	2
9' – 14'	3
15' – 20'	4
21' – 26'	5
27' – 32'	6
33' – 38'	7
39' – 44'	8
45' – 50'	9
51' – 56'	10

This is a *minimum* guideline. Where you might install them on that crack actually depends on the severity of the crack, and whether one side is more cracked than the other (as long as you don't violate the maximum 4'-between-sheet rule). In other words, an 18' crack would require 4 sheets. That also means there will be less than 4' between sheets – where you might put those 4 sheets depends on where the wall is worst, or where the most stress is located.

In addition, if that wall was near the limits – wide crack, 1.5" bow – you might actually decide to install 5 sheets instead.

Q: What happens if I get to a 100' job, with 1 sheet per wall sold, and it needs more?

A: Do not install the job as sold. Call your Production Manager, so that he can have the sales rep go out to sell the proper number.

Q: What if I only have 1.5 feet above the crack, not 2?

A: Richtech Carbon Fiber is designed to be its strongest when it has at least 2 feet on either side of the crack. Although it would add some strength, it would add less than its specs indicate. Consult with engineering or your Production Manager before installing it in this situation, because there may be other options available to you.

Q: I have a wall that's got step cracks, a vertical crack, and the center has bowed out – the middle is leaning in, and the center of it has moved across the sill plate by about 2 inches. Can I Richtech Carbon Fiber this?

A: No. If the wall has moved across the sill plate at all, or the wall has moved off the lower block, Richtech Carbon Fiber is not applicable.

Q: Can you use cement to fill big cracks?

A: Typically no. If cracks are very wide, though, you could use fast setting hydraulic cement to fill those wide cracks. Regular cement must cure first, and that would take a few days at least – and there's no reason to wait that long.

Q: How much time do you need to leave between applying the crack filler and the application of the primer?

A: You can begin application of the primer as soon as the crack filler is dry enough to stay in place – usually ten to fifteen minutes is plenty.

Q: Can I apply the sheet if the crack filler is still tacky?

A: Yes. It will not jeopardize the installation or strength of the Richtech Carbon Fiber.

Q: What is the best paint to use on walls with Richtech Carbon Fiber?

A: A good latex paint will do. You want to use latex paint that is specified for use on concrete walls. You should stay away from any paint that is oil based or has petroleum as its base, because it will affect the curing process.

Q: Can I mix all the ingredients before I begin?

A: No! None of the epoxies can be mixed and set aside. They should be mixed, then used right away or they will set, so make sure you do things in the proper order, and do them one at a time! **Once mixed, the epoxies set quickly!**

GENERAL SAFETY GUIDELINES REGARDING RICHTECH CARBON FIBER

1. Always use plastic gloves when working with the epoxies (primer, paste filler, bonding adhesive)
2. Do not wear contact lenses when working with Richtech Carbon Fiber materials. Wear safety glasses to avoid splashing into eyes.
3. Do not ingest any Richtech Carbon Fiber materials.
4. Read the MSDS sheets from richtechindustries.com.

5. Make sure the area to be worked on is well ventilated. While the fumes are non-toxic, they could irritate a sensitive person.
6. Ventilation is recommended. Air movement must be designed to ensure air turnover to avoid a build-up of heavy vapors.

HAZARDOUS COMMUNICATIONS REGARDING RICHTECH CARBON FIBER

Richtech Carbon Fiber materials do not contain carcinogenic materials as defined by OSHA Hazardous Communications Act.

FIRST AID:

Inhalation: Vapors may be irritating to nose and mucous membranes. Remove victim from exposure. If difficulty with breathing, administer oxygen. If breathing has stopped, administer artificial respiration. Seek medical attention.

Eyes: Contact may cause severe irritation, tearing, and blurred vision. Flush eyes with water, lifting upper and lower lids occasionally for 15 minutes. Seek medical attention.

Skin: Prolonged or repeated exposure may cause skin irritation and redness. Skin sensitization or allergic reaction may occur in some individuals. Remove contaminated clothing. Wash thoroughly with soap and water. If irritation persists, seek medical attention.

Ingestion: Intake can cause gastrointestinal irritation, nausea, vomiting and diarrhea. Do NOT give liquid if victim is unconscious or very drowsy; otherwise give no more than 2 glasses of water or milk and induce vomiting. Seek medical attention.