



FACILITIES PLANNING, DESIGN & CONSTRUCTION

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REQUEST FOR PROPOSAL

Project Title: Cooley Laboratory Renovation
Location: Montana State University

PPA No.: 10-0023
RFP No.: 4
Date: 9/14/11

To: Dick Anderson Construction
4498 Jackrabbit Lane
Bozeman, MT 59718

Attention: Platisha

From: Cecilia Vaniman, Project Manager
Cooley Lab Renovation
Montana State University

Attention:

In order to expedite the Work and avoid or minimize delays in the Work the following proposal is requested. Please return a response by: 09/19/2011
Date Sent: 09/14/2011
Date Received:

Proposal Requested:

Provide corrective action to unsupported brick veneer per the attached product with manufacturer's recommendations and structural engineer's recommendations dated September 6, 2011.

Notify the owner of any conditions not described within the Structural Engineers's recommendation.

This RFP is for pricing purposes only. The contractor shall not proceed with the scope of work described within until pricing is approved by the owner in writing.

Distribution: [ ] Owner [ ] Architect [ ] Engineer
[ ] Agency [x] Contractor [ ] Other



**Project:** Cooley Lab  
**Date:** September 6, 2011  
**Present:** Cecilia Vaniman, Cooley Lab Project Manager  
Don Platisha, CMS Co.  
Greg Schermele, DAC  
Jerome Gannon, Aegis

### **Summary**

The purpose of this field visit was to assess the condition of the tie backs for the brick veneer on the Cooley Lab building. During demolition for the Cooley Lab remodel, it was discovered that the brick veneer was not tied into the structure as shown on the existing architectural drawings. Unsecured veneer can be a life safety issue in a seismic event; therefore, this problem needs to be addressed for the building to meet the design objectives of the project. It was found that some areas of the brick veneer are adequately tied to the existing structure while others are not and will need retrofitting.

### **Original Design**

The original architectural drawings show veneer anchoring and/or reinforcing throughout the building. The different areas shown are as follows:

*Main Columns:* The main columns show dove tail slots with brick ties every 5<sup>th</sup> course.

*Intermediate Pilasters:* The intermediate pilasters show 2 - #4 vertical bars in the brick, 2 - #3 vertical bars between the brick and the CMU, and #9 wire reinforcing every 5<sup>th</sup> course.

*Spandrel beams:* Dovetail slots at 24" o.c. are called out across the face of the spandrel beams. Above the spandrel beams, there is #3 vertical reinforcement at 12" o.c. between the brick and the 4" CMU. The design intent of this reinforcement was to make the brick and CMU act as a composite section and cantilever above the spandrel beam.

*Parapets:* Reinforcement of the parapets is not shown on the original design documents. However from the similarities between details of the parapets and the spandrel beams, it can be inferred that the design intent was for the parapets to be reinforced similarly to the spandrel beams (#3 vertical reinforcement at 12" o.c. between the brick and the 4" CMU).

### **Observations**

#### **South Side**

*Main Columns:* The main columns on the south side of the building appeared to have the dovetail slots and brick ties per the design drawings.

*Intermediate Columns:* The intermediate columns on the south side of the building did not appear to have the ties.

*Spandrel Beams:* The dovetail slots and brick ties were installed in the locations that were exposed.

*Infill above spandrel beams:* The reinforcing and grouting did not appear to be installed per drawings.



#### North Side

*Main Columns:* The main columns on the north side of the building did not appear to have the dovetail slots and brick ties.

*Intermediate Columns:* The intermediate columns on the south side of the building did not appear to have the ties. However, there were 2-#3 vertical bars.

*Spandrel Beams:* No observations have been made.

*Infill above spandrel beams:* The reinforcing and grouting did not appear to be installed per drawings.

#### East Side:

An area of the brick veneer had been removed on the east side of the building and tie backs to the concrete were there.

#### West Side:

The west side of the building is assumed to be similar to the east side of the building.

#### Recommendations

1. The veneer on the main columns on the north side of the building should be tied into the existing concrete with Blok-Lok Spira-Lok stainless steel wall tie system or approved equal.
2. The veneer on the intermediate pilasters (both north and south sides of the building) should be tied into the existing CMU block with Blok-Lok Spira-Lok stainless steel wall tie system or approved equal. This fix depends upon the existence of the vertical bars shown on the intermediate pilaster plan. In one spot checked in the field, the vertical bars were in the pilaster.
3. For the infill above the spandrel beams, a Blok-Lok Spira-Lok stainless steel wall tie system or approved equal should be installed from the brick, through the CMU and into the new steel studs. Where there is existing clay tile instead of CMU above the spandrel beams use a similar installation through the clay tile and into the new steel studs.
4. For the parapets on the north and south sides of the building, spot checks for reinforcing should be made. If there is not reinforcing, a Blok-Lok Spira-Lok stainless steel wall tie system or approved equal should be installed from the brick, through the CMU and into the new steel studs.

#### Notes:

Where supplementary ties are required, a tie shall be provided for every 2.67 ft<sup>2</sup> of veneer. The max spacing of the ties shall be 32" o.c. horizontally and 18" o.c. vertically. The supplementary ties do not need to be placed lower than 4'-0" above finished grade.

Established in 1961, we are one of North America's leading suppliers of masonry reinforcing and tie systems. Our products have been developed in accordance with accepted building practices and meet or exceed local, regional and national codes and standards. **Blok-Lok** remains committed to setting the standard in the industry. Please call us anytime for technical assistance or recommendations.

# The Original Helical Wall Tie System

# SPIRA-LOK

## *A dry set solution for masonry stabilization*

The **Spira-Lok™** Stainless Steel Wall Tie System is an easy to use, cost effective method of re-connecting existing veneers to their structural back-up by means of a corrosion resistant tie assembly.

The process eliminates the need to tear down an existing veneer.

**Spira-Lok™** is the least invasive way of retrofitting wall ties into an existing structure and is particularly well suited to historical restoration.

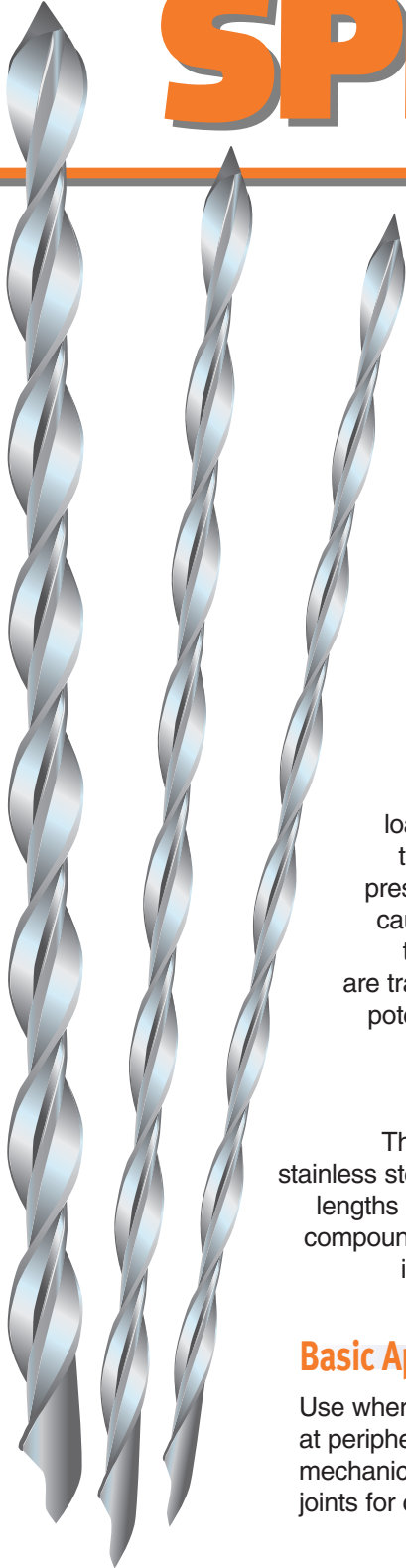
The combination of material and tie geometry provides for long-term durability and structural stability for the design life of the structure.

**Spira-Lok™** is installed into a pre-drilled pilot hole, and cuts its own thread in both the veneer and substrate to form a flexible threaded connection between the two components of the wall being rehabilitated. No pre-load or toxic chemicals are introduced into the structure, and the helical form of the tie acts as a "spring" to absorb differential movement without inducing cracking. Once installed, the anchors resist veneer loading in both compression and tension. The design of the system provides two threaded connections that do not create tension between wythes. This presents a sound solution for façade stabilization to prevent collateral damage caused during a seismic event. Basically, the **Spira-Lok™** system replicates the original wall tie's design performance. That is, live loads on the veneer are transferred to the backup thereby stiffening the veneer and minimizing crack potential. All **Spira-Lok™** ties are installed in the bed joints, concealed with a mortar patch or sealant, and have no exposed hardware. Since the entry point is small, the installation is virtually undetectable upon completion.

The **Spira-Lok™** ties are manufactured from AISI Type 300 series austenitic stainless steel. They are available in a variety of lengths, and can be made to special lengths upon request. Variants include **Patch-Lok™** to mechanically key patching compounds in concrete and other materials, and **Spira-Bar™** for laying horizontally in the mortar joints to stitch cracks or form load-bearing beams in masonry.

## **Basic Applications**

Use where facades have missing or corroded wall ties or anchors. Can be applied at peripheral areas that are bulging or areas that are to be removed. Use as a mechanical key for patching. In bar form, can be installed horizontally into mortar joints for crack control and forming beams in masonry.



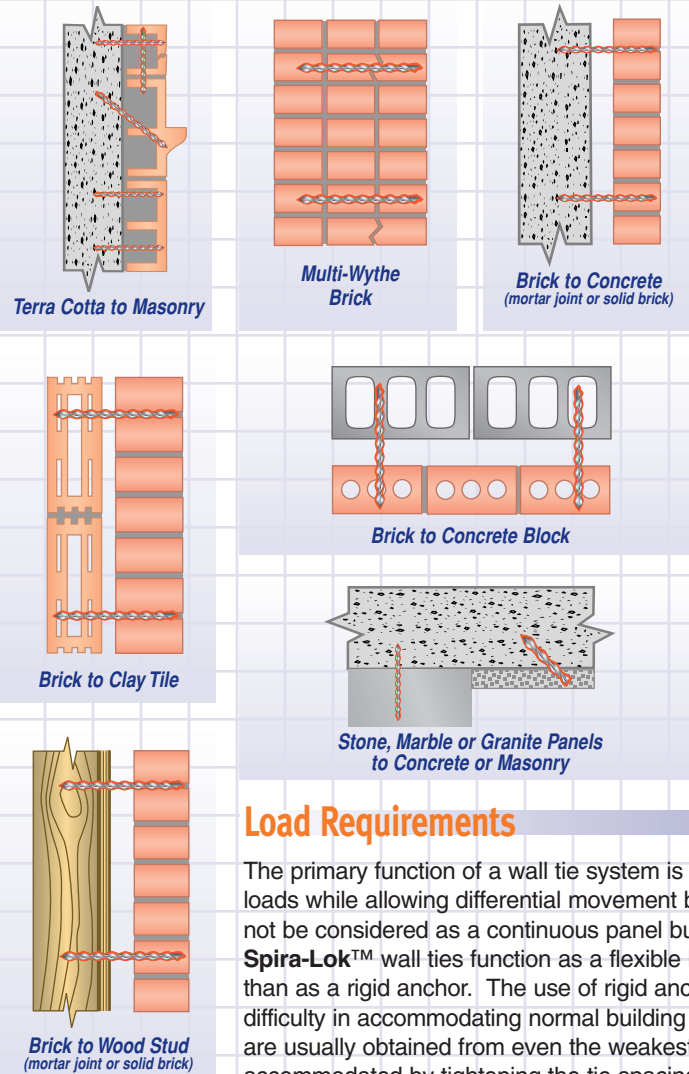
# SPIRA-LOK

The Original Helical Wall Tie System



## Standard Details

The dry set technique may involve various tie diameters, drill bits and installation tools. An on-site survey should be carried out prior to project tendering to determine material strength, tie diameter and length, pilot hole size and appropriate drilling technique. Standard sample specifications are available.

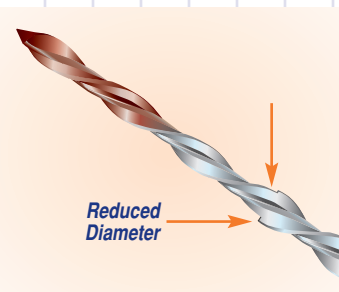


- Masonry pinning for new walls and restoration; Temporary support for lintel and shelf angle replacement; Available in 6, 8 and 10mm diameters plus 8 and 10mm asymmetric sizes with lengths up to 3 feet.
- A one-piece wall tie produced from flexible austenitic stainless steel Type 304. Type 316 stainless also available for more severe corrosive environments.
- Economical to install.
- Only a small diameter pilot hole required.
- No toxic adhesives or expansion devices.
- Site tested immediately after installation.
- Used in a wide variety of building materials.
- Able to withstand cyclic loading.
- Accommodates differential movements between materials.
- Combines flexibility with strength.
- Does not stress or fracture fragile substrates.
- Usable in all weather conditions, environments and temperatures.
- Widely used throughout the world.

## Load Requirements

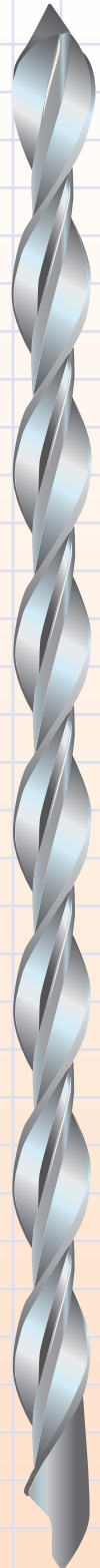
The primary function of a wall tie system is to enable the outer masonry to withstand wind loads while allowing differential movement between adjacent wythes. Masonry walls should not be considered as a continuous panel but rather as a series of load sharing units. **Spira-Lok™** wall ties function as a flexible load sharing connection for masonry walls rather than as a rigid anchor. The use of rigid anchoring systems should be avoided because of their difficulty in accommodating normal building movement. Minimum pull-out load requirements are usually obtained from even the weakest masonry. Tie performance in weak masonry is accommodated by tightening the tie spacing.

## Asymmetrical Ties



**Spira-Lok™ Asymmetrical Ties** are dual diameter **Spira-Lok™ Stainless Steel Helical Wall Ties** designed for use in connecting soft veneer materials to a hard back-up. Typically a larger installation pilot hole is required in hard substrates, such as concrete or brick, than, for example, in a soft veneer mortar.

Since drilling a larger diameter pilot hole behind a small entry hole in the veneer is not possible, Blok-Lok supplies a dual diameter **Spira-Lok™ Asymmetrical Tie** with a smaller diameter on the end being installed in the substrate. This ensures the connection in both the veneer and substrate attain optimum pull-out loading in service.



## Installation

Installation techniques have evolved to optimize the performance of the **Spira-Lok™ Wall Tie System**. Installation procedures are available along with product specifications for typical masonry stabilization. Rotary percussion drilling usually achieves the best results. *NOTE: The SDS rotary hammer is ALWAYS used with the dry set insertion tool to install the Spira-Lok™ Wall Tie.*

## Tools and Accessories

All installation components required, whether it be new construction, refacing or a dry set pinning application are available from **Blok-Lok**. **Blok-Lok** drill bits and setting tools are required for proper **Spira-Lok™** anchor installations.

Typical Spira-Lok Masonry Bit Size(mm)		BACK-UP MATERIAL						
Facade Material	Spira-Lok™	Mortar Joint	Brick	Hollow CMU	Solid CMU	Concrete	Wood Stud	Metal Stud
Mortar Joint	8mm	5.0	AS	5.0	5.0	AS	5.0	5.0
	10mm	7.0	-	7.0	7.0	-	7.0	7.0
Brick	8mm	6.5/5.0	6.5	6.5/5.0	6.5/5.0	6.5	6.5/5.0	6.5/5.0
	10mm	8.0/7.0	8.0	8.0/7.0	8.0/7.0	8.0	8.0/7.0	8.0/7.0
Hollow CMU	8mm	5.0	AS	5.0	5.0	AS	5.0	5.0
	10mm	7.0	-	7.0	7.0	-	7.0	7.0
Solid CMU	8mm	5.0	AS	5.0	5.0	AS	5.0	5.0
	10mm	7.0	-	7.0	7.0	-	7.0	7.0
Precast Concrete	8mm	6.5/5.0	6.5	6.5/5.0	6.5/5.0	6.5	6.5/5.0	6.5/5.0
	10mm	8.0/7.0	8.0	8.0/7.0	8.0/7.0	8.0	8.0/7.0	8.0/7.0
Stone	8mm	6.5/5.0	6.5	6.5/5.0	6.5/5.0	6.5	6.5/5.0	6.5
	10mm	8.0/7.0	8.0	8.0/7.0	8.0/7.0	8.0	8.0/7.0	8.0

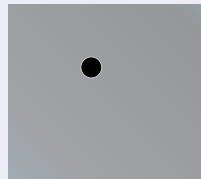
Facade hole / Back-up hole      AS = asymmetric anchor required

## Tie Selection

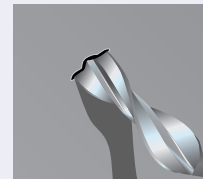
- Spira-Lok™ Wall Ties** are available in 6.0 mm, 8.0 mm and 10.0 mm diameters.
- Tie length to suit wall conditions having a nominal facade width of 4 inches.
- Ties are produced from austenitic stainless steel Type 304. Type 316 Stainless is also available for more severe corrosive environments.

Spira-Lok Tie Length Selection				
Cat Ref - Length	Nominal Length	Minimum Drilled Hole Depth	Cavity Range CMU (solid & hollow) Concrete	
HWT-155	6 1/8"	6 5/8"	1 1/8" - 0	1 1/2" - 0
HWT-170	6 5/8"	7 1/8"	1 5/8" - 0	2 1/2" - 1 1/2"
HWT-195	7 5/8"	8 1/8"	2 5/8" - 0	3 1/2" - 2 1/2"
HWT-220	8 5/8"	9 1/8"	3 5/8" - 0	4 1/2" - 3 1/2"
HWT-245	9 7/8"	10 1/8"	4 7/8" - 0	5 5/8" - 4 5/8"
HWT-270	10 7/8"	11 3/8"	5 7/8" - 0	6 5/8" - 5 5/8"
HWT-295	11 7/8"	12 3/8"	6 7/8" - 0	7 5/8" - 6 5/8"
HWT-330	13 1/4"	14"	8 1/4" - 0	8 3/4" - 7 3/4"

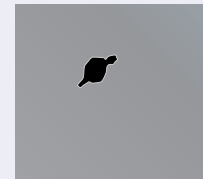
### Installation Mechanism



A pilot hole is drilled through the substrate.

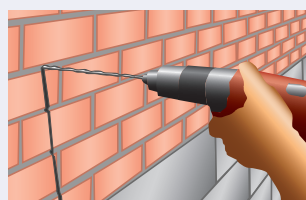


Tie cuts a helical channel through the substrate.

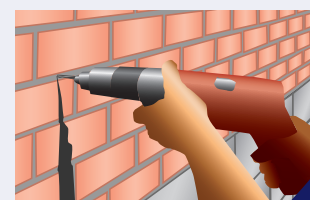


Effective cross-section of helical channel with "slots" that offer resistance to compressive and tensile loads.

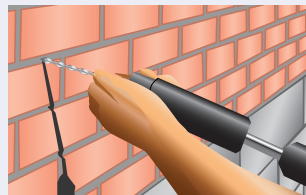
### Spira-Lok™ Installation



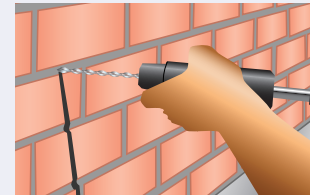
**Step 1:** Drill a pilot hole using percussion hammer drill (3-jaw chuck type) through the mortar joint...



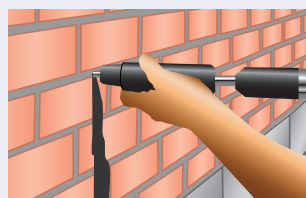
**Step 1:** ...and into the back-up block.



**Step 2:** Insert the Spira-Lok™ Wall Tie into the dry set installation tool mounted on the rotary hammer S.D.S. drill.



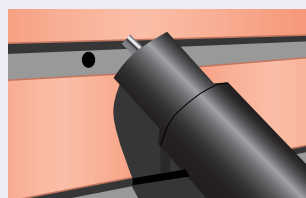
**Step 3:** Drive the Spira-Lok™ Wall Tie through the mortar joint...



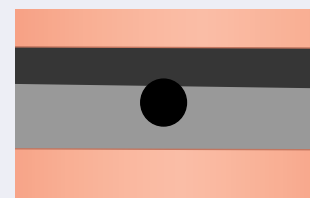
**Step 3:** ...and into the block back-up



**Step 3:** Drive the Spira-Lok™ Wall Tie until the nose of the dry set installation tool is hard against the veneer.



**Step 3:** The dry set installation tool automatically recesses the Spira-Lok™ Wall Tie into the face of the masonry.



**Step 4:** The pilot hole is then aesthetically finished with a compatible material.

## LINTEL AND SHELF ANGLE REPLACEMENT USING SPIRA-LOK™ HELICAL WALL TIES

### Application

**Spira-Lok™ Stainless Steel Helical Wall Ties** can be used for providing temporary support to the masonry wall when removing three or four courses of masonry veneer to enable the replacement of lintels, shelf angles and or flashing. The installation procedure described below is for lintel or shelf angle replacement in walls with brick veneer and block back-up.

### Special Features

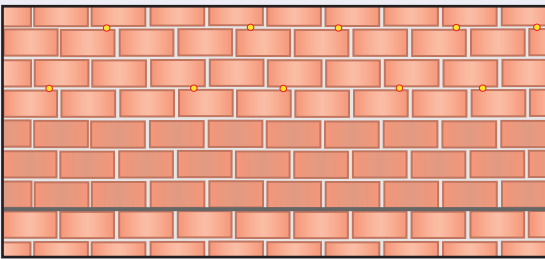
- Maintains structural stability of the wall
- Alleviates the need to use shoring systems which restrict the work area
- Quick and easy to install
- Only minor touch-up required upon completion

### Sizes

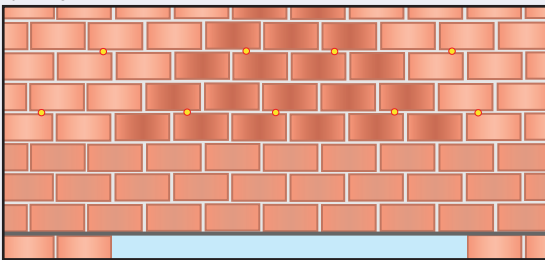
The length of tie to use is determined by the wall make-up. The ties should, however, be imbedded into the back-up wall to a depth of at least 2".

### Installation Procedure

- 1 Three or four courses of masonry above the shelf angle are to be removed as highlighted in the drawing.



For lintel replacement, the area to be supported is defined by drawing lines at 45° from the corner points of each side of the opening.



- 2 Drill 3/16" (5.0mm) diameter pilot holes through the mortar joint to a depth of penetration in the back block of at least 3" (75mm) using an Rotary Percussion (3-jaw type) Drill in the pattern shown above or according to the engineer's instruction.
- 3 Using an SDS Hammer Drill and the Dry-Set Installation Tool provided, insert the **Spira-Lok™ Stainless Steel Helical Wall Ties** into the pilot holes. The Installation Tool will automatically recess the tie 3/8" when the tool nose is hard up against the veneer surface.
- 4 The masonry courses above the shelf angle may now be removed using the newly installed **Spira-Lok™ Stainless Steel Helical Wall Ties** as temporary support to counter both the shear forces and bending moment.

## PATCH-LOK HELICAL PATCH REINFORCEMENT

### Application

**Patch-Lok Helical Patch Reinforcement** is used for providing a powerful mechanical key between the damaged substrate and the patching compound used to effect a repair. Primarily designed for spalled concrete repairs, **Patch-Lok** can also be used wherever a strong, non-chemical bond between a substrate and patching compound is required.

### Special Features

- Forms a powerful bond without chemicals
- Maintains structural stability
- Minimizes the need to build patch up to required profile
- Quick and easy to install
- Drill bit and installation tool required for installation provided

### Sizes

**Patch-Lok Helical Patch Reinforcement** is manufactured from ASTM 304 or 316 austenitic stainless steel and is available in 8.0mm diameters and in lengths of 3" (75mm). Should the patch profile require shorter lengths, **Patch-Lok** can be bent or cut to suit.

### Installation Procedure

- 1 Clean area to be patched, removing any loose material, and preparing any exposed reinforcing steel.
- 2 Drill 1/4" (6.5mm) pilot holes to a depth of 1 3/4" (45mm) using an SDS Hammer Drill. **Patch-Lok** reinforcement is to be placed according to the engineer's instruction, but normally 2" (50mm) from the edge of the repair and with a nominal grid of 6-8" (150-200mm) centers, and not less than two **Patch-Lok** per patch.
- 3 Using an SDS Hammer Drill and the **Patch-Lok** Installation Tool provided, insert the **Patch-Lok** reinforcement into the pilot holes ensuring that they remain below the intended finished profile of the repair. **Patch-Lok** may be bent or cut if it is too long.
- 4 Apply the patching compound.

### Load Data

The "pull-out" load data for **Patch-Lok** is dependent upon the substrate in which it is installed. Load Tests in a variety of different grades of reinforced poured concrete have yielded results having a minimum "pull-out" strength of 350 lbf when **Patch-Lok** pins are installed in accordance with the above procedure. Results may vary for other substrate materials, but Blok-Lok's technical department will be pleased to advise the optimum pilot hole size to use in order to maximize "pull-out" performance. The average Shear Load capacity of **Patch-Lok** is in excess of 2,000 lbf, and the average Tensile Load bearing capacity of the pin itself is in excess of 2,600 lbf.

### Load Data

The "pull-out" load data for **Spira-Lok™ Stainless Steel Helical Wall Ties** is dependent upon the substrate in which it is installed, and Blok-Lok's technical department will be pleased to advise the optimum pilot hole size to use in order to maximize "pull-out" performance. The average Shear Load capacity of 8.0mm Blok-Lok Helical Wall Ties is in excess of 2,000 lbf, and the average Tensile Load bearing capacity of the tie itself is in excess of 2,600 lbf. The bending moment introduced into the wall by removing masonry courses will vary with cavity width and is countered by using multiple rows of ties as shown.



# SPIRA-LOK

The Original Helical Wall Tie System



## Features

- One Piece Anchor
- Austenitic Stainless Steel
- Helical Configuration
- Central Core Cruciform Shape
- Pointed End Symmetry
- Only a Small Pilot Hole Required
- No Adhesive Required
- Pullout Resistance
- Engineered Design

## Benefits

- Simplified Handling
- Long Term Durability
- Acts as a Drip and Maximizes Cutting Edge Contact. Provides self-tapping action. Simulates thread conditions without pre-load stress. Accommodates in-plane cyclic loading. Provides flexibility to accommodate differential movement between wythes.
- Optimizes Axial Strength in Tension and Compression. Dissipates installation energy. Centralizes load disaster.
- Installation Ease
- Minimal Visual Impact
- Can Be Used in Any Climactic Condition. Eliminates substrate preparation. Enhances in-plane ductility. Less problematic.
- Up to Ten (10) Times Conventional Wall Tie Capacity
- Can Be Immediately Tested for Performance Verification on Site. Can be used in various building materials.

## Spira-Lok\* Physical Characteristics

nominal dimensions

Outside tie diameter	8mm	10mm
Pitch length: in. (mm)	0.84 (21.4)	1.0(25.4)
Tie cross-sectional area: in. <sup>2</sup> (mm <sup>2</sup> )	0.017 (11.6)	0.022 (14.2)
Yield strength: ksi (MPa)	65.9 (455)	73.8 (509)
Tensile strength: ksi (MPa)	137.0 (950)	137.0 (950)

\* Material: ASTM A-167 TYPE 304 Stainless Steel

## Typical Spira-Lok Performance Characteristics

Material	Effective Minimum Embed (inches)	Ultimate Tension/Compression (lbs.)	
		8mm	10mm
Mortar Joint (1500 psi)	3"	780	616
Solid Brick (9000 psi)	3 5/8"	700	700
Cavity Brick	3 5/8"	1280	1390
Normal Weight CMU	1"	801	907
Light Weight CMU	2"	550	550
Concrete (3500 psi)	1 1/4"	1200	1300
Wood Kiln Dried Stud: 2 x 4 2 x 6	3"	517	N/R
	3"	520	N/R
Metal Stud	16 Gauge	310	N/R
Granite	1 1/8"	620	650
Travertine	7/8"	590	800
Limestone	3"	600	620
3/16" Steel	3/16"	520	N/R

\* Note: each construction project is unique and the appropriate use of this product is the responsibility of the engineers, architects, and other professionals who are familiar with the specific requirements of the project. This data reflects the results of lab, field and in-house results and provided as a guideline for the designer. Site testing is encouraged for verification of load carrying capacity. (N/R = not recommended)

## Typical Spira-Lok™ Properties

ULTIMATE BUCKLING STRENGTH		
UNSUPPORTED LENGTH (mm)	CAPACITY (lb)	
	8mm	10mm
1 inch (25mm)	1638	2335
2 inch (50mm)	1290	1613
4 inch (100mm)	690	1185
6 inch (150mm)	375	614



## SPIRA-BAR

HELICAL REINFORCEMENT FOR MASONRY CRACK REPAIR

### Application

**Spira-Bar Helical Crack Repair Reinforcement** is used in existing masonry facades for crack stitching, lintel reinforcement, the stabilization of cracking in masonry walls caused by ground movement, and to reconnect wythes of structures built using different construction materials.

### Special Features

- Restores structural stability
- No special equipment required for installation
- Quick and easy to install
- Minimal disturbance to building occupants
- Minimal disfiguration of the building

### Sizes

**Spira-Bar Helical Crack Repair Reinforcement** is manufactured from ASTM 304 or 316 austenitic stainless steel and is available in 6.0mm and 8.0mm diameters and in lengths up to 10 meters. Standard lengths are 39.4 inches(1,000mm).

### Installation Procedure

- 1 Rake out or grind slots into horizontal mortar joints to specified depth at each location and at required vertical spacing. Unless otherwise specified, the ground slot depth should be 1.3/8", and the vertical spacing four brick courses.
- 2 Blow out slots and thoroughly flush with water.
- 3 Using a grout gun, insert a bead of cementitious grout into the back of the slot.
- 4 Push the **Spira-Bar** reinforcement into the **Bond-Lok SB** wet grout to obtain good coverage (minimum 5/8" cover).
- 5 Continue filling joint with **Bond-Lok SB** cementitious grout over the exposed **Spira-Bar** and iron into the slot using a finger trowel.
- 6 Point up or fill the joint.

## BOND-LOK SB

CEMENTITIOUS GROUT

**Bond-Lok SB (Spira-Bar) Cementitious Grout** is a non-shrink, pumpable, thixotropic, high performance, cement based grout suitable for injection with a hand or power applicator. Supplied in a 16 litre (4 gallon) bucket, **Bond-Lok SB** contains the dry powder and liquid component individually packed to make 3 or 6 liters (3/4 or 1 1/2 gallon) of mixed injectable grout. The low liquid to powder ratio ensures a thixotropic grout which develops its compressive strength rapidly. It is designed to fill all voids into which it is injected and the bond stress is greatly enhanced by its non-shrink properties. **Bond-Lok SB** is a non-flammable odorless material specially formulated for bonding **Spira-Bar** into masonry veneers.

## Site Testing

Wherever possible we strongly urge in-situ testing be conducted to verify pull out loads particular to the specific situation. **Spira-Lok™ Wall Ties** may be load tested immediately after installation to verify the strength of the connection. The **Blok-Lok** field test apparatus is custom designed for this purpose. A test key, sized for the appropriate diameter of the helical tie, is quickly installed and a test load applied. The easily read dial indicates the applied load.



## Warranty

Seller makes no warranty of any kind, expressed or implied, except that the goods sold under this agreement shall be of the standard quality of the seller, and buyer assumes all risk and liability resulting from the use of the goods, whether used singly or in combination with other goods. Seller neither assumes nor authorizes any person to assume for seller any other liability in conjunction with the sale or use of the goods sold, and there is no oral agreement or warranty collateral to or affecting this transaction.

## Warning

The information contained in this publication does not constitute any professional opinion or judgement and should not be used as a substitute for competent professional determinations. Each construction project is unique and the appropriate use of this product is the responsibility of the engineers, architects, and other professionals who are familiar with the specific requirements of the project.

## Approval

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