



## A Guide to Water Control Using SealGuard Polyurethane Grouts



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Cover Photographs demonstrate Before & After the usage of our Products



SealGuard Grouts can be used on all Water Control Projects - Big & Small

All photographs in this book are of actual SealGuard or Sub-Technical projects and were taken by our employees

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YES, SealGuard II in the right hands can stop this much water.

# Section 1

## INTRODUCTION

This booklet is intended to help both our new and existing customers use SealGuard products properly and see them through to a successful project conclusion. There are instructions on how to tackle specific types of leaks as well as how to properly use the tools and equipment needed. We've also included some general information on polyurethane grouts and some frequently asked questions to guide the user in finding the proper application solution for their problem.

So, let get started:

Types of leaks: Just about every leak you will come across will share some combination of the following characteristics:

Fast or Slow: Pretty self-explanatory, but very important when it comes to fixing the leak properly. A very fast leak can wash out the grout before it reacts, so it will be necessary to use a faster reacting grout, use mechanical means to slow the flow, or both

Regular or Irregular Crack: A **Regular Crack** is something that is uniform through the substrate, like a cold joint or a precast section joint. These are somewhat easier to fix since we know this joint will be consistent through the substrate and thus, easier to drill into and inject. An **Irregular Crack** occurs when settlement or some other factor causes the structure to shift and then crack, allowing water in (or out in some cases). These are sometimes tougher to fix as it is impossible to tell at the face exactly how the crack is oriented within the substrate. We will explain later how to drill both types of cracks.

Fine or Open: **Fine Cracks** are those that are smaller than 1/8" or so across. It is generally not possible to squeeze any grout into a crack this size with a caulking gun. In these cases a pressure injection is called for. Fine cracks are also sometimes difficult to intersect with the drill, further increasing the degree of difficulty. **Open Cracks** (bigger than 1/8" or so) are a bit easier and can often be fixed with a caulking gun. Many times it will be necessary to use backer rods or other means to keep the grout from flowing out of the face of the crack. All cracks should be cleaned of as much loose debris as possible using a garden sprayer and water.

Voids: Very often, particularly in a leak that is very fast, very persistent or both, a void, unseen from within the structure will be formed. This is due to the fact that as the water flows into the structure, it also carries with it fine silty material from the surrounding ground. Over time, voids can become quite large and, when charged with water can cause a very big leak. A common indication of voiding is when your injection site freely accepts the grout but the leak does not

slow down and there is no sign of material at the face of the leak. Since you cannot see behind the wall and have no way of knowing how big the void is, you could spend a lot of time and grout trying to fill it. It is usually best to re-drill on a more direct line into the leak path.

Confinement: As polyurethane grout expands, it follows the path of least resistance. That results in the reacting foam flowing out through the face of the crack or whatever you are trying to seal, if you don't do something to stop it. Inserting backer rod, oakum rope or burlap into the crack does two things. First the volume of material in the leak path is greater since it is not flowing out onto the floor and secondly, since it cannot freely flow out of the face of the crack it will expand more vigorously out towards the sides of the leak path. This is a demonstration of **Confinement**. Limiting the amount of room the grout has to expand results in a denser, tighter and more permanent seal.



Our products are used in many industries and applications. This is a mine entry.

# Section 2

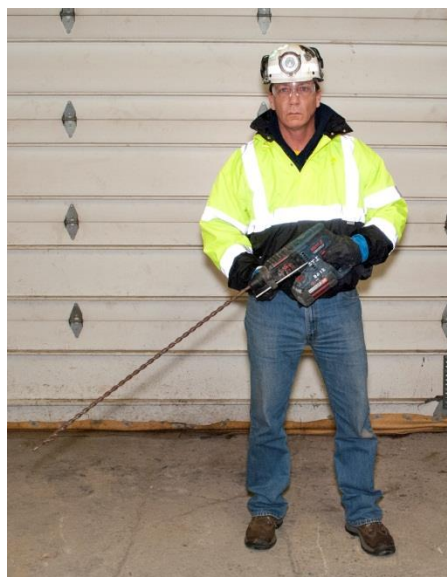
## TOOLS, ACCESSORIES, MATERIALS & HOW TO USE THEM

Clothing: One thing must be made perfectly clear, polyurethane can be very messy! Once you get it on your clothes it will never come out. So, whatever clothing you are wearing on the first day you grout will from that day forward be your grouting clothes. Long sleeves and pants are recommended as polyurethane does not like to come off of your skin either!

Personal Protective Equipment: it goes without saying that the appropriate PPE must be worn. This includes safety goggles, gloves and hard hat, if required. A side benefit to wearing a hard hat is that a cap light may be used, making it much easier to see what you are doing in places that are often wet and dark.

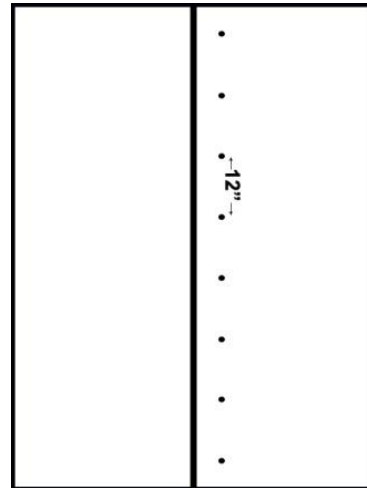
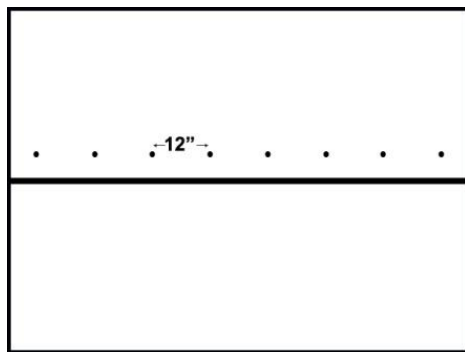
Drills and Drilling: This is the most crucial part of the whole grouting process. If you don't intersect the leak-path, you will not fix the leak

What Kind of Drill do I need? A hammer drill is required. It can be electric or cordless but needs to be able to handle a relatively long (up to 36") 5/8" bit. Below is an example of what we use.



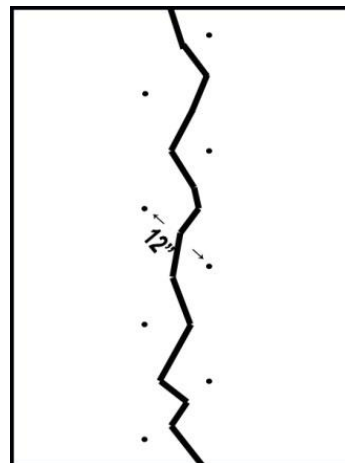
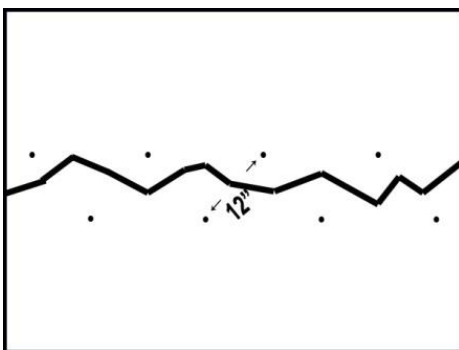
What is the best way to intersect the leak path? The ideal place to intersect the leak path is about halfway back through the thickness of the wall (more or less). This way, when the grout is injected it will flow to fill the entire path from front to back.

The easiest way to hit that spot is to “Step Off” the crack about half the thickness of your substrate and drill at a 45° angle. For example, an 8” thick wall with a leaky joint should be drilled about 4” off the joint at a 45° angle. See the below diagrams of drilling patterns for the various types of leaks you may encounter.



The above drawings depict uniform cracks such as cold joints or pre-cast joints

- If crack is non-uniform it must be stitched



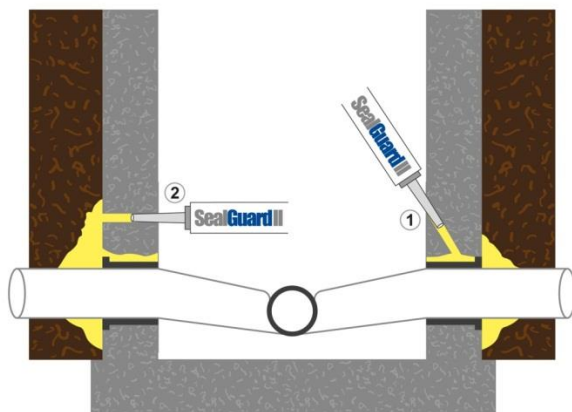
Note how injection holes are drilled on either side of the crack



A word about 45° Angles – One of the most common problems we hear about involves an inability to intersect the leak path and introduce grout. The customer swears they are drilling at a 45° angle, but, as I can personally attest, they rarely are. As you can see there is a big difference between a true 45° angle and what many “feel” is a 45° angle. Just a little too steep and you will miss the leak path and go right out the back of the substrate. A 45° angle is much shallower than most people think, so keep that in mind as you drill.



Is there ever a time where I do not have to intercept the leak path? As a matter of fact there is. In a situation where there is a Strong water flow into a structure, it is sometimes a good idea to breach the structure wall with your injection hole and allow the water to pull the reacting urethane (usually SealGuard II) into the leak. The flow must be strong or it won't pull it in before reaction. This is very common in manhole lateral boots. See the diagram below for examples of drilling into the leak path and also breaching the structure to fix a high volume leak.



- 1 shows a hole drilled to intersect the leak path
- 2 demonstrates how to breach the structure and allow the water to pull the SealGuard II into the leak

A word about Rebar – If, in the process of drilling your injection holes you hit a piece of rebar, you are most likely out of luck. The only thing you can do is shift your position and try again, sorry!

Chinking with Burlap / Oakum / Backer Rod – In many cases, it is necessary to use some sort of medium for either slowing the leak down so the grout doesn't wash out or else to create confinement and prevent grout from running out of the front of the crack. Three common materials used for this are **Burlap** (same as they use for feed bags), **Dry Oakum Rope**, which will expand when wet and can also be separated to fit into various size cracks and **Backer Rod**, which is a sort of spongy, flexible rod that works well in this application, and is available in various sizes. The process of chinking is simple, just start at one end of the crack and force your chinking material of choice into the crack with a putty knife, screwdriver or other implement. The idea isn't to stop all the water, just slow it down enough to give the grout time to react.



Burlap (L)

Oakum (R)

Garden Sprayer and Water – These inexpensive, easy to operate sprayers are a very useful grouting accessory. They are good for rinsing the injection site of the drill dust and loose debris, as well as ensuring that there is water present in the crack to be injected, a must when using HyperFlex. In wider cracks, the sprayer will tell you if your injection hole has met the leak path as water will come out of the face of the crack.

Other Bits and Pieces:

- Wooden Dowel Rod – A 3/8" wooden dowel can be tapped into the hole drilled to inject HyperFlex in a 300ml tube, after the HyperFlex has been injected. It will promote confinement and in turn provide a better seal.
- Scraper / Plastic Sheeting (Garbage bags) – Grouting is Messy! Having all the right supplies on hand will make clean-up much easier.

## Means of Injecting SealGuard Grouts

There are two basic types of injection; **Low Pressure**, using a caulking gun or **High Pressure** using some sort of hand, air, or electrical powered pump. Below are brief descriptions of the various injecting tools and a chart listing the properties of each.

**Dual and Single Component Caulking Guns** – this is self-explanatory, however, a dual component gun will be necessary to use SealGuard II. Caulking guns do not generate sufficient pressure to push grout into the finest cracks, so their use is limited to open crack and void injections.



Dual Caulking Gun on the Left (green)  
Single Caulking Gun on the Right (red)

**Hand Pumps including Bucket Pumps** – these pumps usually have a hand operated lever that will generate sufficient pressure to operate with an injection packer. (More on packers later) They are somewhat cumbersome and tough to work with in tight spaces, although injection line can be run from the pump to the injection site. These pumps are good for situations where there are not that many packers to pump or where electricity or air power is not available. Hand pumps can only be used with single component urethanes such as HyperFlex. Once finished grouting it is necessary to use pump flush (NEVER WATER) to clean the unit.

**Grease Guns** – These are portable and will generate over 1000 psi. They have one big drawback in that they are ETREMELY messy. In general, you can fill the gun up once; after that HyperFlex gets behind the plunger and comes out of the back of the gun. However, when you are in a situation where there is a small crack requiring just a couple of packers, a grease gun can work. Hold the gun inside a plastic bag to keep the mess to a minimum, and assume the grease gun will have to be thrown away when done with the injection. To use, simply empty the contents of a 300ml tube into the gun and seal tightly. You can fill it up 2 or 3 times before the mess gets to be too much

Representative Grease Gun



**Grout Pumps – Electric and Air Powered** – When larger projects require bigger volumes of grout be pumped, a powered pump is usually the best option. **Electric Pumps** are oftentimes converted airless paint sprayers. They deliver approximately 2500 psi of pressure and can be used to pump only single component materials like HyperFlex. Larger professional grouters will use **Airl Powered Pumps**, these generate up to 5000 psi and can be used to pump any type of grouting material, both single component HyperFlex and dual component SealGuard II. The use of these pumps is generally limited to large scale, professional grouters due to the complexity and cost.



Attach suction Line to 5 Gallon Pail

Turn Pail on side, open small air valve



Open Primer valve and turn Pump on to drain pump flush and air bubbles from suction hose. Close primer valve when air is no longer visible.



Point injection line into a bucket and pump until an unbroken stream of HyperFlex comes out. You are now ready to begin injection.

Below is a chart showing the properties of various pumping methods:

### General Specifications for Various Grout Delivery Methods

#### Hand Powered Caulking Guns

- Should be High Mechanical advantage of 27:1 versus standard advantage of 17:1
- Generates approximately 100 PSI at the nozzle tip
- Pressure is insufficient to overcome cracking pressure of an injection packer
- This is true for both dual and single guns
- Used with cartridge based systems
- Performance of Pneumatic guns is very similar



Dual Component Gun



Single Component Gun

#### Hand powered Pumping Devices

- Includes grease guns, bucket pumps, hand pumps
- Generates approximately 1000 PSI
- Pressure is sufficient to allow for the use of an injection packer
- Can pump single component urethanes only
- Only feasible on relatively small jobs
- Not designed for larger projects



Grease Gun



Bucket Pump

## Air or Electric Powered Grout Pumps

- Can be a converted electric airless paint sprayer or an air powered injection pump
- Generates approximately 3000 PSI
- Used with injection packers
- Larger air pumps can pump dual component materials, electric pumps primarily single component material
- For larger jobs using pails or drums of material



Air Pump set up. This example is set up to pump dual component formulations at up to 5500 psi

**Packers** – When performing a pressure injection, some sort of device is needed to prevent the grout from pushing back out through the injection site. **Packers** have rubber bladders that can be inflated mechanically or pneumatically to fit very tightly into the injection hole. Once tightened, a packer can withstand the high pressures encountered when pumping. A check valve in the zerk end fitting or elsewhere keeps material from reacting through the stem of the packer. The most common size we use is a 5/8” mechanical packer, which can only be used with single component material like HyperFlex.

In situations where your pumping pressure is not that extreme “knock-in” packers may work. As the name implies they are simply knocked in with a hammer and held in place by the friction bond. A picture of a knock-in packer is below



“Knock in” Packer



5/8 “ Packer

In order to pump very high volumes of material, or for dual components like SealGuard II, a much larger packer of 1 3/8” or larger may be used. These would not be commonly seen in anything but a large scale mining or civil application.



Range of Packers from ½” to 2”



A properly installed 5/8” packer.

## SealGuard Grouts

### Polyurethane Grouts; terms and definitions

**Single component versus Dual Component Urethanes** - SealGuard offers two grout products, HyperFlex, a single component and SealGuard II a dual component urethane. **Single** components react with water by pulling an OH molecule off of the H<sub>2</sub>O water molecule during reaction. This can take a long time so pretty much all of our competitors offer a separate catalyst to make the reaction happen faster, so they really aren't single component after all since the separate catalyst must be mixed before use. Our HyperFlex already has the catalyst pre mixed meaning it is a true single component product, and it reacts in 30 seconds, (see below for an explanation of why this is an advantage). The longer reaction time of HyperFlex is an advantage versus a material like SealGuard II in that the material migrates much farther through the substrate before reacting. This results in a more complete seal of the entire leak path. **Dual** component urethane is a binary system, with the chemical (A side) and reactant (B side). They do not react with water but with each other allowing for much faster reaction times and much greater certainty about the composition of the reacted product than with a single component system which is slower and the reacted product chemically variable depending on the amount of catalyst when it reacts. In the case of SealGuard II this allows a very fast reacting material that can stop higher flows of water than a slower material, which could wash out.

**Hydrophobic versus hydrophilic polyurethanes** - **Hydrophobic** products **do not** like water and will repel it during reaction. Once the reaction occurs the urethane will not absorb water and has no water in it. As a result it will not shrink over time. All SealGuard products are **Hydrophobic**. **Hydrophilic** urethanes, on the other, hand use water as part of the reaction and it is also a part of the reacted product. As long as the reacted product remains in contact with water, it will remain in place and will not shrink. However, if the water dries up (as in an extended dry spell) the grout will dry out and shrink. The problem with **hydrophilics** is that once water is reintroduced, the grout will re-expand, only not quite to the extent that it was before, over time it will leak. Our competitors like **hydrophilics** because they are less viscous and will simply react with water and thus needs no accelerant or catalyst added to them. Our HyperFlex single component pre-catalyzed grout product is better than **any hydrophilic** because 1) it is **hydrophobic** and 2) requires no catalyst. Viscosity can be adjusted by simply heating or cooling the tubes or pails. HyperFlex is better than other single component **hydrophobic** because all of them require a separate catalyst be mixed in to make them react. Incomplete mixing (very common) causes inconsistencies through their products leading to hot spots (too much catalyst in an area) and cold spots (not enough) this causes excessive foaming or an incomplete reaction, both of which can lead to leaks.

**Toluene Diisocyanate (TDI) versus Methyl Diisocyanate (MDI)** - These are the two different main components of **polyurethane grouts**. ALL SealGuard products are MDI based, but many of our competitors still use TDI based products. TDI's are NASTY stuff. It is a known carcinogen, gives off hazardous vapors (full breathing apparatus must be worn to apply them) and is generally very hazardous to work with. MDI's are not carcinogenic, don't give off hazardous vapors, and, while I wouldn't want to drink it, is generally a lot safer to work with than TDI's. In general, it is easier and safer to work with MDI polyurethanes. There is no appreciable



difference in the applications of a TDI vs. MDI grout, so I don't understand why anyone would still use them.

**Reaction Time** - This is pretty self explanatory but basically means how long it takes the urethane to rise (foam) after it is applied. Reaction time is variable based on temperature and pressure but in general the reaction time is slower when it is colder and faster when it is warmer. Most of the reaction times quoted by most of the players in the business are based on 70 degrees F (including ours). For the record, Hyperflex reacts in about 30 seconds and SealGuard II reacts in 1 to 3 seconds.

**Pre-catalyzed versus non-pre-catalyzed materials** - I have touched on this earlier, but the basic difference is that pre-catalyzed materials such as Hyperflex can be used right out of the tube or bucket and be pumped right away. All of the competing single component products have separate catalysts that must be mixed in prior to use leading to hot spots and cold spots, which I discussed above. As a practical matter, it is nearly impossible to hand mix a catalyst to get adequate distribution through a solution in the field, so the advantage of having a pre-catalyzed single component grout cannot be underestimated.

**Percentage of Solids** - This is a measure of how much react able material is present and how much is filler such as calcium carbonate and others. SealGuard products are 100% solids. When a product is not 100%, the fillers can act as an abrasive and damage the pumps used to deliver the material.

# Polyurethane Grouts vs. Other Chemical Grouts

## Cements

A wide variety with varying strengths, slumps and flow ability. Often in field use there are a variety of additives designed to "help" with various properties, such as, sodium Silicates and assorted Hydrophilics such as Bentonite (Clay) and Ground Walnut husks.

**Limitation:** Bulky application equipment, prolonged set times, limits in fracture size, poor performance in water, brittle, shrinkage, poor adhesion. Environmental problems around water sources, pressure injection ceases when pumping stops.

## Hot Bitumen

An ancient method now rarely used, environmental concerns, application hazards with heat. No real control on set times.

**Limitations:** Unknown set times, poor mechanical strengths, poor adhesion.

## Silicates (Sodium/Urea) "Water glass"

A variety of compounds, using silica sands in a dissolved form. When reacted it forms a silica gel, which is hard and very brittle.

**Limitations:** Highly Alkaline, (PH 13) extremely hard and brittle.

## Acrylics

Supplied in a variety of formulations. Somewhat Hydrophilic but all generally form a gel. Reactions can vary from instantaneous to around 30 minutes.

**Limitations:** Poor adhesion, limited mechanical strength. Hydrophilic promotes shrinkage.

## Acrylamides

Introduced in the 1950's these materials have been effective in many cases but have experienced health and safety challenges relating to various formulations. (Sweden Hallandsasen Site - 1998).

**Limitations:** Poor adhesion, limited mechanical strength, some formulations present H&S issues. Complex chemistry when used as a grouting medium.

## Acrylates

Similar in appearance and end product to Acrylamides, their main claim to fame being that they are less toxic than Acrylamide.

## Siloxanes

A water soluble compound generally of use in surface sealing of concrete, but can be of use for pre-injection of crack systems to prepare them prior to crack injection with "HyperFlex".

## Epoxies

Although commonly used for a variety of repairs, epoxies have become less popular for water sealing.

**Limitations:** Insufficient flexibility for use in crack systems due to non-expansive nature, not ideal for void application. Many formulations are too viscous to pump. Expensive.



The expansiveness of HyperFlex, coupled with its adhesion and flexibility, make it an ideal medium for filling voids, in this case a 48" pipe at an inactive steel mill.



**Comparative Application of Polyurethane Grouts**

*(Cements vs. Polyurethane)*

<b><u>Cement</u></b>	<b><u>Polyurethane</u></b>
<b>Bulky application equipment</b>	<b>Simple application equipment</b>
<b>Delayed set times</b>	<b>Adjustable set times to suit conditions</b>
<b>Limitations in flowability and fracture size</b>	<b>As a viscous material, injection into the finest fractures</b>
<b>Final strength in days</b>	<b>90% cure in minutes or seconds</b>
<b>Poor performance in wet conditions</b>	<b>Extremely effective in or around water</b>
<b>Shrinkage a problem upon cure (often requires re-application)</b>	<b>Maintains positive pressure when cured</b>
<b>Very poor adhesive properties</b>	<b>Excellent adhesion even in water</b>
<b>Often presents environmental problems</b>	<b>Many of our formulations are NSF-61 approved for use in Potable Water</b>
<b>Susceptible to washout</b>	<b>Will re-constitute even in flowing water</b>
<b>Injection ceases with cessation of pumping</b>	<b>Even after cessation of pumping material will self-inject</b>
	<b>Up to 13,700 PSI compressive strength</b>

## Our Products:

### SealGuard II

- Dual Component
- Hydrophobic
- 100% solids
- Very fast reaction time: 1-3 second reaction and 10 second cure time
- Patented check valve enhances safety and allows for use of a partial tube set
- Use in situations where there is very high water volume, which can be upwards of 50 gallons per minute (nearly a gallon per second)

Available in:

12 Pack reorder (SGRE12)  
6 Pack Reorder (SGRE6)  
6 Pack Starter Kit (SG Kit ST)



### HyperFlex

- Single Component
- Pre-Catalyzed
- Hydrophobic
- 100% solids
- 20:1 Expansion ratio
- Slower reaction time allows for better migration through the substrate
- Use for slower leaks, voids and curtain grouting

Available in:

12 Pack (HF12) 300ml Tubes  
6 Pack (HF6) 300ml Tubes  
5 Gallon Pail (HF5G)



### X-Seal

- Single Component
- Pre-Catalyzed
- Hydrophobic
- 100% solids
- Formulated for tenacious, watertight, adhesive seal between concrete, brick and metal surfaces

- Use to join pre-cast concrete sections, new manhole construction or anywhere a permanent, flexible, strong & watertight seal is needed

Available in:

20 Bottles (X-Seal(20) 8 oz bottles  
 6 Pack or 12 Pack (X-Seal6 & X-Seal12)  
 300 ml Tubes  
 5 Gallon Pail (XS5G)



X-Seal is commonly used for joining and sealing manhole components.



These photographs give a good idea of the volume of water SealGuard II can stop in seconds.



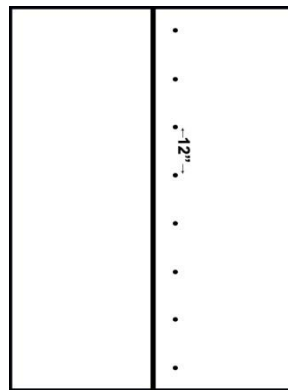
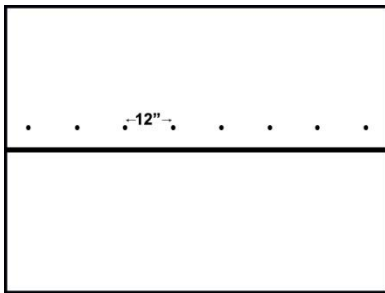
HyperFlex in caulking tubes can be used to inject large, open cracks. The water bottle washes drill dust away before injecting the grout.

# Section 3

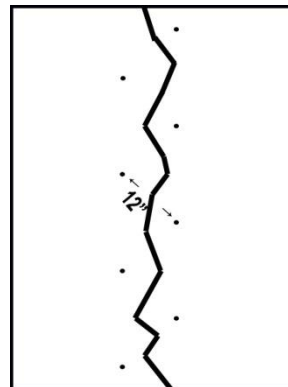
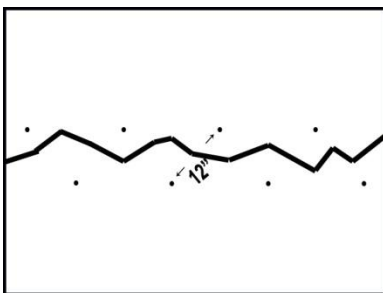
## THE TECHNIQUES

### Low Pressure Crack Hand Injection with HyperFlex

- For cracks at least 1/8" wide at its narrowest point with slow to moderate flow.
- If crack is uniform, such as a cold or barrel joint you can drill a 5/8" or 3/8" hole every 12 inches along one side of the joint. Offset the crack 4 to 6 inches and drill at a 45° angle to ensure interception of the crack.



- If crack is non-uniform it must be stitched



## Typical Application

Leaking foundations, poured concrete structures, manholes

## Required Equipment

- 3/8" Drill bit and Hammer Drill
  - 300ml tubes of HyperFlex
  - Garden sprayer with water
  - Burlap / oakum / backer rod
  - Goggles / gloves / old clothes
  - Wooden dowels – to plug your injection holes as you go
- In situations where water is actively flowing from crack, or if the crack is fairly wide (greater than ¼") it will be necessary to "chink" the crack with burlap, oakum rope or backer rod. This keeps the urethane in the crack and increases confinement, and in turn provides a tighter seal.

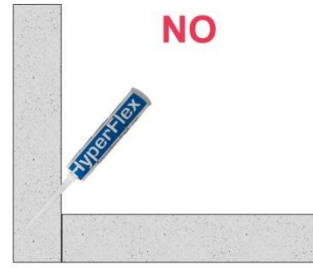
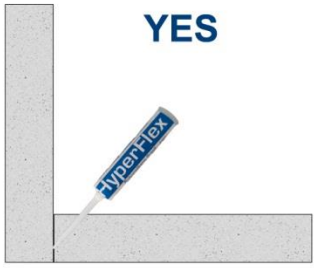
## Instructions:

1. Insert nozzle tip firmly into the hole, if the drill bit "walked" a bit and the fit is loose, you can wrap a piece of duct tape around the nozzle to tighten the fit.
2. Begin pumping HyperFlex at a steady moderate pace. Continue until refusal. If, when beginning to pump, the trigger is difficult to pull or grout is running freely out around the nozzle tip, stop. The crack is either too narrow to accept grout or the hole drilled did not intersect the crack. Drill another hole being careful to drill at a 45° angle.
3. Once the HyperFlex cures, the excess may be cut or scraped off. The crack may then be patched with hydraulic cement or epoxy.

## **SPECIAL NOTE ON INJECTING THE WALL / FLOOR JUNCTION IN A BASEMENT REPAIR**

- When injecting into a leak coming in the junction between the basement wall and the poured concrete floor, ALWAYS inject from the floor into the junction. This is due to the way the floor is poured. If you drill through the wall, you will not have a successful result.





As HyperFlex reacts and fills the void, foam is visible at the injection site.



In this photograph, HyperFlex is being used to fill a void found on the other side of this very old farmhouse wall.

## Low Pressure Injection using SealGuard II

- For situations where very high, fast water flows are leaking from a crack, defective pipe seal or hole.
- SealGuard II is very fast reacting so the water flow will not wash it out before reacting.

### Required Equipment

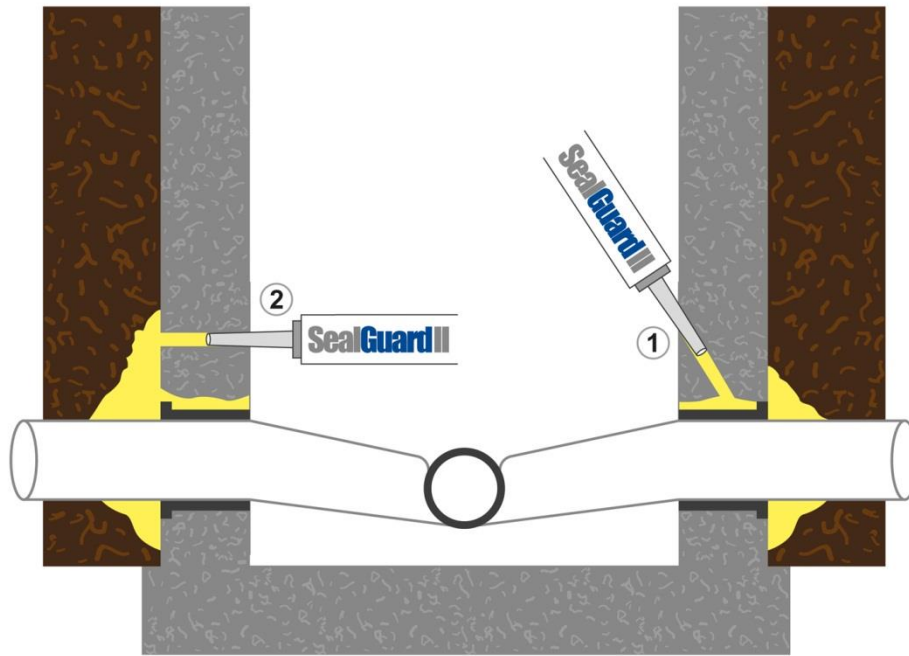
- Hammer Drill and 5/8 inch drill bit
- Dual Component Caulking Gun
- SealGuard II Tube Set with Static Mixer
- Burlap, Wedges, or Backer rod

Can be used on:

- Leaking or failed manhole boot seals.
- Leaking barrel joints or cold joints.
- Annular space around a pipe or a conduit
- Leaking roof bolts (mining)
- Failed mortar around pipes
- Missing brick

### Instructions:

1. Drill a 5/8" hole so that you intersect the leak path. This can be done one of two ways depending on the repair:
  - a. In underground structures such as manholes or vaults where the wall thickness is 12" or less, a hole can be drilled straight back, approximately 4" to 6" above the leak, breaching the structure.
  - b. Underground structures with walls thicker than 12" will require a 5/8" hole be drilled at an angle to intersect the leak path.



While this drawing is of a manole, it illustrates the principal of drilling through the substrate on the left, intersecting the leak path on the right.

#### IMPORTANT NOTE ABOUT DRILLING A HOLE TO INJECT SEALGUARD II

- If, once you have drilled your hole you do not get a return of water, it will probably be necessary to drill another. Usually when water is flowing at a high rate of speed it will flow back through a hole that intersects it.
- After the hole is drilled and return verified, it may be necessary to chink the leak with an appropriate material (see “Chinking” definition in Section 2). A rough rule of thumb is if the water is flying from the leak, chink, if it is merely flowing you should be fine without it, although it never hurts to do so.

#### 2. Prepare SealGuard II Tube for Injection:

- a. Remove nut from top of tube set and place over static mixer.
- b. Remove the tab on the top of the SealGuard II tube and connect it to the static mixer using the nut to tighten the assembly.
- c. Place tube set into the dual component caulking gun & jam static mixer snugly into your injection hole.

#### 3. Pump SealGuard II vigorously, stopping when either the hole will not accept any more or when you see a show of material at the face and the leak stops. DO NOT FORCE SEALGUARD II IT COULD RESULT IN BACKFLOW INTO THE CARTRIDGE SET OR A BROKEN GUN. **APPLICATION TIP:** It may help, when dealing with a fast inflow, to pause for a

second or two once you've pumped enough SealGuard II in to fill the static mixer. This will allow material to get closer to set up just prior to entering the water path, making it less likely to wash out of the crack.

4. If you still have SealGuard II remaining in the tube set, QUICKLY detach the nut and remove the tube set. The patented check valve in the mixer will keep material in the mixer from reacting back into the cartridges. Using another mixer, the remainder in the tubes could then be injected in another site. If not to be used immediately, replace the white tab on top of the cartridge set.



## High Pressure Crack Injection using HyperFlex, Packers and a Pump

- For narrow cracks 1/8 of an inch wide or smaller, where hand injection with a caulking tube is insufficient to force urethane into the leak path.
- Water flow may range from a single weep all the way to active water flow.

### Tools & Equipment Required

- Hammer Drill with 5/8" bit
- Electric Grout Pump, Grease Gun or other hand operated pump
- 5/8" Packers and ratchet set
- Garden Sprayer with water
- Burlap, Oakum or Backer rod, if needed
- Personal Protective Equipment
- HyperFlex 5 Gallon Pail or 300ml cartridge

### Instructions:

1. Drill a 5/8" hole every 12' or so, "stitching" the crack if irregular. You may or may not get a return of water. See drawing in Section 2, Drilling if needed.
2. Using the garden sprayer clean as much dust and debris from the injection hole and the crack itself. The cleaner the better.
3. Insert packer into the hole, tightening it so that the zerk end fitting is sticking up just above the surfact. Make sure the packer is tight.



This shows the correct way to set a packer for injection

4. "Chink", if necessary, however with with the finest cracks it may not be possible
5. Set up injection device according to instructions from Section 2.
6. Hook your injection device onto the packer zerk fitting. It will still be able to move once attached but will not pull off
7. Begin to pump HyperFlex into the packer. You will see water being forced from the face of the crack, then HyperFlex. STOP Pumping when you either see nothing but HyperFlex flowing from the face of the crack (no water) or if the packer will not accept any further urethane. If a packer does not accept any urethane at all, it may be necessary to re-drill, perhaps on the opposite side of the crack. As always, DO NOT FORCE urethane into a

packer that will not accept it. Pressure could build, forcing the packer out of the wall and showering you and everyone nearby with HyperFlex.

8. On occasion, the opposite will occur, where the packer keeps taking urethane but none is visible at the face of the crack. This usually means you have locked into a void, usually behind the substrate. Since it takes less pressure to flow to the void than back to the face of the crack you can pump for a long time. In this situation, let the packer take some HyperFlex then move to another packer and continue injecting. Go back to the previous packer later after HyperFlex has had a chance to work. As it fills the void, you should be able to force it into the crack. In general though, if the packer is accepting grout, that material is going somewhere
9. CLEAN UP – It is best to wait a few days if possible to clean up, your packers and injection points especially if there was a fair amount of HyperFlex pumped into the leak system. This is because it can “work” behind the wall for quite some time when injected with pressure. To repair the injection points loosen the packer and, using a punch of some sort and a hammer, knock the packer into the hole so the zerk fitting is below the surface of the substrate. You can patch the holes with your preferred patching medium and paint or seal as needed.
10. Excess urethane at the face of the crack can be scraped off as soon as it is fully cured, no need to wait as with the packer injection sites.

Preparing pump for injection



Packer is set in place



Injection wand attached to packer



Injection in process. Note how HyperFlex has migrated into the corner



## High Flow Leak through a hole or pipe using SealGuard II and a Balloon

- When large flows of water are rushing in at high velocity through a hole in concrete or a pipe / conduit and chinking is not an option for some reason

### Tools & Equipment:

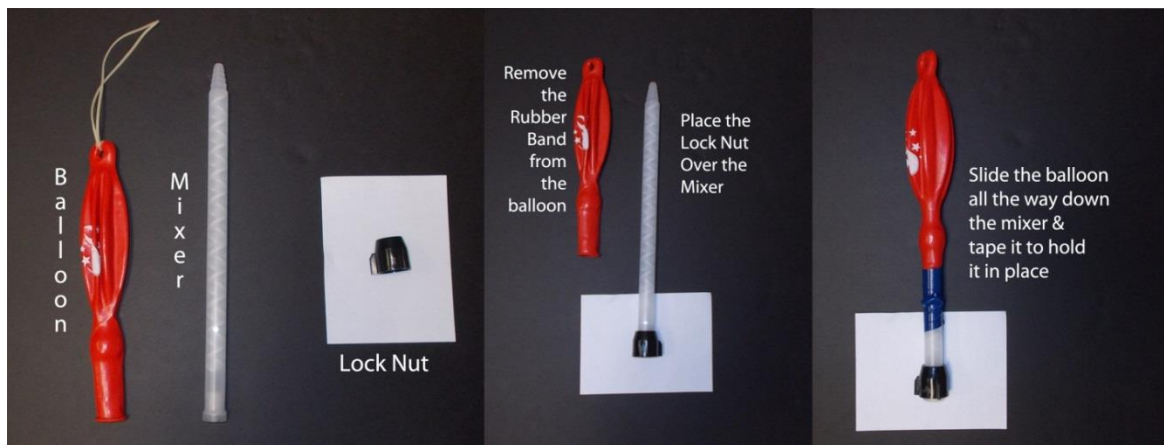
- SealGuard II tube set and mixer
- Party Balloon
- Duct Tape

### Use When:

- High water pressure is forcing water through a hole in the substrate or through a compromised pipe or conduit at a very high rate that would cause even SealGuard II to wash out.

### Instructions:

1. Detach nut from tube set and slide over mixer. Make sure to do this first, you won't be able to slide it over after the balloon is in place.
2. Slide the balloon over the mixer as shown and tape it in place.
3. Connect mixer / balloon assembly to the tube set.
4. Making sure balloon is not folded over, reinsert balloon into hole or pipe as far as you can.
5. Pump contents of tube set vigorously into the balloon.
6. The balloon will fill up and eventually pop, but not before allowing the SealGuard II to react to the point where it will not wash out. **Do not stand directly in front of application site just in case anything escapes, when the balloon pops.**



## Solving a Leak in a Corner Using SealGuard II or HyperFlex

- When there is a leak in the corner of a concrete structure

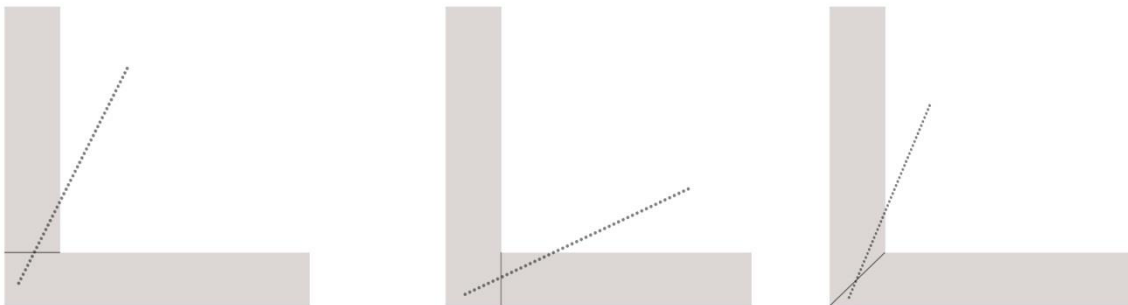
### Tools & Equipment:

- Normal injection equipment for the application

### Instructions:

1. Resist the urge to drill straight into the corner. That is because you have no way of knowing where the crack goes behind the wall.

TOP VIEW



2. Drill holes as shown in the above drawings. You will obviously have to re-drill if the crack or joint is on the opposite side. Remember, you will usually see a bit of water flow from your injection site if you have intersected the leak path.
3. Inject until refusal. Just like any other leak, it may move up or down the wall so it may be necessary to “chase” it and drill another hole.



Note where the injection point had to be to successfully shut off this corner leak.



## Using HyperFlex Underwater to Fix a Small, Drawing Crack

- Use this technique in swimming pools, ponds or any other situation where cracks are in the bottom or the side of a concrete water containment structure.
- This will only work on small (1/4" or smaller) cracks. A crack larger than this will most likely draw the material all the way through the substrate before it can react.

### Tools & Equipment:

- 300 ml tube of HyperFlex and a caulking gun
- Burlap, oakum or backer rod, if necessary
- Food coloring

### Instructions:

1. Tubes should be maintained at a temperature of 70° or higher for best results
2. Using food coloring, determine if a crack is drawing water and if so, the velocity. A non-drawing crack may be bypassed
3. Introduce HyperFlex into the crack through the face, allowing the water to draw the material. Adjust the rate of introduction to match the draw rate of the water into the crack. Apply liberally along the face until the crack stops accepting the material or the tube is empty. It is not necessary to insert the tip of the cartridge into the crack, simply placing the tip against the crack and releasing it slowly will be sufficient.
4. After grouting, a stopper in the form of backer rod, burlap, rags or similar should be forced into the crack using a screwdriver or putty knife. This will keep the HyperFlex in the crack as it reacts, minimizing any possible release into the tank.
5. In the event that there is a release of HyperFlex into the tank, simply use a net and capture the floating material (it will collect at the top of the chamber). HyperFlex is NSF 61-2007 approved for contact with potable water.

## Pipe or Conduit Sealing using SealGuard II

- Use when you need to seal a pipe or conduit

### Typical Applications:

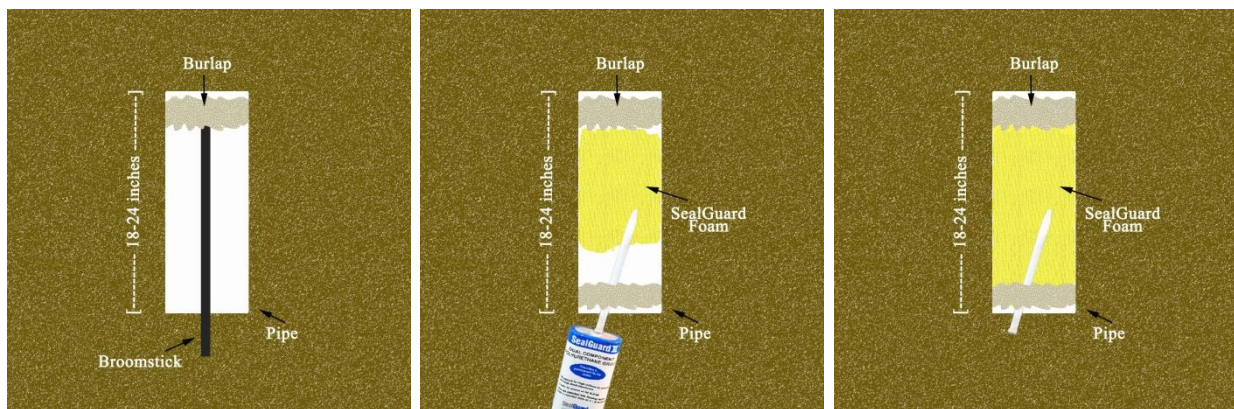
- Conduit transmitting water into a utility or other vault
- Abandoned pipe may need to be sealed

### Tools & Equipment:

- Burlap
- 18"-24" rod or broomstick to push plug into pipe opening
- SealGuard II tube set with mixer
- Dual component caulking gun

### Instructions:

1. Wad up some burlap, sufficient to form a tight plug inside the opening to be sealed
2. Using the rod or broomstick, jam the burlap into the pipe 18"-24", the fit should be snug
3. Wrap wadded burlap around the mixer so that it fits snugly just inside the pipe opening
4. Pump SealGuard II into the area between the plugs. It can get a bit messy if the burlap plug around the mixer isn't tighter.
5. AFTER CURE, Cut the mixer off and cap pipe end if desired



## Joining and Sealing Pre-Cast Concrete Sections using X-Seal

- Used during assembly of pre-cast concrete sections to provide a permanent, flexible and watertight seal

### Typical Applications:

- Assembly of manholes (including cast iron lids), vaults, box culverts, pips or any other pre-cast assembly that must be watertight

### Tools & Equipment:

- Spray bottle or Water filled garden sprayer
- 300 ml tube of X-Seal and caulk gun or 8 oz bottle of X-Seal
- Disposable paint brush

### Instructions:

1. Make sure surfaces to be joined are free from dust and loose debris
2. Using the garden sprayer, wet the surfaces to be joined. Surfaces only need to be wet not soaked. (NO STANDING WATER)
3. Liberally apply X-Seal to the surfaces to be joined. You can use a paint brush to make sure the surface is fully coated, particularly in a vertical application
4. Assemble pre-cast sections. A vacuum test can be performed after 2 hours



# Section 4

## TROUBLESHOOTING / FAQ's / TECHNICAL DATA

### FAQ'S:

#### Grout won't Pump:

**Q:** I have drilled the injection hole and am trying to inject grout, but it won't pump. What is wrong?

**A:** In just about every case, this result is caused by the injection hole not intersecting the leak path. Re-drill your hole at a shallower angle and try again.

**Q:** I have injected multiple tube sets of either SealGuard II or HyperFlex and the water won't stop. What is wrong?

**A:** This can be caused by one of two things: If you are not seeing any grout coming from the face of the crack, there is most likely a large **Void** behind the substrate caused by the washout of fine silts over time. If you continue pumping grout into the void, it will eventually fill up, the problem being that there is no way of telling if your void is the size of a basketball or of a basketball court. The permanent fix would be to excavate the area and fill the void with gravel and soil. However, short of that, you can either shorten the distance from the leak that you drill your hole, (if you are breaching the structure), or chink real well and intersect the leak path itself. (See drawing of alternative drilling paths in the section on "Drilling").

Alternatively, if you are injecting SealGuard II or HyperFlex and you are seeing the material coming out of the face, the culprit is "washout" when the flow of water is too great to allow the grout to react. When this occurs, chink the leak with burlap, rags or oakum rope. Use wooden wedges if needed to keep the chinking in place, and try again.

**Q:** Do SealGuard grouts conduct electricity?

**A:** No, they do not. SealGuard products will provide cathodic protection between metal substrates.

**Q:** Are SealGuard grouts fire resistant?

**A:** No, they will burn, but not until it reaches a temperature of 600°F. There are additives that improve flame retardance, which SealGuard can produce on an "as needed" basis.

**Q:** Does cold weather have any effect on polyurethane grouts?

**A:** Yes, temperature is probably the most important variable regarding the reaction time of any polyurethane. The colder the temperature, the longer the reaction and cure time. The use of HyperFlex, for instance, in very cold (less than 40°F) can result in an extended cure time measured in days, not hours.

**Q:** How do I use SealGuard Grouts in the cold?

**A:** Dual component products like SealGuard II will generally behave better than single component grouts like HyperFlex, however both will react much more slowly as the temperature falls to and below 40°-45°F. It is helpful to warm the tubes in a heated truck cab or some other warming device. This will help some, although the cold concrete and water will sap any warmth away quickly. If possible, a propane torch can be used to warm up the substrate for long enough to allow for a reaction in conjunction with the warmed tubes or pail. The best course of action would be to wait for the weather to warm up, but that isn't always possible.

**Q:** Sometimes it seems like SealGuard II gets set up in the mixer before I can inject the whole tube set, why?

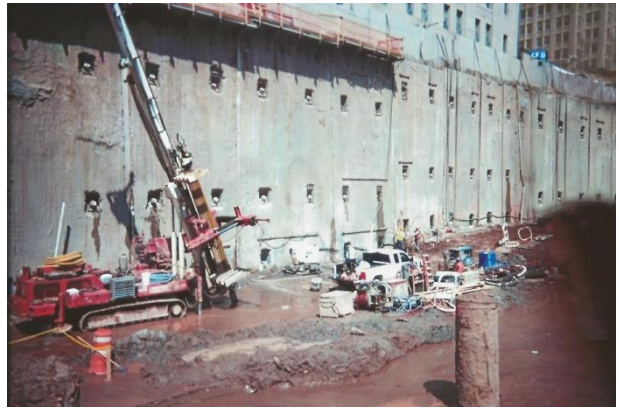
**A:** SealGuard II is very fast reacting, so if you start pumping and then stop for more than a second or two, the mixer can get clogged. In general, keep the material moving the entire time you are injecting.

**Q:** If all I want to do is fill a pipe or other void space, can I just pour HyperFlex in without injecting?

**A:** Yes, you can. Adding 1 part water to 4 parts HyperFlex will help to carry the grout throughout the space you are filling. Adding water like this is called a "Hot Shot".

**Q:** What if I feel like I've tried everything with no success?

**A: Call us!** Our toll free number is **866-625-4550**. We have had good luck getting our customers back on track.



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