



# Well Application Guidance For PetroFix™





## Table of Contents

# Well Application Guidance for PetroFix

---

### Introduction

- 3 Well Application Guidance for PetroFix

---

### Health & Safety Information

- 4 Storage and Handling Guidelines
- 4 Personal Protective Equipment Requirements for Safe Installation

---

### Typical Requirements

- 5 Features, Installation Equipment and Supplies Needed for PetroFix Application

---

### Application Process

- 6 Pre-Mixing of PetroFix
- 8 Injection Well Installation Tips
- 9 Injection Well Head Assembly Tips
- 9 Post Application Flushing

**Questions?**  
Get in touch with us.

Phone: 949-366-8000  
Email: [info@petrofix.com](mailto:info@petrofix.com)

Or visit <https://petrofix.com/apply>  
today to learn more.



## Introduction

# Well Application Guidance for PetroFix



**H&S Note:** Prior to use all personnel should review the specific SDSs to assure compliance and preparedness for any type of emergency that arises. OSHA (29 CFR 1910.1200)

**Rule-of-Thumb:** Recommended injection pressures should be maintained below 80 psi

PetroFix™ Remediation Fluid (PetroFix) is an environmentally-compatible formulation of micron-scale activated carbon (1-2 microns) that is combined with both slow and quick-release inorganic electron acceptors (Electron Acceptor Blend or EA Blend). This document presents instructions on how to mix and apply PetroFix directly into groundwater wells. Additional instructions about how to use PetroFix for direct push injection can be accessed at <https://petrofix.com/apply>. For guidance on application methods that are not described in either document, please contact REGENESIS directly at 949-366-8000 or send an inquiry to [info@petrofix.com](mailto:info@petrofix.com).

This document assumes that injection wells have injection screens positioned at the correct injection zone (not above the water table or deeper than the target treatment zone). Prior to application REGENESIS recommends that injection wells be developed using surge blocks and/or pumps, and that good conductivity into the aquifer is verified.

While it is common to have pre-existing injection wells that have 10- or 20-slot screen, ideal PetroFix injection well construction would have 30-slot screen with 8/16 or 6/9 sand pack. The maximum operating pressure of a 2-inch schedule 40 PVC well is 166 psi. It is our experience that most injections would require pressures well under this maximum operating pressure. However, it is possible that depending on the depth and type of soil in the target treatment zone (TTZ), higher injection pressures could be realized without initiating fracturing. If this is the case, it may be necessary to use a higher-rated well material such as schedule 80 PVC, which has a maximum operating pressure of 243 psi for a 2-inch well.

Pressures should be slowly increased to achieve desired volumetric flow rates while also staying below the failure pressure of the annular seal or injection fittings. As a general rule-of-thumb, we recommend that injection pressures be maintained below 80 psi and that one makes careful observations for potential product surfacing around the injection area. However, it is not uncommon for injection pressures of up to 130 psi to be reached. If PetroFix begins to fill the well piping and rise to the surface in the injection well, consider that it also will exert a pressure into the well screen and formation of roughly 1 psi for every 2.3 feet of standing PetroFix in a well above that water table. If surfacing occurs, decrease the injection pressure and consider less product dilution.

We also recommend that application under pressure always be used to inject and distribute PetroFix into the TTZ. Low-pressure or even gravity feed systems often don't produce the injection fluid velocities needed to achieve the desired radius of influence (ROI) during the application. We leave it to the applier to engineer and verify such systems.

## PetroFix Health & Safety Information Storage and Handling Guidelines

- ➔ Store away from incompatible materials and in original closed container
- ➔ Store at temperatures between 40°F and 95°F
- ➔ Do not allow material to freeze or store in direct sunlight
- ➔ Freezing and hot weather technical memo can be accessed [here](#)
- ➔ Dispose of waste and residues in accordance with local authority requirements

## LEVEL D

**Level D Protection** is primarily a work uniform and is used for nuisance contamination only. It requires only coveralls and safety shoes/boots. Other PPE is based upon the situation (types of gloves, etc.). It should not be worn on any site where respiratory or skin hazards exist.

Source: <https://chemm.nlm.nih.gov/ppe.htm>

**Note:** *This recommendation is only for PetroFix and does not supersede additional precautions due to site conditions and potential exposures.*

## Personal Protective Equipment (PPE) Requirements for Safe Installation

PetroFix is considered nonhazardous although it is recommended that personnel working with or in areas where there is a potential for contact with PetroFix should be required at a minimum to be fitted with Level D personal protective equipment. However, this recommendation is only for PetroFix and does not supersede additional precautions due to site conditions and potential exposures. PPE should be upgraded from modified Level D based on site-specific hazards and requirements.

## Typical Requirements

# Features, Installation Equipment and Supplies Needed for PetroFix Application

- ➔ Secure storage area
- ➔ Properly pre-installed injection wells. We recommend the head of the well be outfitted with a Male National Pipe Thread Adaptor (more detail on the “Injection Well Head Assembly Tips” section)
- ➔ Qualified applicator
- ➔ Water source for mixing
- ➔ Access to electricity
- ➔ Appropriate Personal Protective Equipment (PPE)
- ➔ PetroFix SDS
- ➔ Mixing tanks – size based on product quantity to be applied per injection point
- ➔ Drum mixer for homogenizing PetroFix in its 55-gallon drums (examples given later in this document)
- ➔ Injection pump rated to at least 200 psi and at least 5 gpm
- ➔ Injection hosing and pressure relief valve with a bypass (make sure all equipment is rated for expected injection pressures required)
- ➔ Hosing between mixing tank/drum and pump
- ➔ Pressure gauges to monitor injection pressure
- ➔ Flow meter for tracking injection volumes (or use visual drops in tank volumes over time)
- ➔ Pressure regulator between pump and transfer line to prevent pressure spikes (recommended, but not mandatory)
- ➔ Well head injection assembly to allow generation of pressure and injection of PetroFix into the well. This assembly should essentially be fitted with an inlet, pressure gauge, and outlet with valve.

The following text provides general guidance for how to apply PetroFix into dedicated injection wells. This document should not be considered an exhaustive review of all potential PetroFix application techniques and only provides a brief discussion on procedures recommended by REGENESIS.

## Application Process

### Pre-Mixing of PetroFix

**Shipping Information:** PetroFix fluid is shipped in 55-gal. polyethylene drums and the EA Blend is shipped in 20-lb plastic pails and the EA version is shipped in 20-lb plastic pails.

**Note:** Always add water to mixing tank prior to adding PetroFix Remediation Fluid

PetroFix fluid is shipped in 55-gallon polyethylene drums and the EA Blend is shipped in 20-lb plastic pails. There is approximately 41 gallons of fluid in each drum and PetroFix is filled to roughly 12 to 14 inches below the top of the drum. PetroFix fluid can be transferred from its drum into a mix tank using either a diaphragm pump or a drum pump.

In most instances PetroFix will need to be diluted in a larger volume mixing tank and then pumped from that mixing tank to the injection pump. Both PetroFix and the supplied electron acceptor should be diluted in the mixing tank and not in the drum the material was shipped in. Always add water to mixing tank prior to adding PetroFix Remediation Fluid.

- ➔ Assemble product transfer system to move the PetroFix from the drums to the mix tank. A diaphragm or drum pump can be used to pump PetroFix from a drum to a mix tank. Recommended batch sizes should range from 50 to 350 gallons to aid in easy mixing and for measuring injection volumes per well.



The image shows an example PetroFix transfer and mixing setup where a 330-gallon tote was chosen as the mix tank



The image shows the homogenization of PetroFix using a high torque/high rpm mixer with appropriate mixing paddle.

- ➔ Always pre-mix PetroFix in its drum prior to transferring material out of the drum.
  - ➔ PetroFix is easy to mix with a proper power drill/mixer and a mixing blade combination. In cold weather or prolonged storage times PetroFix may settle a few inches at the bottom of the 55-gallon poly drum. Any such settling can be resuspended in the field with little time and the right equipment. A recommended mixing combination for all circumstances would be a high torque, double handle mixer such as a QEP or Rigid thinset grout and mortar power mixer with QEP 30" pro spiral mixing paddle, or equivalent (available at Home Depot). Other high torque mixers and paddle combinations can be used if they can create a vortex in the drum.
  - ➔ If the PetroFix is difficult to pump after mixing with our recommended mixer you may need to thin the material. We recommend you add 3 to 5 gallons of water to the drum and blend that into the material. This will reduce the viscosity to allow for proper homogenization and transfer to dilution tanks.
  - ➔ Transfer appropriate volume of PetroFix remediation fluid to the water in the mix tank.
  - ➔ Thoroughly mix PetroFix solution in the mixing tank using an impeller type drum mixer or by recirculating the product inside the tank.
  - ➔ Add recommended ratio of PetroFix Electron Acceptor Blend to the mixed solution in the tank. One tip is to use a scale to measure mass of electron acceptor blend needed for partial mix batches. Standard dosing is one bucket of electron acceptor blend per one drum of PetroFix.
- CAUTION:** DO NOT mix PetroFix Electron Acceptor (EA) blend from the 20 lb buckets into undiluted PetroFix Remediation Fluid in the drums or totes. Only add the PetroFix EA blend into the diluted PetroFix solution in the mix tank.
- ➔ As the drum is emptied into the mixing tank, flush out the drum with water to fully use all material. Flush water can be used as mix water.
  - ➔ Connect transfer tubing from the mix tank to pump and then from the pump to injection head assembly of the injection well. Turn on the pumps and slowly ramp pressure until desired volumetric flow rates are achieved and continue pumping until desired volume is achieved.

# Injection Well Installation Tips

The figure below shows an example PetroFix injection well design. The goal of a properly constructed schedule 40 PVC injection well is to handle at least 130 psi without pressure failure to the Target Treatment Zone (TTZ), although most injection pressures will be below 80 psi. We leave it to the customer to verify that the wells are placed and constructed appropriately, including developing the wells and confirming they will effectively deliver PetroFix remedial fluid. This is particularly true for bedrock sites where interconnected fracture porosity can be highly variable. We recommend if there is any concern about the viability of using injection wells that a pilot test be conducted with 1 or 2 drums of PetroFix injected into 1 or 2 pilot test wells to verify their hydraulic efficiency. Consult with your internal resources to verify that appropriate well screen, seal type and thicknesses are used for your TTZ. For more details please refer to the chapter on injection well design in "Remediation Hydraulics" by Payne et al., 2008, Chapter 10.

Finish top of injection well to allow for desired injection assembly fitting. A 2" male NPT fitting will allow for an inlet, pressure gauge, and outlet using common parts.

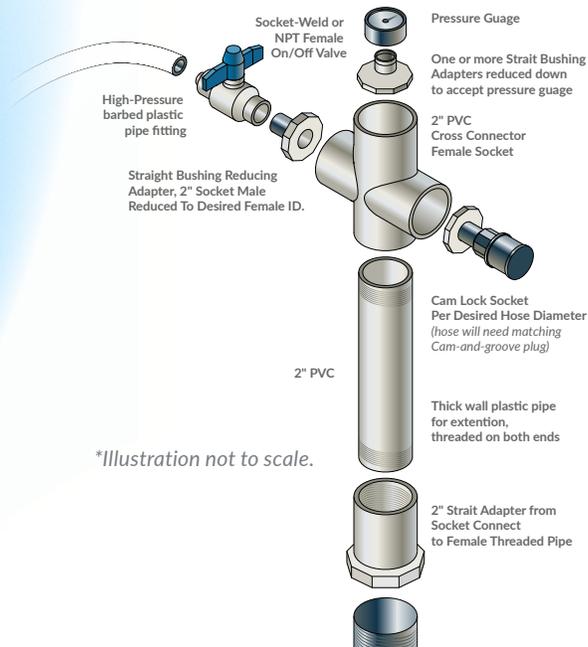
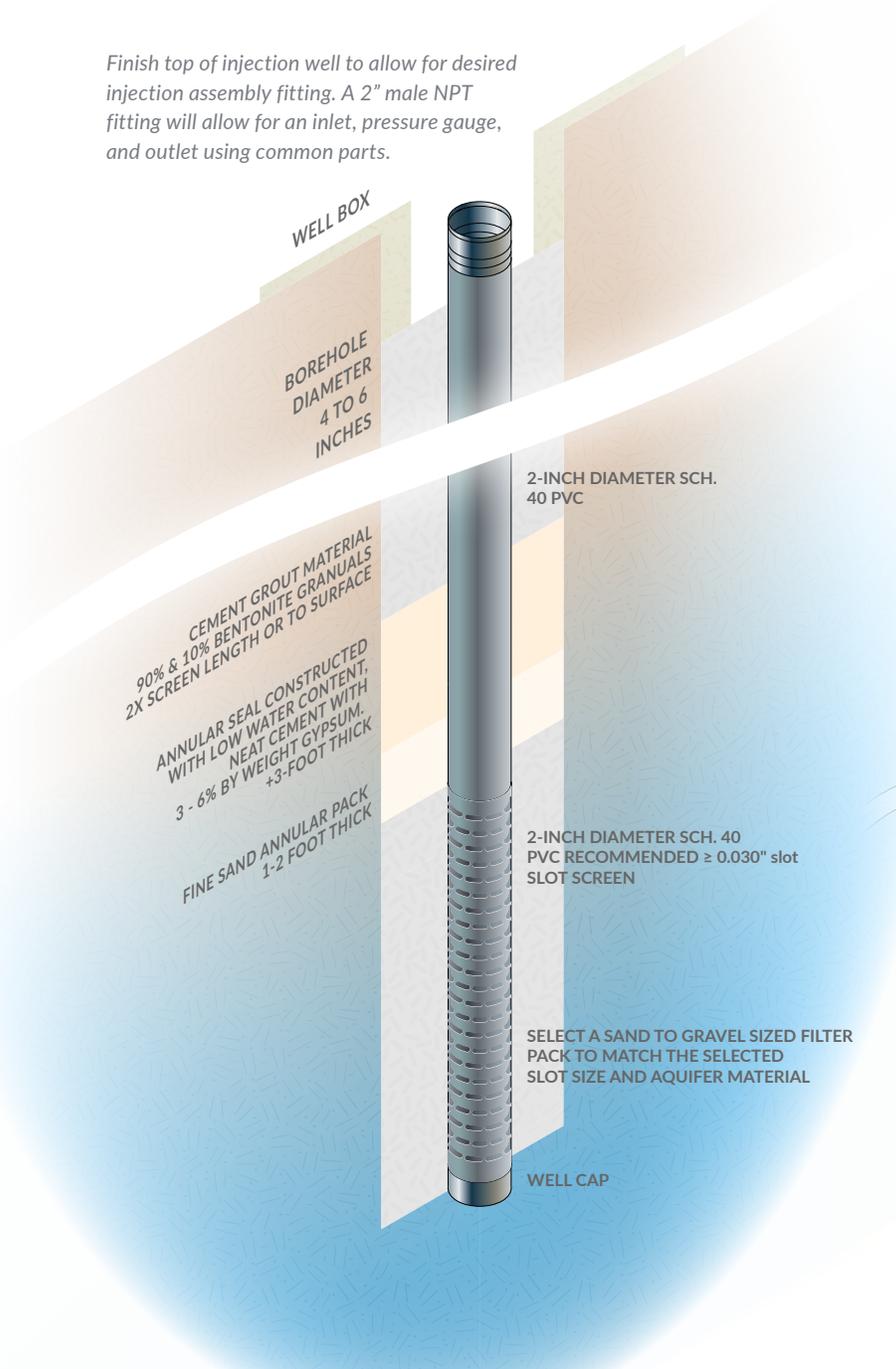
The length and depth of the screen should be appropriately set across the target interval. Top of the injection screen and engineered sand/gravel filter pack above that should be below groundwater to prevent preferential flow above the TTZ.

Consider nested screens for any screen lengths exceeding 15 vertical feet to ensure discrete product delivery.

Use a tremie pipe to replace the annular seal.

Increased injection hydraulic performance can be obtained by using either PVC or SS v-wire-wrapped screens instead of PVC slotted screens as budget allows. For example, 30 slot PVC V-wire screens can improve screen transmitting capacity by up to 2.4x over PVC slotted screens.

\*Although constructing the annular seal with neat cement and gypsum is preferred, the annular seal can be constructed if needed with 95% cement grout and 5% bentonite.



\*Illustration not to scale.



*An example male national pipe thread adaptor used to mount the well head injection system onto the well.*



*A recommended well head injection fitting system that has an inlet, pressure gauge, and outlet.*



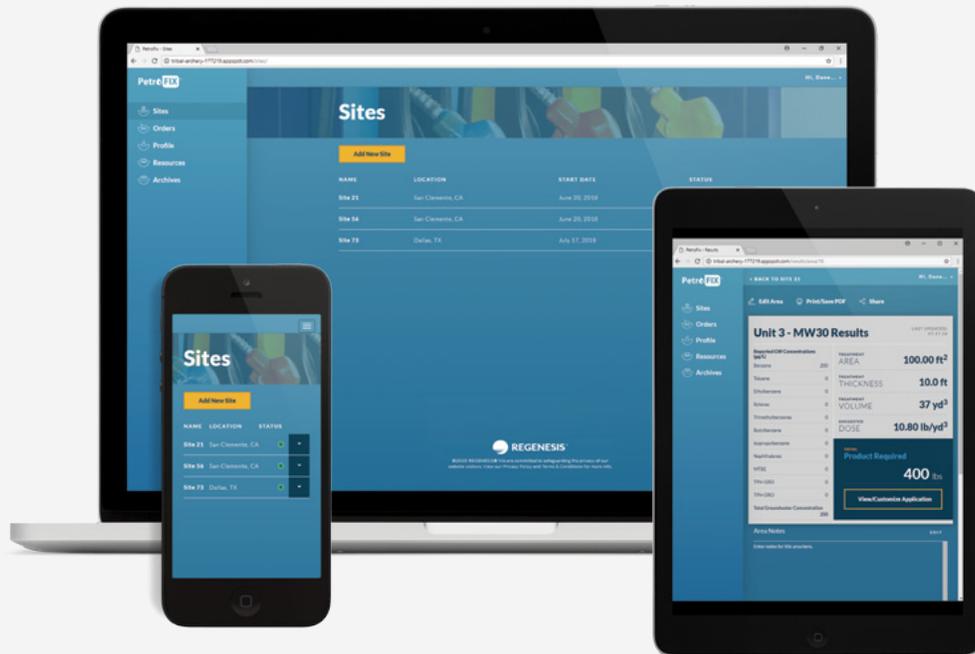
*Example of an injection head assembly mounted to an above ground well.*

## Injection Well Head Assembly Tips

While there are numerous methods to inject PetroFix using an injection well, we recommend a well head injection assembly composed of an inlet, pressure gauge, and outlet (see photo below as an example). The outlet has a valve and is used to depressurize material as needed (we recommend you have a bucket on hand to capture any PetroFix that may backflow due to pressure). To attach the well head assembly on top of the well we recommend that a male national pipe thread (NPT) adapter be attached to the top of the well with the bottom of the well head injection assembly fitted with a corresponding female NPT fitting so that it can be screwed onto the well head. For the NPT fitting on the injection well we recommend that it be glue fitted with at least 1" of joint overlap. Using NPT thread fitting is the safest way to connect when pressuring a well. While there are other options that can be used such as use of Fernco coupling and expansion plugs with bypasses, we find that the method described above is our recommended approach.

## Post Application Flushing

PetroFix particles are small enough to move freely into and out of the filter pack with the natural flow of groundwater. PetroFix can be easily flushed from monitoring wells or injection wells post-injection if so desired. Please see the technical bulletin on well flushing and the available well flushing calculator at <https://petrofix.com/resources/>.



**Simple**  
Easy to Use



**Flexible**  
Designs Tailored  
to Your Site



**Fast**  
No Waiting  
for a Design

**Phone: (949) 366-8000**  
**www.PetroFix.com**

[www.REGENESIS.com](http://www.REGENESIS.com)

©2020 All rights reserved. PetroFix is a trademark and REGENESIS is a registered trademark of REGENESIS Bioremediation Products. All other trademarks are the property of their respective owners.



**REGENESIS®**

