



STEP-BY-STEP APPLICATION GUIDE BINDTEK LIQUID



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INTRODUCTION: To Bindtek Liquid

What Bindtek Liquid Is

Bindtek Liquid is an enzyme-based soil stabilizer. It transforms the native soil on your site into a hard, concrete-like surface that lasts ~10 years. This introduction covers why people choose it, where it is used, and how it works.

Why People Use Bindtek Liquid

A single treatment stabilizes soil for ~10 years with little to no maintenance, which saves time and money. Some customers have cut road construction costs by as much as 80% compared with conventional methods.

It sharply reduces potholes, washboarding, ruts, mud, erosion and dust. It is also 100% organic, non-toxic and non-hazardous, so it is safe for people and the environment.

Bindtek Liquid Uses

Bindtek Liquid addresses difficult soil problems on unpaved roads and on the subbase of paved roads. It also stabilizes soil on many other kinds of projects:

- Parking lots
- Storage pads
- Oil and gas pads
- Utility pipelines
- Ponds and lakes
- Embankments
- Driveways
- Walking trails



PRO TIP

Bindtek Liquid is made for areas that see vehicle or foot traffic. It is not recommended for use in building foundations.



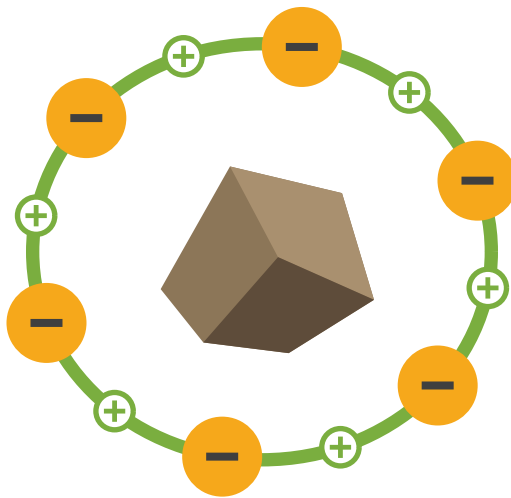
How Bindtek Liquid Works

The enzymes bond clay particles to one another through a cationic chemical reaction. Here is the science behind it.

Clay particles carry a negative charge, and negatively charged particles repel one another. Clay may feel clumpy and sticky, but there are microscopic gaps between its particles. Air and water get into those gaps, which leads to erosion, dust and other problems.

The enzymes carry a positive charge. They are drawn to the clay particles and pull them tightly together, forming a hard, concrete-like surface. The enzyme bond is permanent. The treated area keeps getting stronger for six weeks after application while the enzymes lock into the soil, for lasting results.

With that background on what Bindtek Liquid is and does, you are ready to learn the application process.



What's Next

The rest of this guide walks through the 10 steps for building roads and other projects with Bindtek Liquid. Let's begin.

STEP 1: Evaluate Your Soil

Soil everywhere is a different mix of clay, silt, sand and rock, and each type reacts differently to each stabilizer. You need to determine how your soil will work with Bindtek Liquid.

Soil Requirements for Bindtek Liquid

Ideally your soil contains 15% to 80% cohesive fines, which are better known as clay. With too little clay, the enzymes have nothing to react with. With too much clay, the soil may lack shear strength because there are not enough large particles to give it structure.

Bindtek Liquid performs best on soil with a mix of particle sizes, which gives both strength and enough material to bond.

Addressing Incompatible Soil

If your soil has too much sand, gravel or silt, Bindtek Liquid cannot react chemically with it. You can still use it successfully by making a few simple soil amendments, such as adding lime, decomposed granite or aggregate. Bringing in that material to use alongside Bindtek Liquid is often still cheaper than traditional soil stabilization.

STEP 2: Calculate How Much Bindtek Liquid You Will Need

You need one gallon of Bindtek Liquid for every 160 cubic yards of soil. That works out to five gallons per acre, or 15 gallons per mile of two-lane road or 20-25 gallons for heavy industrial traffic.



Start with 1/3 mile of road for your first application. That gives you time to learn the process and see the results before you treat a larger area.

STEP 3: Purchase Bindtek Liquid

When you are ready to buy, contact the sales team or listed distributor in your area. These soil stabilization specialists walk through your project with you, answer your questions and help you and your crew prepare for a successful application.

STEP 4: Plan and Prepare for Your Project

Good planning is the key to success. Before you apply Bindtek Liquid, think through design parameters, equipment, water, timing, weather and traffic management. Each one is covered below.

Set Design Parameters

Design parameters define how you will shape the road, parking area or other project you plan to treat. The three most important are depth, drainage and grade.

Depth

For areas that mostly see passenger vehicles, treat the soil to a depth of six inches. For areas with constant heavy vehicle traffic, such as mines and quarries, treat it 12 inches deep (through 2 lifts of 6" each) to build a stronger base that holds up to heavy loads over time.

Drainage

Once cured, the surface is almost completely impermeable to water. Plan drainage as though the area were paved, even if it is dirt or gravel. You can:

- Build the road up higher than the shoulder.
- Add ditches on both sides when possible.
- Make turns higher on the outside and lower on the inside.
- Add a crown of about half a degree per foot of road width per lane (for example, a 24-foot-wide, two-lane road needs a six-degree crown along the centerline).

Grade

Steep grades force construction equipment to run slower, and they are more prone to washboarding because traffic travels downhill and stops quickly. To avoid surface problems, fully compact the treated soil on steep grades.

Acquire the Right Equipment

To apply Bindtek Liquid you will need:



Water Truck

Water Trucks (4,000 Gallons Each)



Grader

Grader With Ripper Attachment and 12-Foot Blade
(Cat 140 or Equivalent)



Sheepsfoot Compactor



Smooth Wheel Compactor



Reclaimer (Optional)



Do not use a potable water truck. Bindtek Liquid is made from food-grade materials, but they are not digestive enzymes. They can cause stomach cramps and diarrhea if ingested.

Equipment Substitutions

If you cannot get heavy equipment, you can still apply Bindtek Liquid with these substitutions:

Grader	→ tractor with a tiller and grader attachment
Water truck	→ water buffalo, feed truck or sprayer
Padfoot compactor	→ filled water truck or front-end loader

There is no good substitute for a smooth wheel roller. Most heavy vehicles have aggressive tire tread that leaves a rough surface, and smaller vehicles may not weigh enough to reach maximum compaction. Consider renting or hiring a smooth wheel roller for the day. The upfront cost is well worth the long-term savings from stabilizing soil for years rather than weeks at a time.

Find a Water Source

Water is the key to a hard, concrete-like surface. It lets Bindtek Liquid move through the soil and helps with proper compaction.

Your environment, your soil and the distance to your water source determine how many water trucks you need. One truck may be enough if you are working very close to the source, but you may need up to three in a dry climate with a faraway source. Choose a water source as near to the jobsite as you can, to hold down costs and reduce the chance of the soil drying out during application.

Set Aside Time for Application and Curing

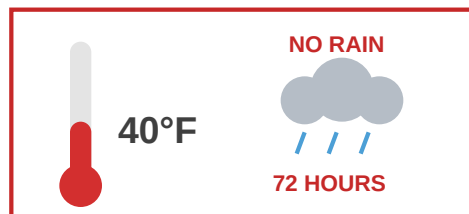
You can apply Bindtek Liquid in one day, although some customers prefer to take two. Both options are covered in Step 5: Begin Construction.

After application, Bindtek Liquid needs 72 hours to cure before you can allow normal traffic or apply a topcoat to the treated area. Step 8: Allow Time to Cure covers this in more detail.

Check the Weather

Bindtek Liquid has two weather requirements:

- Temperatures between 40°F and 115°F during application and curing
- No rain for 72 hours before and after application



Extreme heat can destroy the enzymes, while cold weather slows their chemical reactions and may keep the soil from fully curing. Your application should still succeed if overnight temperatures drop into the high

30s, because the ground will likely stay warmer.

Heavy rain before application leaves the soil too wet to compact properly. Rain within 72 hours after application can compromise the surface before it has fully cured. If that happens, simply wait for the soil to dry, add a little Bindtek Liquid diluted with water, and recompact it.

Create a Traffic Management Plan

Traffic management is crucial for governments and heavy industries, because heavy or speeding traffic during the 72-hour curing period can cause ruts and washboarding.

Ideally, close the road completely for 24 hours after application, then allow only light traffic for the next 48 hours before fully reopening to all traffic.

Because closing a road is not always possible, you can also:

- Limit traffic to light vehicles such as cars and pickup trucks for 72 hours
- Plan and clearly mark detours for heavy vehicles
- Set a temporary lower speed limit
- Notify local residents and businesses about the application ahead of time, including any changes to traffic patterns or speed limits



If traffic disturbs the soil surface during the curing process, simply spray it with a little water and Bindtek Liquid and rework it.

STEP 5: Begin Construction

You have two options for starting construction. You can finish the full application in one day, or you can do the prep work on one day to speed up construction the next. Either way, you begin by ripping up and presoaking the soil.

Rip Up the Soil

Using the motor grader's ripper attachment, rip the soil to a depth of four to six inches for light traffic, or nine to 12 inches for heavy traffic. Break up any large clumps.

Presoak the Soil

Water is essential for full compaction, which Bindtek Liquid needs in order to work. Presoaking helps you reach optimum moisture during application.

Determine Optimum Moisture

Optimum moisture is when the soil is wet enough to stick to itself and compact easily, but not so wet that it turns muddy or cannot hold its shape. At optimum moisture you can compact the soil so its particles are pressed together and the enzymes can bond them into a long-lasting, concrete-like surface.

How much water it takes to reach optimum moisture depends on your environment, soil and climate. Consider two examples:

	Bob's Project	Steve's Project
Location	Mohave Desert	Michigan
Season	Summer	Fall
Distance to Water	40 minutes	5 minutes
Number of Water Trucks	3	1

How to Check for Optimum Moisture

You can hire a geotechnical firm to determine your soil's exact optimum moisture content. Or you can use a hand test: pick up a handful of soil and try to roll it into a ball.



TOO DRY:

The soil crumbles and will not form a shape.



TOO WET:

The soil is muddy; water oozes out when you squeeze it. It will not hold a shape.



OPTIMUM MOISTURE:

The soil looks and feels like modeling clay. You can easily shape it into a ball, and it holds that shape without crumbling or oozing.



PRO TIP

When completing construction in one day, water the soil to only about 80% of its optimum moisture content. That keeps the soil from becoming oversaturated when you apply Bindtek Liquid.

Presoaking Soil Overnight

When construction takes two days, presoak the soil to 100% of optimum moisture on day one. Then use the motor grader to rake the soil into windrows, which keep it from drying out overnight.

In the morning, spread the soil evenly over the area you want to treat. Then you are ready for the next step.



PRO TIP

Presoaking the day before is especially helpful for applications in hot, dry climates or with a faraway water source. It makes up for the soil's natural lack of moisture and speeds up construction on day two.

STEP 6: Apply Bindtek Liquid

Prepare Your Water Truck

Fill the truck with water first, then add Bindtek Liquid. It has a strong tendency to foam, so adding the water first is necessary to prevent a mess.

Personal protective equipment (PPE) is encouraged when pouring Bindtek Liquid, including safety glasses in case of splashes. If it gets on your skin, wash it off. Watch for spills, because Bindtek Liquid can be slippery.



For more safety tips, refer to the Bindtek Liquid Safety Data Sheet.

The Dilution Rate for Bindtek Liquid

There is no set dilution rate. The amount of Bindtek Liquid you need is fixed at one gallon per 160 cubic yards of soil, but the amount of water you need varies, so your dilution rate does too. Generally, soil in humid climates needs less water to reach optimum moisture, which gives a lower dilution rate. Soil in dry climates needs more water to reach optimum moisture, which gives a higher dilution rate.



Do not worry about the dilution rate. Use the recommended amount of Bindtek Liquid and as much water as you need to reach optimum moisture.

Spray Bindtek Liquid onto the Soil

Spray the soil surface evenly. If the area is too wide, make a second pass or stagger two water trucks so together they cover the full width.

Mix Bindtek Liquid into the Soil

Using the 12-foot grader blade, work the soil back and forth to spread the Bindtek Liquid evenly throughout it.

Clean Up

Bindtek Liquid will not gunk up your water trucks, but it is wise to rinse them out so you do not accidentally spray it somewhere else.

STEP 7: Compact the Soil

Compaction is the most important part of the application process. It presses the soil particles closer together, so they cure faster and become stronger. Compaction takes time, and there is no substitute for it. Here is how to do it well.

Use the Soil Compactors

Start with the sheepsfoot compactor with its vibratory function on. The large knobs on the drum compact aggressively and work the soil particles close together.

Then use the smooth wheel compactor with its high-frequency vibratory setting on. For your last few passes, turn the vibratory setting off to help produce a smooth driving surface.



Successful compaction depends on running the compactor at medium speed (not too fast or too slow), keeping good contact pressure with the ground, and making as many passes as the job takes. Be patient and take your time.

Compacting Problem Areas

As you compact, pay special attention to areas where traffic changes speed, such as steep grades, driveway entrances and tight turns. These areas are prone to washboarding, ruts and other problems because tires create friction on the road as vehicles speed up or slow down. Larger vehicles such as haul trucks and farm implements do even more damage than passenger vehicles.



For heavy-traffic areas where you have treated the soil to a depth of 12 inches, compact in six-inch lifts for thorough compaction and a stronger road.

Compactor Substitutions: Wheelpacking

Without a sheepsfoot compactor, you can drive a full water truck or front-end loader slowly and repeatedly over the soil to compact it. This technique is called wheelpacking.

Wheelpacking takes longer than using compacting equipment. Your finished surface may also be rougher, especially if you do not have a smooth wheel roller. If the soil is no longer at optimum moisture, you will need to adjust it.

Keep Your Soil at Optimum Moisture Content



As you compact, the soil starts to dry out, especially on hot, dry days. Check it frequently to make sure it is still at optimum moisture.

The soil must stay at optimum moisture throughout construction in order to compact properly. For a quick refresher on optimum moisture, see Step 5: Begin Construction.

Dry Soil

Overly dry soil starts to crumble and fall apart. Fill a water truck with plain water and wet the soil. (You do not need to add more Bindtek Liquid, only water.)

Wet Soil

Overly wet soil may delay construction, but it is typically not a major cause for concern. Many people accidentally over-water their soil. This will not ruin the application, but you will have to let the soil dry somewhat before you can compact it. Dry it faster by raking it back and forth with the motor grader to expose it to the air so the excess moisture can evaporate.

How to Know Compaction Is Complete

Generally, compaction is complete when small rocks on the soil surface begin to break under the compactor drum instead of sinking into the soil. Soil in that condition is well compacted and should hold up to its job.



A geotechnical firm can test your soil before you apply Bindtek Liquid and tell you its maximum dry density and percent compaction, so you know exactly how much to compact it.

STEP 8: Allow Time to Cure

Curing is the process by which the enzymes in Bindtek Liquid chemically react with the clay particles in the soil, permanently bonding them together into a hard, concrete-like surface.

Allow 72 Hours for Curing

Most of the curing happens in the first 72 hours after application. During that time the treated soil reaches 60% hardness and develops its concrete-like surface.

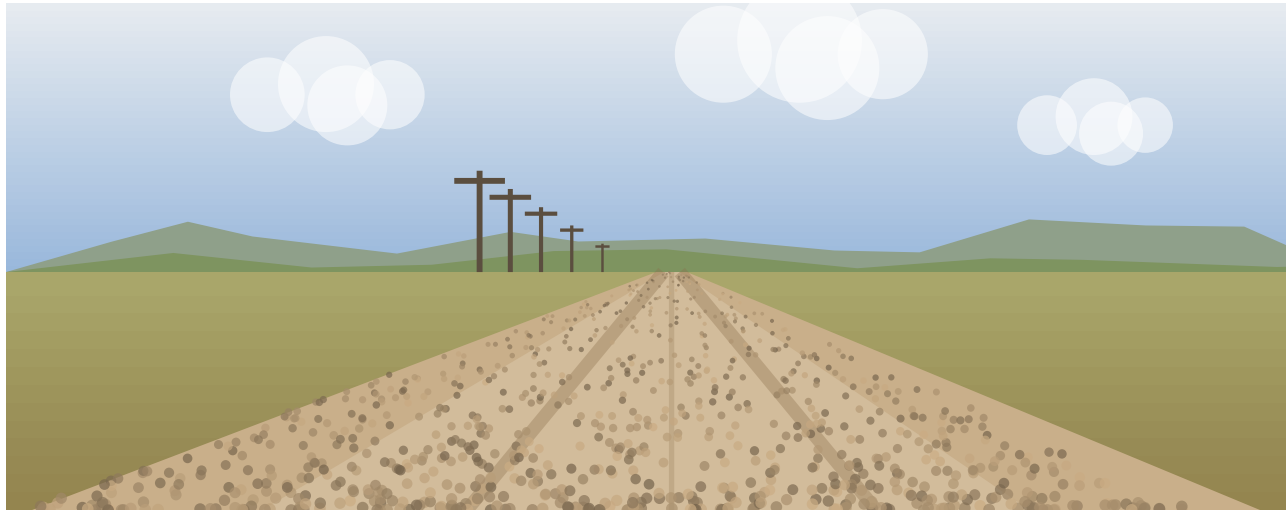
If possible, close the road during curing. If you cannot, minimize traffic and slow it down as much as you can for 72 hours. After that, you can reopen the road to normal traffic at normal speeds.



For ways to minimize traffic on treated areas, see Step 4: Plan and Prepare for Your Project.

PRO TIP

Bindtek Liquid keeps strengthening the soil over the next four to six weeks, unlike traditional stabilizers, which are strongest right after application. The longer the treated soil cures, the stronger it becomes.



STEP 9: Apply a Topcoat (Optional)

Many customers treat unpaved roads with Bindtek Liquid and then add an aggregate topcoat. Others use it to build strong, durable subbases for paved roads. Both options are covered below.

Aggregate Topcoats for Unpaved Roads

For traction on an unpaved road, you can add one to two inches of gravel. Then mix a “sweet shot” of one part Bindtek Liquid to 1,000 parts water and spray it evenly over the surface to lock in the gravel.



Most customers who add an aggregate topcoat do so after curing is complete, but you can also add it near the end of the compaction process to embed the aggregate into the soil.

Asphalt and Chipseal Topcoats for Paved Roads

Treating your subbase with Bindtek Liquid is the ideal substitute for traditional subbase construction on rural roads. You save time and money because Bindtek Liquid turns native soil into a strong subbase, eliminating the need to export or import material.

Geotechnical tests also found that soil treated with Bindtek Liquid is stronger than Type II aggregate subbase. Bindtek Liquid is nearly as strong as steel, so you can build a subbase as little as six inches deep, saving up to 80% compared with traditional construction methods and greatly shortening your project timeline.

How to Apply an Asphalt or Chipseal Topcoat



Wait until the 72-hour curing period is over before you apply a topcoat, so the cured subbase is strong enough to support the pavement.

Start by wetting the soil with a highly diluted mix of one part Bindtek Liquid to 10,000 parts water. (That is a Coke-can-sized amount of Bindtek Liquid in a 2,500-gallon water truck.) This mixture helps the pavement bond to the subbase for a long-lasting, stable road. Spray it evenly across the road, then let it dry a little. Once it loses its sheen, you are ready to apply the asphalt or chipseal following the usual application procedures for the materials you are using.

STEP 10: Enjoy Your New Road

Applying Bindtek Liquid is an easy, one-time process with lasting results. Unpaved roads treated with it can last ~10 years with little to no maintenance, and paved roads can last more than 20 years. The enzyme formula is 100% natural, organic and non-toxic, with no negative environmental impact.

