

CONTENTS:

Fast Work Saves a Dike...and a River

pg 2

Rembco® Waits for No Ready Mix Truck

pg 3

Sinkholes 101

pg 4

The Sinkhole that Swallowed a Forklift

How Rembco filled a void and saved a department store

The anchor store for Bessemer, Alabama's newest shopping center was already under roof. As construction continued, the reach forklift operator stopped for a quick break. When he returned, a crowd was gathered around his forklift which now sat upside down at the bottom of a thirty foot opening in the concrete floor.

Sinkholes - they have the annoying habit of showing up at the least opportune moment. This one, at least according to the forklift operator, had excellent timing, but still caused an immediate halt to construction. It was even possible that the entire project would have to be scuttled. That's when Rembco got the call.

The solution is the problem

Sinkholes can be caused by several different processes, but sinkholes caused by solutioning of the bedrock are very common in the Karst topography that is found in Bessemer and much of the East/Southeast. That's because carbonate bedrock such as limestone or dolomite is widespread throughout the Karst region, and carbonate rock dissolves relatively quickly when exposed to ground water.

"This sinkhole was caused by solutioning of bedrock, eventually producing a hole," says Rembco owner, Clay Griffin. "Once a hole forms in the bedrock, ground water has a drain to move through. As it moves, it carries soil along with it. Over time, more and more soil is carried away and an underground void forms. The void grows until its domed ceiling eventually collapses and that is when a surface depression appears - sometimes dramatically."

"Additional subsurface investigation revealed karst activity under other portions of the building," says Griffin. "It turns out this department store had significant problems...well beyond the original dropout."

The Plan

The plan for a typical deep sinkhole repair is to drill a pattern of holes down to the bedrock and 'cap' the solution feature by pumping in a thick, mortar-like

grout. After capping the defect in the bedrock, the Rembco team fills any voids in the subsurface and restores bearing capacity to the affected area with compaction grouting. (See animations of a typical sinkhole repair - [click here](#))

"But this was no ordinary sinkhole" says Griffin, "This was a monster sinkhole that eventually required 75 injections to depths of 110 feet." To create a solid foundation, 50 more injections were placed in other locations throughout the building. In all, 7,000 lineal feet of grout casing was advanced to bedrock, and a total of 2,700 cubic yards of grout was injected.

To meet an aggressive project schedule, drilling and grouting operations were conducted 24 hours a day, using two drill rigs and three pumps.

"Due to the widespread sinkhole activity under the building," says Griffin, "16 columns had settled beyond the allowable tolerances for the structure. We again used compaction grouting, this time to raise the sinking columns as much as 3 inches, bringing them within the required tolerance. To complete the job, we underpinned four columns around the original dropout with 12 drilled steel micropiles." Mission accomplished.

One-Call Terra Firma

Whether you have a forklift-eating sinkhole, precarious slopes, low bearing capacity, or all of the above...make Rembco your first call for geotechnical challenges. You may reach R. Michael Bivens, P.E. at 865-363-4708, or email Mike at mike.bivens@rembco.com.



Visit www.rembco.com for more information about geotechnical services. Or Call Rembco today at (865) 671-2925.

Fast Work Saves a Dike...and a River

Rembco goes around the clock to prevent environmental disaster.

8:30 am, January 22: Rembco gets an urgent call from a paper products company. The dike on their wastewater pond is leaking badly and if it fails, millions of gallons of untreated effluent will empty into the adjacent river.

4:35 p.m., the same day: On the scene, beginning a 10-day, around-the-clock work schedule to save the failing dike.

The Plan

“Our initial assessment revealed that the water loss was about 34 gallons a minute at the high flow channel,” says Rembco Project Manager, Ken Bowman. “But water was also seeping out along a 200-foot stretch of the dike. “We immediately began polyurethane and compaction grouting, hoping to reduce the water flow into the river and, at the same time, improve the structural integrity of the dike. It was a race against time.”

The Scope

As grouting projects go, this was a massive one. To stem the leaking, Rembco installed 3217 linear feet of casing and pumped in 2712 gallons

of polyurethane grout. To further stabilize the dike, the team installed 3515 linear feet of grout casing to accommodate 265 cubic yards of compaction grout. Using a combination of both treatments, Rembco reinforced a length of dike measuring 450 linear feet. Coordinating with the client’s geotechnical engineer, the team worked ten 24-hour days, followed by another 10 days on the site, continually assessing the conditions and modifying the approach as needed.

The Results

“When we demobilized to go home,” says Bowman, “the discharge was mitigated, the dike was stabilized, and a potential disaster was averted.”

Whether your situation requires immediate response or patient, comprehensive planning, let Rembco be your first phone call. Whether building foundations, stabilizing slopes or soils, controlling underground liquid migration, or even putting the proverbial thumb in the dike, The Stabilizing Force (Rembco) is always a solid place to start. For evaluation of your project, call our lead estimator and project engineer, Mike Bivens at 865-363-4708. Or email Mike at mike.bivens@rembco.com.



Rembco® Waits for No Ready Mix Truck

Ready mix vendors love to deliver on jobs that call for full truckloads...especially those jobs that call for a procession of full truckloads! But when the job calls for two yards of grout now and two more later, they don't really want the call at all. In fact, they charge extra fees and are often slow to deliver. But these expenses and frustrations are a thing of the past when Rembco rolls out our Zim® volumetric mixing truck.

Officially known as the Zimmerman 400N1 Series Rear Discharge Concrete Mixer, Rembco's Zim® Mixer streamlines projects, increases efficiency and saves clients' money. In short, this mixer helps Rembco to be a lean, mean geotechnical services machine.

Made to Order. Made on Site.

"Our Zim® Mixer is mounted on a flat bed truck that goes wherever we need it," says Rembco Director of Operations, Bill King. "It includes two aggregate bins, a cement bin, a tank for additives (like plasticizers,

thixotropes and retarders) and a 300 gallon water tank." "When it's operating," says King, "Water, cement, aggregates and additives are all metered, mixed and delivered by a system that is the most accurate in the industry. We can make virtually any quantity... from a wheelbarrow full to 30 cubic yards in just one hour. This mixer can handle any job."

Perhaps no one appreciates the Zim® Mixer more than its operator, Patrick Whitt. "Once I get the mix design from the engineer," says Whitt, "I just feed in the settings and it automatically proportions all the ingredients."

Versatility is another attribute of the Zim® Mixer. It mixes concrete, gunite and shotcrete as well as cement grouts from zero-inch slump to grout slurries. "It's the only mixer you need on the job," says Whitt.

With a corporate tool box that includes equipment like the Zimmerman 400N1, Rembco is prepared to respond to your needs – big or small – quickly and efficiently. Give us a call!



Sinkholes 101

A sinkhole is a surface depression that may be caused by either geological conditions or man-made problems, like leaking storm sewers or buried trash. The man-made variety can certainly be disruptive and troublesome, but a geologic sinkhole can be downright devastating. What is a geologic sinkhole, and more importantly... what can be done about it?

Sinkhole Formation

About 25% of land mass in the world is characterized as karst. Karst describes areas with sinkholes, caves, and underground streams which are formed by the slow dissolving of bedrock. When rainwater falls through the atmosphere and trickles through the soil, it becomes slightly acidic. In karst areas, this weak acid can dissolve holes in the bedrock or enlarge existing fractures, creating a "drain" for more groundwater. As water flows into the feature, it takes some of the surrounding soil with it, sometimes resulting in significant soil loss. At the ground surface, this may appear as a slowly sinking circular depression, or a very sudden dropout into collapsing soil caverns. And so... a sinkhole is born.

Repairing a Sinkhole

Remediation options for sinkholes are fairly limited, and can be generalized into two basic methods... excavation, or grouting. What about just dumping several trucks of concrete down the hole? Although you might fill the depression, it is highly unlikely that dumped concrete will actually reach (and plug) any holes in the bedrock. This merely delays the problem and vastly complicates the eventual repair. Let's look at the real options.

Excavation and Backfill

Sinkholes that form where the depth to bedrock is shallow (less than about 15 feet), can typically be remediated by excavation and backfill. All soil in the affected area must be removed from the bedrock surface to expose the hole or feature causing the problem. Often, it is a group

of holes or an enlarged fracture, requiring additional exposure of the bedrock. Once located, the throats can be plugged with low-slump concrete to prevent water and soil from draining away. Alternatively, a graded filter can be constructed of stone and filter fabric to allow water to pass into the feature, but retain the soil. Then the excavation is backfilled, with special attention to proper compaction.

Excavation and backfill is a much more cost effective solution when indicated. If bedrock is too deep, however, or if excavation would undermine or damage nearby structures, then grouting is the preferred approach.

Grouting

Remediation of sinkholes where bedrock is deep is accomplished by a process called "cap grouting". Steel pipes are drilled or driven to bedrock on a grid pattern that covers the affected area. A thick cement-based grout is pumped down the pipes and injected at the bedrock surface. The grout spreads out on the surface and creates a concrete "cap" that covers the bedrock defects. Cap grouting prevents further soil loss, but by itself does not address the disturbed and poorly compacted cone of soil from bedrock to the ground surface. So, as the grout pipes are slowly withdrawn, thick mortar-like grout is injected to displace and compact the surrounding soil. This "compaction grouting" restores the bearing capacity of the affected soil to prevent settlement of overlying structures.

Grouting is the best alternative when the problem is deep or occurs under or near an existing structure such as a roadway, bridge or building. This method creates much less disturbance to the surrounding area while accomplishing the two main objectives: stopping the soil loss and restoring the soil bearing capacity.

Our Approach

Rembco specializes in repairing sinkholes by grouting. We have a history of success spanning almost 30 years.

When you suspect sinkhole activity, make Rembco your first call. You'll get a qualified assessment, straightforward conversation, and an unbiased recommendation. Then, if you choose Rembco to make the repair, you'll get a fair price for an enduring solution.

