

CUTTING THROUGH COMPLEXITY

The Mr. Manhole system enables machine-powered manhole repair that seals effectively and leaves behind a smooth road surface

By Erik Gunn

Manhole repair can be complex and time-consuming. Many manholes develop leaks in the chimney area, which is subject to wear from the stress of traffic and from freezing and thawing.

In repairing these manholes, crews face the challenges of sealing or otherwise repairing the chimney and resetting the manhole casting itself in a way that both excludes clear-water infiltration and leaves a smooth road surface. Poorly leveled manholes can cause

problems for motorists driving over them.

Traditional repairs require crews equipped with jackhammers or saws to break up the roadway surrounding the manhole, re-level the manhole frame, and then refinish the roadway. The process typically takes several hours.

Mike Crites, a foundation contractor who operates Crites Excavating Inc. in Lima, Ohio, devised the Mr. Manhole repair system, manufactured and sold by a separate company, Critex LLC. The system includes a circular cutting device to remove the manhole frame and the surrounding asphalt, and additional components to complete the repair. The cutting unit is operated from a skid-steer loader's auger drive.

Tony Crites and Galen Troyer of Critex demonstrated the Mr. Manhole system at the World of Training underground utility construction show in Manteno, Ill., on June 26. The show took place at Planet Underground, a cityscape training venue in Manteno.

Walk-around

The principal tools in the Mr. Manhole system are the circular cutter/extractor and a ring saw.



The Mr. Manhole cutting device is shown attached to the skid-steer. Turning at about 70 rpm, the cutter digs into the asphalt. (photography by Erik Gunn)

TECHNOLOGY TEST DRIVE

EQUIPMENT:

Mr. Manhole repair system

MANUFACTURER:

Critex LLC
419/229-3015
www.mrmanhole.com

LOCATION OF DEMO:

World of Training construction show, Manteno, Ill.

DEMONSTRATED BY:

Tony Crites and Galen Troyer of Critex

LIST PRICE:

\$41,000 as demonstrated



Before the cutting begins, a "speed plate" is installed inside the manhole rim. This plate will enable the skid-steer operator to remove the manhole and the surrounding asphalt when the cutting is finished.

The 800-pound cutter consists of two 44-inch-diameter disks. Four adjustable arms extend outward from between the disks. Cutting blades extend vertically from the adjustable arms. Each blade has four teeth, which can be replaced when damaged or worn. They are positioned so that when the cutter spins, it cuts in a circular path.

The adjustable arms allow the cutter to be set to varying diameters, normally 50 to 60 inches. The cutter unit surrounds a shaft. The upper portion of the shaft ends in a hex-shaped female socket that fits snugly onto the hex-shaped shaft of a skid loader's onboard hydraulic auger drive, to which it is attached with a 5/8-inch pin. The lower portion of the shaft extends and serves as a pilot. At the shaft's tip are two small flanges.

The ring saw consists of a cast metal ring along with attached calibration tools and a small gasoline- or battery-powered saw for cutting PVC sewer liner used in



The operator lifts the circular segment of asphalt surrounding the manhole ring and moves it out of the way of the manhole area.

the manhole repair process.

Accessory tools include a metal speed plate. At the center of the speed plate is a circular keyhole with two opposing slots to match the flanged bottom of the pilot shaft. The speed plate is clamped inside the manhole frame at the beginning of the repair. Additional accessories include a lifting bracket with an attached magnet used to carry manhole covers and frames, and a trailer stand for transporting

the cutter/extractor.

The system demonstrated was the Mr. Manhole municipal/contractor package, which includes the cutter, ring saw, accessories, a software package for use in working up specifications for each job, and material kits to repair 80 manholes.

Operation

When the demonstration began, Crites and Troyer had attached



Upper photo, a close-up of the bottom of the cutter's pilot shaft, showing two opposing flanges. Below, a close-up of the teeth on the cutter.



the cutter/extractor to a Caterpillar A26B auger drive, installed on a Cat 287B skid loader. In normal

ered the cutter into place, threading the pilot shaft and its flanges through the slotted keyhole in the speed plate.

With the auger drive turning at about 70 rpm, he lowered the cutter to the asphalt. The cutter teeth sawed out a circular section of roadway centered on the manhole. It took less than 10 minutes to cut through about 10 inches of asphalt.

With the cutting complete, Troyer used the skid loader con-

“What we’ve got is something with no joint. It won’t let water in and it won’t let gas at the concrete from the inside. Then we encapsulate the whole thing in concrete. The objective is to make sure every repair is a high quality repair that lasts.”

Mike Crites

use, the cutter/extractor is hauled on a trailer, resting on its metal stand, and the cutter is attached to the auger drive for the first job of the day. Assuming that several jobs are all scheduled in the immediate vicinity, the cutter remains attached to the skid loader for the day as the machine is driven from job to job.

Crites and Troyer removed a manhole cover and clamped the speed plate in place inside the manhole frame. Troyer then maneuvered the loader with cutter attached over to the manhole. Using the loader’s controls, he low-

trols to turn the shaft so that the flanges were transverse to the slots on the speed plate’s keyhole. He then raised the cutter/extractor, and the circular section of roadway and the manhole came with it, dangling by the speed plate hole from the cutter’s pilot shaft.

Troyer maneuvered the removed section of roadway to a spot about 15 feet from the manhole and lowered it. After again turning the shaft so that the flanges were

After the PVC liner is adhered to the manhole, a special tool is used to determine where the liner should be cut so that the metal manhole ring will be level with the street surface after repair. A battery-powered saw is used to cut the liner at the right point.

Tony Crites installs a temporary debris prevention system that blocks the pipe below the manhole throat from debris caused by the removal process.



Galen Troyer moves the ring out of the way of the other debris so that it can be moved back into place in the manhole.





The ring is carried using a special tool and lowered onto the PVC liner. Then the manhole lid is put back in place.

aligned with the speed plate keyhole, he raised the cutter, leaving debris behind the removed section of roadway and the manhole frame.

Crites then installed a temporary debris barrier that is part of the system. With the barrier in place, he shoveled debris away from the manhole chimney. Crites and Troyer broke up the concrete chimney using hand shovels and a Bobcat mini-excavator, then used hand shovels and a broom to finish sweeping debris from the hole in the asphalt left by the cutter. Crites also used the excavator to break remaining asphalt away from the

removed manhole frame, until it was clean and able to be reinstalled.

Once the concrete manhole chimney had been removed, Crites used a hammer drill to prepare what was now the top of the structure below the road surface. He then took a piece of PVC sewer liner that had been rough-cut to fit the installation and applied white, urethane adhesive to one edge. He placed the adhesive-coated edge of the liner on top of the manhole opening and applied a water-activated sealant strip around the bottom seam where the liner met the manhole throat.

Crites and Troyer then placed the 100-pound metal ring-saw tool over the manhole opening. They used a caliper to measure the exact depth of the cast iron manhole frame, and used that measurement to adjust the length of the arm to which a small saw was attached on the ring-saw tool.

With the ring saw, they cut off the top of the liner at a height below the road surface that would allow the manhole frame and lid, once reattached, to be level with the road surface. Once the liner was cut to the proper height, Crites applied adhesive to its upper edge.

Using a special bracket (part of the system), Crites and Troyer carried the manhole frame back to the hole and placed it on the upper edge of the PVC, then put the manhole lid in place. Troyer double-checked the level of the lid.

Then a cement mixer standing by moved into place to pour aggregate into the opening surrounding the newly installed liner and the reinstalled frame and lid. Two rings of epoxy-coated reinforcing bar were lowered into the wet cement, and a vibrator was used to drive the cement into the nooks and crannies beneath the manhole frame to eliminate air pockets.

When the concrete was finished and smoothed off, the men applied a black colorant to the surface of the new concrete collar so that it matched the asphalt. A temporary polyethylene cover protected the concrete as it cured. From beginning to end, the repair took less than one hour.

Observer comments

The Mr. Manhole system worked with speed and precision. In function, the cutter resembled the common hole saw found in many home craftsmen's toolboxes, except that its adjustable design allows the operator to use just one cutter in many situations rather than a series of fixed-diameter rings. The system requires no water or other lubrication for cut-

ting. Dry cutting eliminates the need to contain runoff.

Manufacturer comments

Since its initial development less than a year ago the system has already gone through evolution. For example, the speed plate that holds the ring to the cutter/extractor device replaces a different assembly.

In addition to the cutter's standard configuration up to 50 inches across, Critex can custom configure the device to a diameter up to 6 feet, reports Critex president Mike Crites. The system has uses besides manhole repairs. For example, "It can be used for utility companies to penetrate the street for repairs," Crites says.

Critex supplies materials kits that include urethane sealant, rebar rings, PVC sewer pipe insert liner, black sealant, and black colorant for the road surface. Materials kits include enough for 20 manholes. The company also supplies a software package that can develop specifications for repair projects. The replaceable cutter blades are rated to last for 100 to 200 uses.

Noting that hydrogen sulfide sewer gas is a common cause of sewer leaks because it erodes concrete, Crites says that the PVC liner between the manhole throat and the frame makes for a superior repair.

"We're guaranteeing it not to leak, and we're not having to put a chimney seal in it in," he says. "What we've got is something with no joint. It won't let water in and it won't let gas at the concrete from the inside. Then we encapsulate the whole thing in concrete. The objective is to make sure every repair is a high quality repair that lasts." ♦

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MORE INFO:

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