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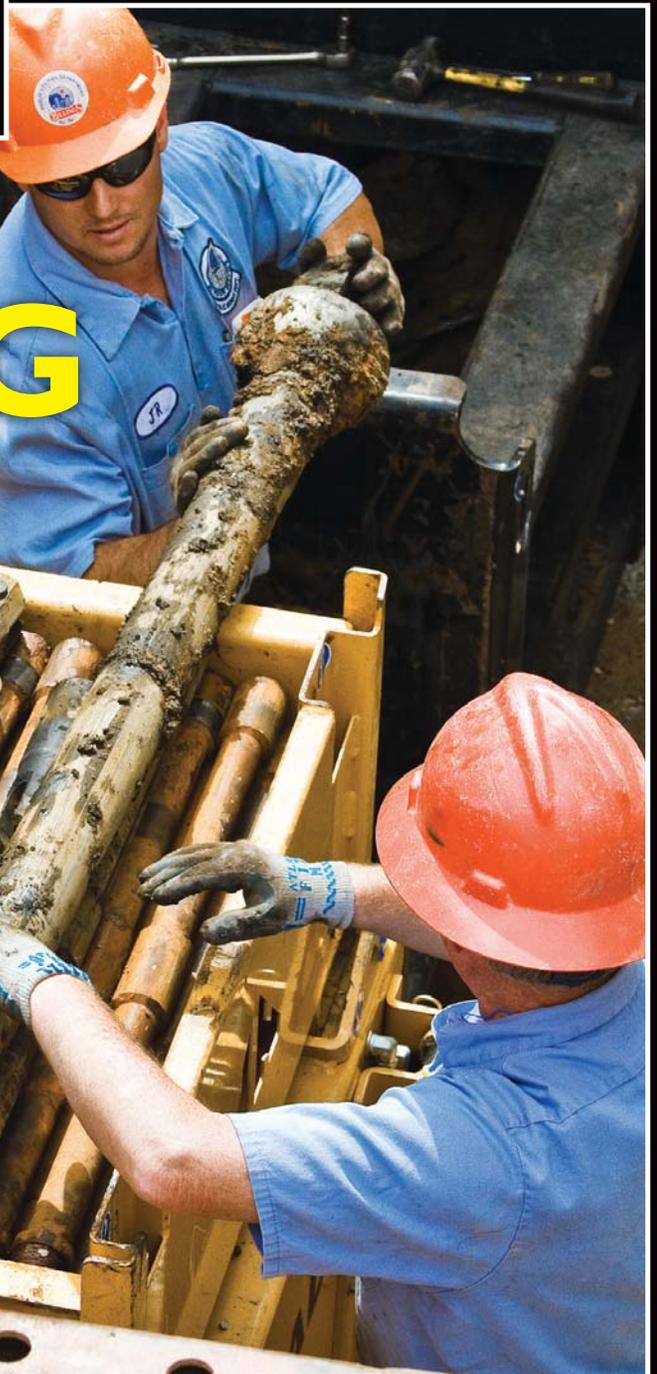
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uses in-house pipe
bursting to repair
water leaks and
upsized lines

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FOCUS: WATER

DOUBLING UP

The City of Billings uses pipe bursting with in-house crews to repair water distribution leaks and enlarge mains to ensure adequate flow for fire protection

By Jim Force

Located on the slopes of Montana's Beartooth Mountains, Billings is a pioneer city in more ways than one. It is the only municipality in the country double-upsizing its water distribution system, and doing most of the work itself.

Public Works Department Distribution and Collection Division superintendent Scott Emerick reports that his team is using pipe bursting and fusible PVC pipe to replace old cast-iron mains and upsize the line diameter from four to eight inches. By using city crews instead of consultants and contractors, his division is doing it at nearly 50 percent less cost than for conventional methods.

"If we were using open trenching, hiring a consultant and bidding out to contractors, we'd probably be seeing costs in the area of \$270 to \$300 per linear foot," he says. "Instead, our costs are about \$160 a foot. Plus, with each project, our crews are getting more and more efficient, and they're gaining confidence in what we're doing."

"As far as I know, we're the only city double-upsizing. There's one other comparable project out there, but it's a private operation."

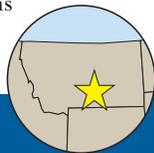
Lots of cast iron

Billings, population 104,000, maintains 433 miles of water mains throughout the 33-square-mile area of the city. A fair amount of the system consists of cast-iron pipe, some of it nearing 100 years old. Modern fire flow requirements and a plethora of leaks are driv-

ing the line upsizing project in the southern section of the city.

"We started two years ago," Emerick says. "At first, we experimented in a cul-de-sac with a type of plastic pipe and some borrowed pipe bursting equipment, but we experienced three failures involving the pipe section couplings."

Then, on a reference from Miles City, Mont., Emerick and his leadership team of engineer Kent Lustig and foreman Jim Burnham decided to use a fusible PVC pipe replacement system offered by Underground Solutions Inc. (UGSI) of Poway, Calif.



PROFILE:
City of Billings,
Mont., Public Works
Department,
Distribution and
Collection Division

INCORPORATED:
1882

POPULATION:
104,000

AREA SERVED:
33 square miles

INFRASTRUCTURE:
433 miles of water mains

ANNUAL BUDGET:
\$2 million (operations
and maintenance)

EMPLOYEES:
13

WEB SITE:
www.ci.billings.mt.us

Maintenance worker/equipment operator Scott Haynes (left) helps senior equipment operator Ryan Skillestad fuse a PVC joint on a McElroy 412 TracStar pipe fusion machine. (Photography by Kelvin Pinney)



Three of the division's employees received UGSI training to become licensed in pipe fusing, and the city purchased the necessary equipment. Billings owns:

- A pipe fusion machine from McElroy Manufacturing to heat-fuse the pipe sections.
- An HB 100 pipe bursting system from HammerHead Trenchless Equipment to slit and burst the cast-iron pipe.

“We’re learning as we go. We’re improving our speed and getting more aggressive in our scheduling. We’re learning a lot about different soil conditions, and we have developed some little tricks that make the project easier.”

Jim Burnham

- Other accessories that enable crews to upsize the old water distribution system.

“It’s working out beautifully,” says Emerick. The division has budgeted \$4 million a year for the project and has replaced and upsized about 3,000 feet of water main thus far. Another 27,000 feet of line is planned for future replacement.

“We’re learning as we go,” says Burnham. “We’re improving our speed and getting more aggressive in our scheduling. We’re learning a lot about different soil conditions, and we have developed some little tricks that make the project easier.”

An example is a second “extraction cage,” which increases the pull-in area for the new pipe and provides better access to the bursting head and associated tooling.

How they do it

Billings is tackling water main replacement one block at a time. Working in the middle of the street so that homeowners can get in and out of their driveways, crews dig a pull pit 14 by 8 feet and 6 feet deep at an intersection, and an entry trench at the other end of the block, about 400 feet away.

The entry pit can be up to 45 feet long to accommodate the length of fused pipe that will be pulled into the line. It is gradually sloped to the level of the main line so that the fused PVC pipe can follow a smooth entry and doesn’t have to be bent or twisted. “We like a 24-foot flat bottom in the entry trench at the depth of the main,” says Burnham.

Ten-foot lengths of 8-inch PVC pipe are heat-fused into a permanent butt joint with the McElroy 412 fusing machine at street level. The machine incorporates a hydraulic pipe lift to assist in loading and unloading and is mounted on tracks for easy maneuvering at the job site.

Next, the crew feeds 3-foot rod sections through the host pipe into the entry pit. The tooling and the conical-shaped HammerHead pull head are attached, and then the whole assembly, including the trailing PVC pipe, is pulled through to the next intersection. A slitter splits the host pipe, and the conical bursting head follows, breaking the pipe apart and pushing the debris into the surrounding soil.

At the exit pit, the crew inserts the extraction cage to provide the required safe access to remove the rods and bursting head, and con-

Scott Haynes (left) and Ryan Skillstad work with the fusion machine as part of the fusible PVC pipe replacement system offered by Underground Solutions.



The slitter section of the pipe bursting system.

CUTTING LEAKS IN HALF

The City of Billings has cut water system leaks by more than half through an aggressive detection program based around technology from Fluid Conservation Systems (FCS).

“We used to experience more than 200 leaks a year back in the 1980s,” says Public Works Department Distribution and Collection Division engineer Kent Lustig.

“Today, we might average 60 to 70, and that number is decreasing as we replace and upsize the old cast-iron lines.”

Billings uses FCS Permalog and Correlator units to locate leaks with acoustical technology. The Permalog units are positioned on main valves, where strong magnets hold them in place. When a unit “hears” a potential leak, the logger enters an alarm state and transmits a signal to indicate a leak condition.

The handheld Correlators, loaded with specific information on the pipe footages, pipe material, connections and other data, then point to exact leak locations. Using asphalt cutters, the crew opens the pavement and cuts a 9- by 6-foot hole for a trench box to access the pipe.

“If it’s just a corrosion scab, we will generally use a repair clamp to fix the leak,” says Lustig. “If the leak is more extensive, then we’re looking at a pipe replacement job.”

Lustig says regular valve and hydrant inspections and customer concerns are other ways of finding leaks. “Sometimes we have homeowners call and say they can hear running water,” he explains. “That’s a pretty good indication that there’s a leak somewhere nearby.”



A section of old 4-inch cast iron pipe installed in 1916.



nect the new pipe to the existing line. Lustig says it takes about an hour and a half to burst and pull the new pipe through a 400-foot section. “We generally do one block at a time,” he says.

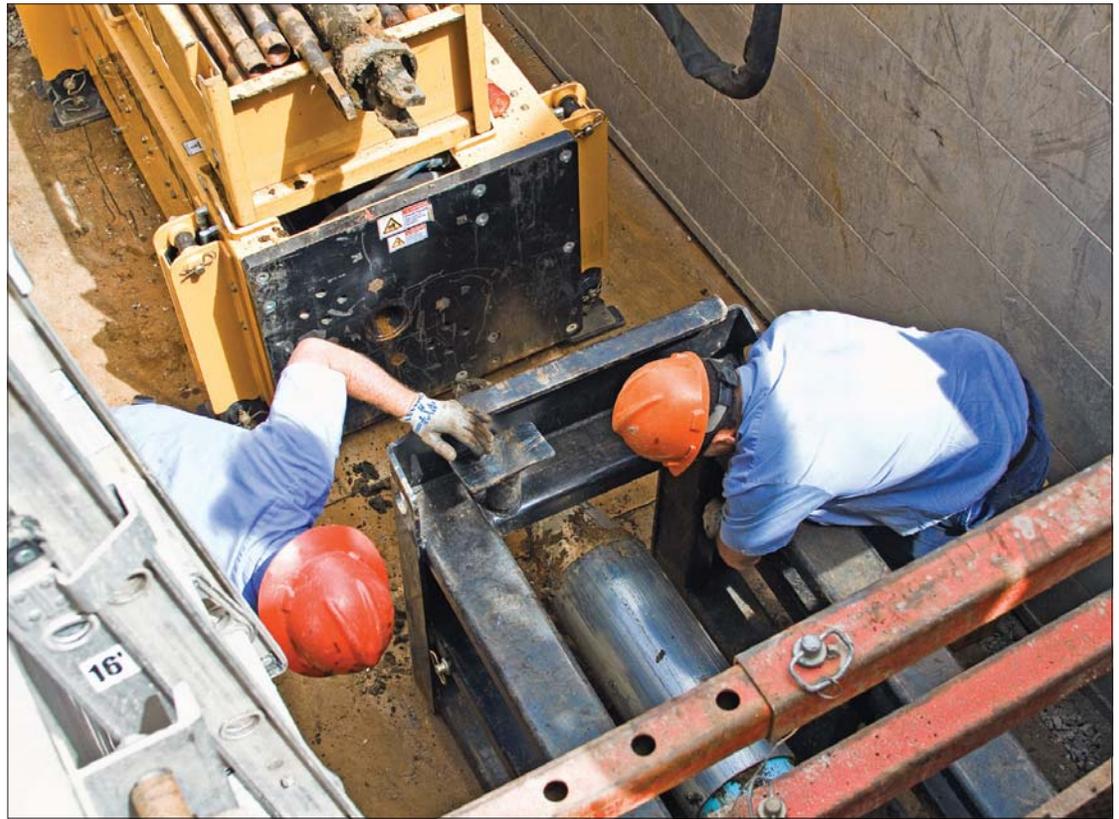
Billings finds it most practical to fuse the pipe sections the day before installation, and then pull the new pipe first thing the next morning. After a section of pipe is pulled, the crew performs a two-hour pressure test, then doses chlorine at 50 ppm and lets the pipe sit for 24 hours, maintaining a chlorine residual of 25 ppm. Then they flush the line, dechlorinate with sodium bisulfate, and take samples at 24 and 48 hours before the line is ready for use.

“We used to experience more than 200 leaks a year back in the 1980s. Today, we might average 60 to 70, and that number is decreasing as we replace and upsize the old cast-iron lines.”

Kent Lustig

While the water's off

With a temporary water system, crews keep water flowing to the homes and businesses while their mains are being upsized. An outside contractor performs the work, which involves hooking up an interim water line to a hydrant that remains in service during construction. From the hydrant, a 2-inch PVC pipe carries water down the alleyways, and a connection pipe supplies water to



Senior equipment operator J.R. Fox (right) and maintenance worker/equipment operator Jim Burchell operate the HammerHead 100-ton hydraulic pulling unit.

each user along the alley, usually through an outside faucet.

The contractor supplies chlorine metering equipment to disinfect the temporary water supply and takes samples at the head and tail ends of the temporary system. The city laboratory tests the samples to make sure the required chlorine residual exists in the system.

“We’ve really had no issues with our customers,” says Emerick. “We hook up the temporary system about two weeks ahead of the construction and leave it in place until about a week after the work. The only complaints have been about minor stuff, like running over the temporary pipe with a lawn mower.”

Bottom line

The distribution and collection division and the City of Billings couldn’t be happier with their program. By purchasing the equipment and investing in staff training, the division is saving



A finished fused joint between two sections of fusible PVC pipe.

substantial money. Based on his experience, Emerick says he’d like to see the city bring as many tasks in-house as possible.

While he feels fusible PVC pipe may not be the solution for every application, the Billings master plan calls for its use in all upsizing projects. “We want everything to be compatible,” he says. “In addition, there are not as many parts with PVC as some other piping materials require.”

“We’ve had good support from all our suppliers, and some good pub-



J.R. Fox (in excavation) realigns the HammerHead pulling unit while Scott Haynes (right) and Ryan Skillestad assist.

licity in the local newspaper. Our council is on board with what we’re doing. It’s a win-win situation.” ♦

MORE INFO:

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