

**MELFRED  
BORZALL**

A BORING GUIDE TO

# **MATCH THE RIGHT REAMER TO THE JOB**

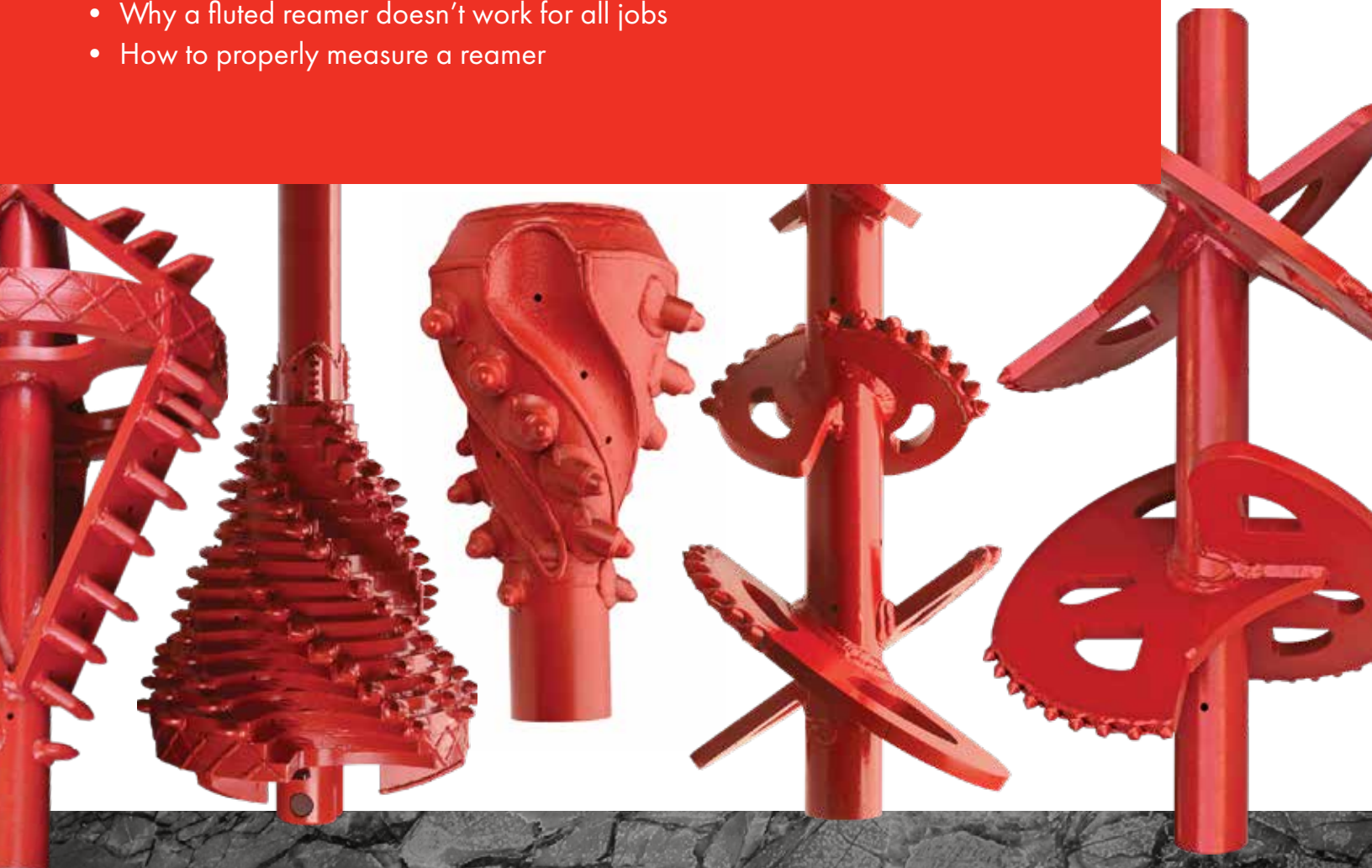
*Your guide to selecting the best reamer to maximize production and save money on your next job.*





You wouldn't limit yourself to the drill bit that comes with a handheld drill. The same idea applies to your HDD tools. It's critical to only use a reamer designed to handle the specific conditions of a bore. Backreamers are the workhorse of every HDD drilling operation. For that reason, in this guide, we cover the "boring" reamer basics:

- What to consider before choosing a backreamer
- Why a fluted reamer doesn't work for all jobs
- How to properly measure a reamer



# WHAT TO CONSIDER BEFORE CHOOSING THE RIGHT BACKREAMER

## *What can happen when you rely on the wrong reamer?*

At best, picking the wrong backreamer can make your drilling proceed slowly and drag your productivity way down. At worst, your reamer can snap off in the hole, causing you to stop drilling to retrieve it or forcing you to abandon the hole altogether and re-drill a new pilot. Pick a reamer that pulls back too fast and you may cause road humping that you're on the hook to repair. Too slow and you could either cause cratering or the reamer to drop to an undesired depth.

All these scenarios eat up time and stall your progress, essentially choking your productivity and profitability. Broken backreamers require replacement of the original reamer and an investment in a reamer that is better suited for the job. Add on extra for the rushed air freight to get the reamer to your jobsite as fast as possible. That's a lot of cash that you could have saved if you had the right reamer in the first place.

Before you decide which reamer you need for the job, think about these factors:



## GROUND CONDITIONS YOU'LL ENCOUNTER

Know the type of material you expect to encounter before you drill your pilot. If you're in ground that is sticky (like clay), you need a reamer with excellent mixing action and enough fluid pressure to make sure the material doesn't ball up or leave big chunks behind in the hole. For unstable conditions like sand that face the risk of collapse, you need a packing reamer with an efficient mixing action that keeps the cuttings and the drill fluid mixed together to support the borehole wall, and not allow the sand to collect on the bottom of the hole.



## CUTTING ACTION YOU'LL NEED

The type of cutting action you'll need also depends on your ground conditions. Shale and soft limestone require backreamers with more cutters for fracturing material, then grinding it up. Softer ground like clay or sand requires fewer cutters or you risk balling up. Harder conditions like cobble or river rocks mean you don't need to break up baseball-sized cobble as much as you just need to push it out of the way, so you need reamers with a gradual, tapered body that help push the rocks aside. This is where a solid, tapered body reamer like the basic fluted or stacked plate reamer performs best. Finally, solid rock conditions need cutting action that pulverizes the rock as it's spinning, making small rock chips that are easier to pump out of the hole.





## THE SIZE OF YOUR RIG

Using an undersized tool (not the cutting diameter but the shaft it's built on) on too powerful of a drill rig can damage the backreamer and stop your job. Choose a backreamer that is strong enough for the size of rig you're using. If you must mix and match, it's better to use a big rig reamer on a smaller rig than the opposite. For example, don't use a 20,000 lb. drill tool on a rig with 40- or 60,000 lbs. of pullback.



## THE RIGHT VOLUME OF DRILLING FLUID

Always be sure you have plenty of drill fluid flow when backreaming. Pressure isn't as important as making sure you have enough volume passing through the shaft. If you're not using enough fluid, you're not going to be able to mix the soil with the drilling fluid which allows you to remove the cuttings from the hole. Pulling back too quickly without enough fluid to carry the cuttings out of your hole can just push the material forward with the reamer, causing it to get stuck or create a speed bump.

If you're using a reamer meant for a small rig on a big rig, the fluid holes in the reamer could be too small—not allowing enough flow to carry your cuttings out. The opposite applies, too. Using a big reamer (with big fluid holes) on a small rig means not enough pressure and causes the whole thing to ball up.

## HERE ARE SOME DO'S AND DON'TS WHEN PICKING YOUR BACKREAMER:

### DON'T

- Just assume that your OEM reamer is right for every job
- Hesitate to trip out and swap out your reamer if ground conditions change

### DO

- Try to get a sense of every ground type you'll run into on one job
- Ask your HDD supplier's opinion before you begin the job
- Stay open-minded. HDD tooling experts are there to help

# WHY A FLUTED REAMER ISN'T A "DO-ALL" TOOL

The fluted reamer that comes with your drill rig might seem like a great multi-purpose reamer. It's sturdy, compact and hailed by OEMs as the perfect do-all reamer for a variety of conditions. It's true, fluted reamers do have some benefits. But they are definitely not the do-all reamers they're advertised as—especially if you're looking to maximize production.

As HDD tooling experts, we see too many drillers make the mistake of thinking that one backreamer can do it all. The fluted reamer that comes with the rig is great—under certain conditions. However, drillers try to use the default drilling reamers in situations where a specialized reamer would increase production.

## INSUFFICIENT MIXING ACTION

Fluted reamers generally provide insufficient mixing action, because it's not what they're designed for. This can be very problematic in combination soils like clay, where poor mixing can cause the material to ball up. When drilling in soft ground, if you don't get completely stuck, pulling your reamer back through sticky material will be slow going. Insufficient mixing and pumping action will result in your reamer simply displacing the material in the hole, rather than flowing the cuttings out. At the very least, you'll have to do multiple passes through the same hole.

## STRUGGLE IN SANDY CONDITIONS

Fluted reamers will also struggle in sandy conditions. The reamer typically can't mix enough drill fluid with sand to help stabilize the hole and keep it open. Without the right mixing function, you risk collapse. Your hole is much more likely to cave in around the reamer itself or right behind your reamer, where you're trying to pull product pipe.

## FLUTES AREN'T DEEP ENOUGH

Finally, even though fluted reamers are designed with openings (flutes) to carry slurry out the back of the hole, the flutes generally aren't deep enough to allow enough material to pass through. As a result, you're essentially shoving lots of material forward that will slow you down significantly during pullback, and could even cause inadvertent returns.







## **WHY USE A FLUTED REAMER AT ALL?**

Fluted reamers do perform sufficiently under certain conditions. The solid design and carbide cutters of fluted reamers make them ideally suited for abrasive, hard ground conditions like gravel or shale. Most fluted reamers are also typically under a couple feet long, which is pretty short. Because of this compact design, fluted reamers can perform well in tight areas.

## **WHICH OTHER HDD TOOLS WILL BEST COMPLEMENT YOUR FLUTED REAMER?**

If you're primarily using a fluted reamer for tight areas, we also recommend adding a couple of open blade reamers to your tool shed. Open blade reamers give you more mixing action when you need it and feature tapered cutters that gradually bore through material. As always, your reamer choice depends on the material you're in.

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# HOW TO MEASURE YOUR REAMER & CHOOSE THE RIGHT SIZE

Determining the appropriate size backreamer for your job can get a little tricky. You can't just hold up a ruler to such an oddly-shaped tool and expect to get an accurate measurement. But your HDD reamers need to be the right size for the jobs they're on. Otherwise, you run the risk of leaving too large a void around your pipe, or you drill a too-small hole that stresses the product pipe during pullback.

## HOW TO MEASURE YOUR BACKREAMER

To obtain an accurate measurement of the diameter your reamer will cut, place a straightedge or flat board parallel to the shaft, across the top cutter. Be sure to keep it level. Measure up from the middle of the shaft, perpendicular to your straightedge. Double this measurement to calculate your reamer's true diameter.

Don't try to cut corners and take measurements by simply following the angle of the blade or measuring the body of the reamer. Your measurement should always encapsulate the furthestmost edge of your widest cutter. Measuring only the body (the solid part) of the reamer will leave you with a hole that is much bigger than anticipated. Now that you've got an accurate reading on your reamer's measurements, what size do you need, based on your job conditions?

## HOW TO DETERMINE THE RIGHT REAMER SIZE

When selecting the right backreamer, the general rule of thumb is size your backreamer so that it is 1.5x bigger than the outside diameter of the pipe you're pulling in. Of course, there are some exceptions.





## PRODUCT PIPE DIAMETER

Think about the diameter of your pipe, including the ends where two pieces slip together. Those areas might be up to 2" wider than the diameter of the main pipe. Make sure that you're basing your "1.5x" measurement on the widest part at any point in the pipe.

## SOLID ROCK

It's not always necessary to use a 1.5x overcut when drilling into rock. You know you'll have a sturdy bore that is not in danger of collapse or ground swelling. You also won't have a lot of slurry in the hole. In these conditions, you can come down to a hole diameter that is a bit closer to the diameter of your pipe.



## ON-GRADE BORES

Drilling to match a grading specification, like in the case of sewer lines, usually means that there's a tighter tolerance for bore size. Bore paths must hold a grade within a fraction of a % of slope. In this case, you'll want to ream a hole that is as close to the diameter of the product pipe as possible. This may require a custom-built reamer and slowing down your pullback speed to allow more time for the cuttings to move out of the hole.

## CLAY

In this soil type, it's important to strictly adhere to the 1.5x diameter rule—or even add a little extra. Clay swells when liquid (like your drill fluid) is introduced, then shrinks back down as it dries. Drilling an insufficient hole might seem permissible when the hole is wet, but your pipe could feel the pressure as the clay solidifies.



## UNSTABLE CONDITIONS

In cobble, sand or other unstable material, extra space makes it easier to pull product through. Make sure to allow sufficient clearance in these situations by drilling a hole that is 1.5x the size of your diameter.



## LENGTH OF BORE

If you're drilling a short bore (under 150 feet), you might be able to get away with lesser clearance around your pipe. Shorter bores make it easier to remove cuttings from the hole, so you don't have to worry about material filling up the hole and cramping your pipe. In longer bores, be sure to drill a hole with enough space surrounding the pipe, to make up for unreachable cuttings that are left behind.





## **WHY WORRY ABOUT THE RIGHT SIZE HOLE?**

Drilling the right size hole can have a major impact on your job. Too small of a hole and your job takes forever, you risk humping the road during pullback, or your product pipe can stretch or break. Too big, and you require more expensive tooling and drill fluid, your progress goes slower, you risk encroaching on other lines or your pipe can sink with time.

## **MEASURE TWICE, REAM ONCE**








When measuring your reamer and choosing the right tool for the job, it's always a good idea to double check everything. The markings on the outside of your reamer are a great starting place, but as time and work take a toll on your directional drilling tools, broken or shaved down cutters can alter the true size of your reamer.

***Your HDD reamers need to be the right size for the jobs they're on. Otherwise, you run the risk of leaving too large a void around your pipe, or you drill a too-small hole that stresses the product pipe during pullback.***



# REAMER COMPARISON CHART



|  | DIRT/SANDY LOAM | SAND | CLAY | SHALE | SANDSTONE | HARDPAN | GRAVEL | COBBLES | CALICHE |
|--|-----------------|------|------|-------|-----------|---------|--------|---------|---------|
| <br><b>TERMINATOR</b>   | GOOD            | GOOD | BEST | BEST  | GOOD      | BEST    |        |         |         |
| <br><b>SHREDDER</b>     | GOOD            |      |      | BEST  | BEST      | GOOD    | GOOD   |         | GOOD    |
| <br><b>JUGGERNAUT</b>  | BEST            |      |      | GOOD  |           |         | BEST   | GOOD    |         |
| <br><b>OGRE</b>       |                 |      |      | BEST  | GOOD      | GOOD    | BEST   | BEST    | BEST    |
| <br><b>TURBO</b>      | BEST            | BEST | GOOD |       |           |         |        |         |         |
| <br><b>SABERTOOTH</b> |                 |      |      | BEST  | BEST      | GOOD    | GOOD   |         | GOOD    |
| <br><b>HEDGEHOG</b>   | BEST            |      | GOOD | BEST  | GOOD      |         |        |         |         |



# TALK TO THE EXPERTS

*Choosing the right backreamer before you begin a job saves time, saves stress and saves money. If you have questions about which drilling reamers are right for your job, call your local Melfred Borzall distributor to talk "boring" options.*

Call **800-558-7500** or Visit **[melfredborzall.com](http://melfredborzall.com)**



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