



PIPE BEVELING 101

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WHY BEVEL?

Pipe comes in varying wall thicknesses, sizes, and materials. For pipes you can't fusion weld, which is typically schedule 10 and up, you'll likely need to bevel. Beveling is the process of removing material to form an angle on the end of your pipe end. This will allow you to get a solid, fully penetrated weld on the joint. Typically while dealing with pipe, you must take away wall material to make a penetrated root pass.

Then while welding the joint, material needs to be added back, often through filler wire – whether you are completing it by hand or through an automated process.

A GOOD WELD STARTS WITH THE PREP. IN PIPE WELDING, THIS OFTEN MEANS GETTING THE PROPER BEVEL ON YOUR WORKPIECE.

REASONS TO BEVEL

- Necessary for certain types of welds and applications
- Helps with fit-up for “out of round” pipe
- Allows full penetration welds



TYPES OF BEVELS

There are several different types of bevels, but these are the most commonly used in tube and pipe applications.

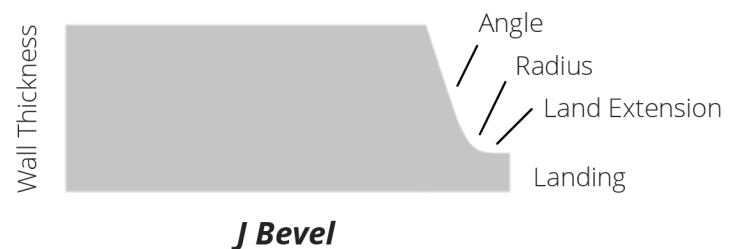
V BEVEL

- Two angled pipe edges appear to form a "V"
- Used in traditional hand welding
- Used with a knife edge, but sometimes has a landing
- A gap will be between the two workpieces



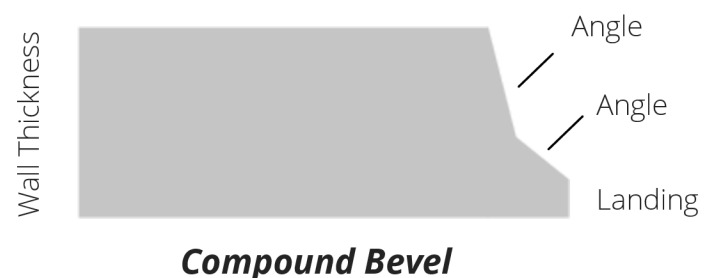
J BEVEL

- Two angled pipe edges appear to form a "U", individually they look like a "J"
- Used in automated weld processes such as orbital
- Cannot be ground by hand
- Landings will be Butt to Butt



COMPOUND BEVEL

- Two angles on one edge
- Also known as a 37/10
- Reduces the amount of weld metal that needs to be added back
- Saves time and material on thicker joints



TYPES OF BEVELS

FACING

- Leaves 90-degree edges to create a flat, or squared angle
- Used in automated fusion welding typically on thin-walled sanitary applications



COUNTERBORING

- Takes away material from the I.D. of the piece
- Creates an even surface on the inside of the pipe end
- Helps the fit-up of face or landing by eliminating mismatch



KEEP IN MIND

Angles and landing thickness depend on the welding application.

Cutting and beveling processes can often be done at the same time with the equipment and tools listed on the next page. Some machines, like the ESCO Millhog line, have several inserts where you can face, bevel, and counterbore at the same time.



WAYS TO BEVEL

A pipe can be beveled in several different ways, but here we highlight the different processes available.

HAND GRINDING

Hand grinding is time-consuming compared to other beveling methods. Since you are performing this process by hand, it takes a certain amount of skill – especially for a good fit-up. Hand grinding also cannot create certain bevel types, such as a J-bevel. It might be fine for those dealing with only a few workpieces that aren't critical or automated welding applications. The dust emissions and the loud process creates a hazardous work environment.



TORCH OR PLASMA CUTTER

A torch or plasma cutter cuts through the pipe end at an angle. This can be done with various tools such as a hand torch, a saddle cutter, or a pipe profiling machine. This hot-cut process heats the surface and creates a large heat-affected zone. Also in this process, you are limited in what materials you can cut with it. Compared to other methods, it often isn't as clean or precise. The workpiece is often hand ground afterward to clean the edges. Even with that extra step, it is often faster than just hand grinding – especially in large pipe applications where automation can be used.

Note that this process cannot create certain bevel types, such as a J-Bevel, because you are unable to put a landing on them.



WAYS TO BEVEL

A pipe can be beveled in several different ways, but here we highlight the different processes available.

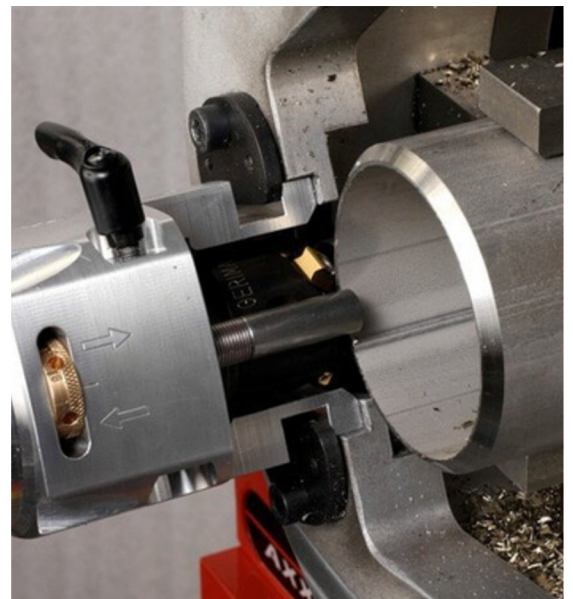
PORTABLE BEVELING TOOLS

Portable Beveling Equipment is often used with a bit or blade that removes material by cutting into the material and rotating 360 degrees. Different product lines have I.D. and O.D. clamping options as well as electric, pneumatic, and hydraulic powered options. This process prevents the surface from having a heat-affected zone and is commonly cleaner and more precise than other beveling options. Portable equipment is also very convenient for maintenance work. Tools can be moved to various parts of a plant or facility without clearance issues. These precise bevels often make a better weld because of how clean they are. This process will leave behind material that will need to be discarded.



STATIONARY BEVELING EQUIPMENT

Stationary Beveling Equipment is very similar to your portable beveling process with a blade, but the equipment is meant to stay in place in a shop environment. It's great for high production in one place and creates a safe and clean workspace. They often feature automated clamping jaws whereas other processes typically don't. Like portable equipment, it creates consistent and precise bevels like, but it is typically more expensive.



WHAT YOU NEED TO KNOW

When choosing a beveling tool, you need to consider several application factors, such as:

SIZE - O.D. AND WALL THICKNESS

The type of machine and process you use might also depend on the pipe workpiece size. ESCO Tool has equipment that works on a range of 0.5" to 36" O.D. and HGG has CNC machines that can bevel a maximum of 118". A plasma torch machine such as an HGG pipe cutter can take on much larger sizes. Each of the equipment processes listed previously have size ranges they operate within.

MATERIAL

Some materials may only work in certain beveling processes. For example, it might not be able to have the heat affected zone from a torch or plasma cutter.

LOCATION

Will the equipment need to be moved to and from job sites? Can it be stationary?

SPACE CONSTRAINTS

Is the application dealing with any space constraints, such as if the pipe is located where the equipment can be placed on it? Do you have the proper space to store or place your equipment? Larger equipment such as CNC machines can have stationary roller beds several feet long.

SAFETY HAZARDS

With emissions, debris, and dust, you'll need to know your job's safety standards as well as available tools - such as ventilation hoods and PPE.

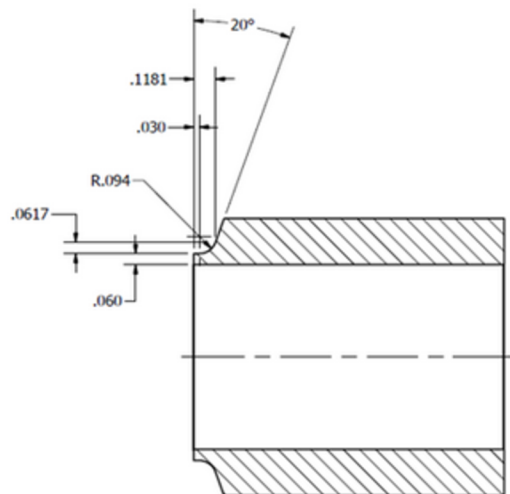
ORBITAL PIPE WELDING BEVELS

In orbital welding, consistent, clean, and accurate J-bevels are key to the weld's success.

We recommend using a portable or stationary beveling tool with a cold cut process to achieve a consistent prep. Be mindful of a consistent speed and feed - this will depend on the material, wall thickness, and O.D. of the application. You'll adjust the torque and speed as needed. A consistent ribbon tail - also known as a chip - is often a good indicator of a successful bevel.

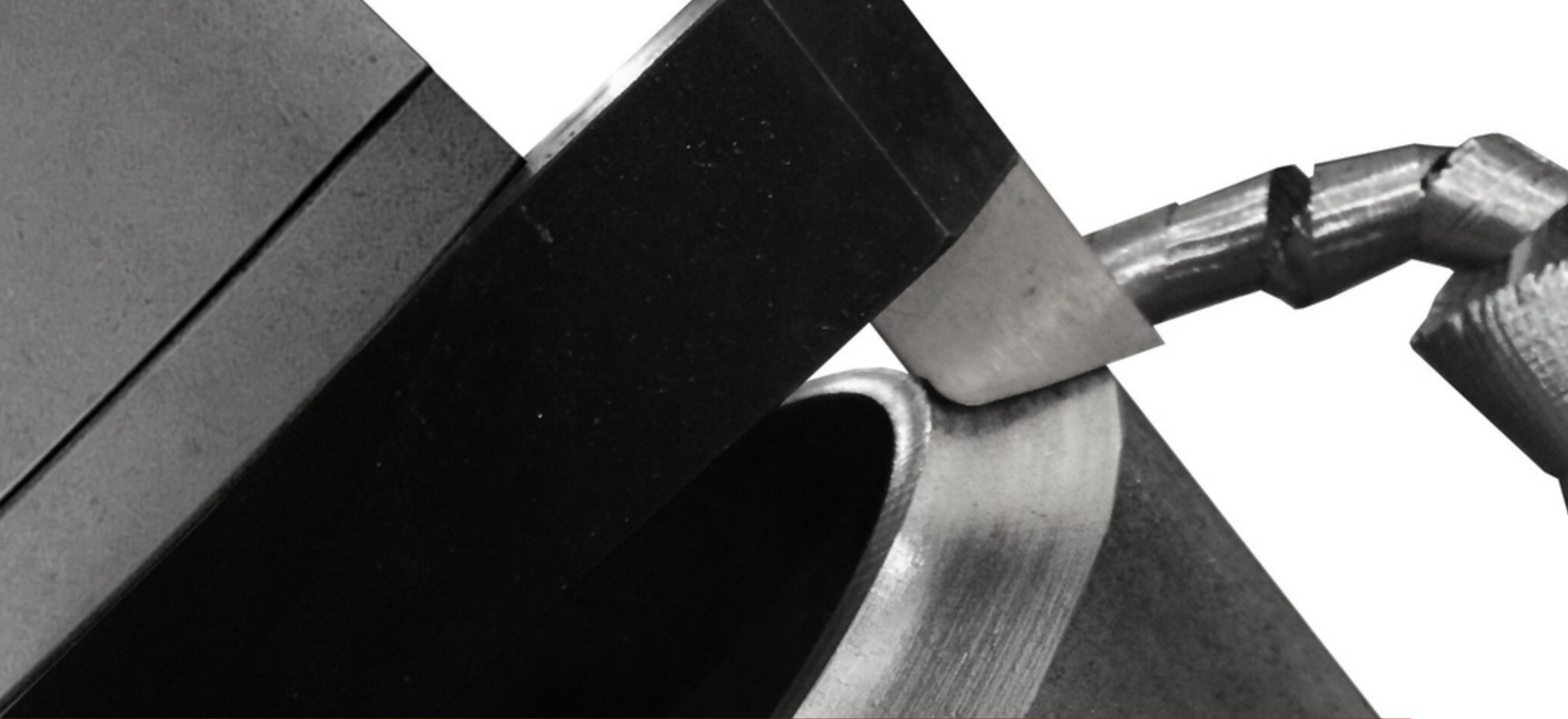


Orbital equipment manufacturers, such as Magnatech, recommend specific J-bevels when using their orbital tig weld heads.



The bevel will need to match what was mentioned in the weld program created. Your bevel is almost as important as the program itself when it comes to the weld's execution.

As for the match-up, both workpieces need to have the same land thickness. A consistent weld seam makes a consistent weld.



THE J PREP QUICK GUIDE

When using an orbital welding machine, the J Bevel (also known as a U joint) is utilized, giving the operator a clean, consistent and easily penetrated root. This due to the J prep being around of the wall of pipe. This joint geometry brings the root face out.

All of the Millhog line of ESCO tools can achieve the J bevel with a land. Picking the appropriate ESCO tool is solely based on the O.D. and Wall Thickness of the pipe you are prepping and welding.

A J Prep consists of a making a 25° cut into a work piece while providing a radius of 1/32" from the land. You start by inserting the clamping ribs into the workpiece I.D. and positioning the cutter head 2 inches beyond the end of the pipe.

The cutter head will then align into the pipe as it is ratcheted into place and the operator will turn on the motor. Slowly begin applying even and consistent pressure to the workpiece as the bit rotates around the pipe removing material. Once you achieve the desired prep, reverse the direction on the ratchet and slowly reverse the bit away from the workpiece.



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