

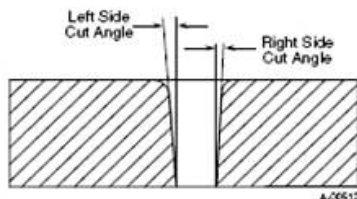
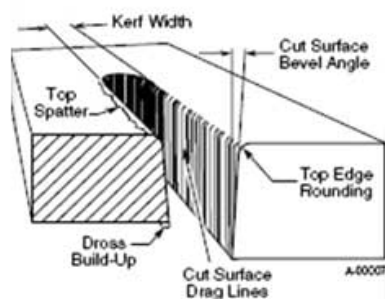
## Cutting Tips and Tricks

## CHOOSING A PLASMA PROCESS

Thermal Dynamics systems offer a variety of plasma cutting processes for precision and general purpose cutting. Ultra-Cut® systems offer precision cutting as well as conventional cut options. Auto-Cut® O2 systems offer high speed oxygen cutting, precision non-ferrous and conventional cut options. Auto-Cut systems offer conventional mild steel and precision non-ferrous options.

Process	Shield	USED FOR	ADVANTAGES
O2	Air	Mild Steel Precision 50-300 amps and High Speed Oxygen process	Weld ready cut surface
O2	O2	Mild Steel Precision at 30 amps	Weld ready cut surface
N2	H2O	Precision Aluminum and Stainless Steel	Best cut quality on stainless and aluminum to 3/4" Better parts life than air
N2	N2	Conventional thin non-ferrous	Better cut surface than air on non-ferrous Faster cutting on thicker SS and aluminum
H35	N2	>1/2" aluminum > 3/4" stainless	Weld ready cut surface H35 = 65%Ar / 35%H2
Air	Air	Conventional mild steel	Economical cost of operation Good cut quality
Air	Air	Conventional non-ferrous	Economical cost of operation

## CUT CHARACTERISTICS



Cut Surface – The cut surface is influenced by process and positioner precision more than by other parameters.

For smoothest cut face on different materials, use the process best suited to the material:

mild steel – oxygen plasma  
stainless < 3/4" – nitrogen / WMS  
> 3/4" – H35 / nitrogen

aluminum <  $\frac{3}{4}$ " – nitrogen / WMS  
>  $\frac{3}{4}$ " – H35 /nitrogen

Direction of cut – The plasma has a clockwise swirl as it exits the torch tip. Considering the direction of torch travel, the right side of the cut will always show less bevel and top edge rounding than the left side. Program cuts so that the right side will be on the finished part and the left side will be scrap

Top edge rounding – Caused by the heat of the plasma arc at the top surface of the cut. Proper torch height control can minimize or eliminate top edge rounding. Excessive top edge rounding is often a sign that torch cutting height should be lower.

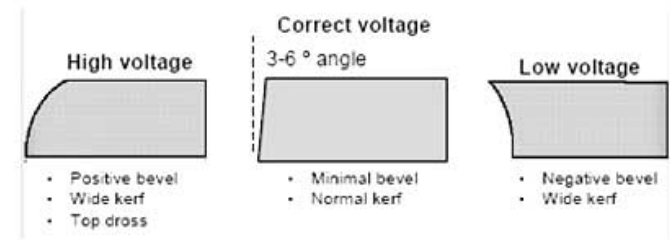


**Top spatter** – Top spatter is caused by fast cutting or by too high a torch height setting. Reducing cut speed or lowering torch cutting height will reduce top spatter. Top spatter is easy to remove.

**Bottom dross** – Molten metal may build up on the bottom of the plate. Faster cut speeds reduce bottom dross as less material is melted. Bottom dross that is easy to remove is an indication of slow cutting speed. Bottom dross that is difficult to remove or requires grinding is an indication of too fast cut speed.

**Kerf** – Kerf width is specified in the cut charts and can be calculated into cut programs. The kerf width is related to tip orifice size and higher current cutting will produce a wider kerf. Higher torch height will also result in a wider kerf.

**Bevel angle** – Precision cut processes produce bevel angle in the 0-3° range. Conventional plasma cutting will produce larger bevel angles. Proper torch height control will produce the smallest bevel angle, as well as improved kerf width and minimal top edge rounding. A slower cut speed can be used when cutting circles and corners to reduce bevel.



**Nitride contamination** – Air plasma cutting will produce nitride contamination of the cut face on carbon steel and stainless steel. Nitride contaminated surfaces will require grinding before welding to eliminate weld porosity. The depth of the contamination will be close to the Heat Affected Zone, between .005 and .010" in depth.

Nitride contamination can be eliminated by using a process other than air plasma; oxygen plasma for carbon steel, H35 or nitrogen/WMS for non-ferrous materials.

**Cut speed** – Cut charts specify a cut speed that will produce high quality cut performance. Any plasma system can cut at faster or slower speeds, but cut performance will be affected. Cut speed should be reduced for corners and tight curves to reduce bevel and corner rounding.

Optimum cut speeds produce a trailing arc which will be visible in the slight arc lines visible in the cut face. Arc lines are useful for evaluating cut speed on mild steel, but less so for aluminum and stainless steel. Arc lines that trail at less than 15° indicate that cut speed is in the optimum range when air or oxygen plasma processes are used. Optimum cut quality in precision cutting processes will result in arc lines that are near vertical. A slow cut speed may show arc lines that angle forward and a fast cut speed will show arc lines at a sharper angle relative to the top of the plate.

**Cutting Over or Under Water** - Water tables are useful for capturing flash and fumes. Some customers prefer a water table over a downdraft table because a water table does not draw heated air from the interior of the building and exhaust it outside.

Cutting over or under water is not recommended for precision cut processes. While Ultra-Cut systems are capable of cutting over or under water, cut quality will suffer.

Water either touching the plate or covering the plate has a quenching effect. Dross flowing down from the cut will solidify quickly in the cooler water and will adhere to the bottom side of the plate. The same dross formation can occur if the water level is not touching the plate but is close enough for splash to interfere with the dross stream leaving the cut. In extreme cases, splash can actually extinguish the plasma arc. The dross stream is significant and will cause splashing on any water table. Additionally, the shield gas stream for many processes is 120 psi, so the shield gas itself will cause

turbulence and splashing if the level of the water is too close to the bottom of the plate. When the water level is low enough to eliminate the risk of splash (approx 6 inches), it is too far from the plate to perform its purpose of capturing smoke and flash.

Underwater cutting with an XT torch will require cut speeds approximately 30% slower than speeds specified in the cut charts. Water level should be set so that the water covers the plate but does not rise more than halfway up the shield cup. Underwater cutting will not produce precision cut quality.

