ESAB Welding & Cutting Products

PLASMA
Cutting & Gouging

ESAB 1904-2004
A CENTURY OF INNOVATION

ESAB®

THREE CUTTING METHODS

MECHANICAL

Saw, Drill,
Punch, Shear

CHEMICAL

Oxy-Fuel

THERMAL

Plasma, Laser,
Electron Beam

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WHAT IS A PLASMA ARC?

- PLASMA - a fluid part of the blood
- PLASMA - an ionized gas (Air)
  - When a gas is heated above 17,000 ^{0}F, electrons are free to move. The gas conducts electricity

THE PLASMA SYSTEM

AIR REGULATOR / FILTER

Work Clamp

Torch

POWER SOURCE/ CONTROL

SPARE PARTS KIT

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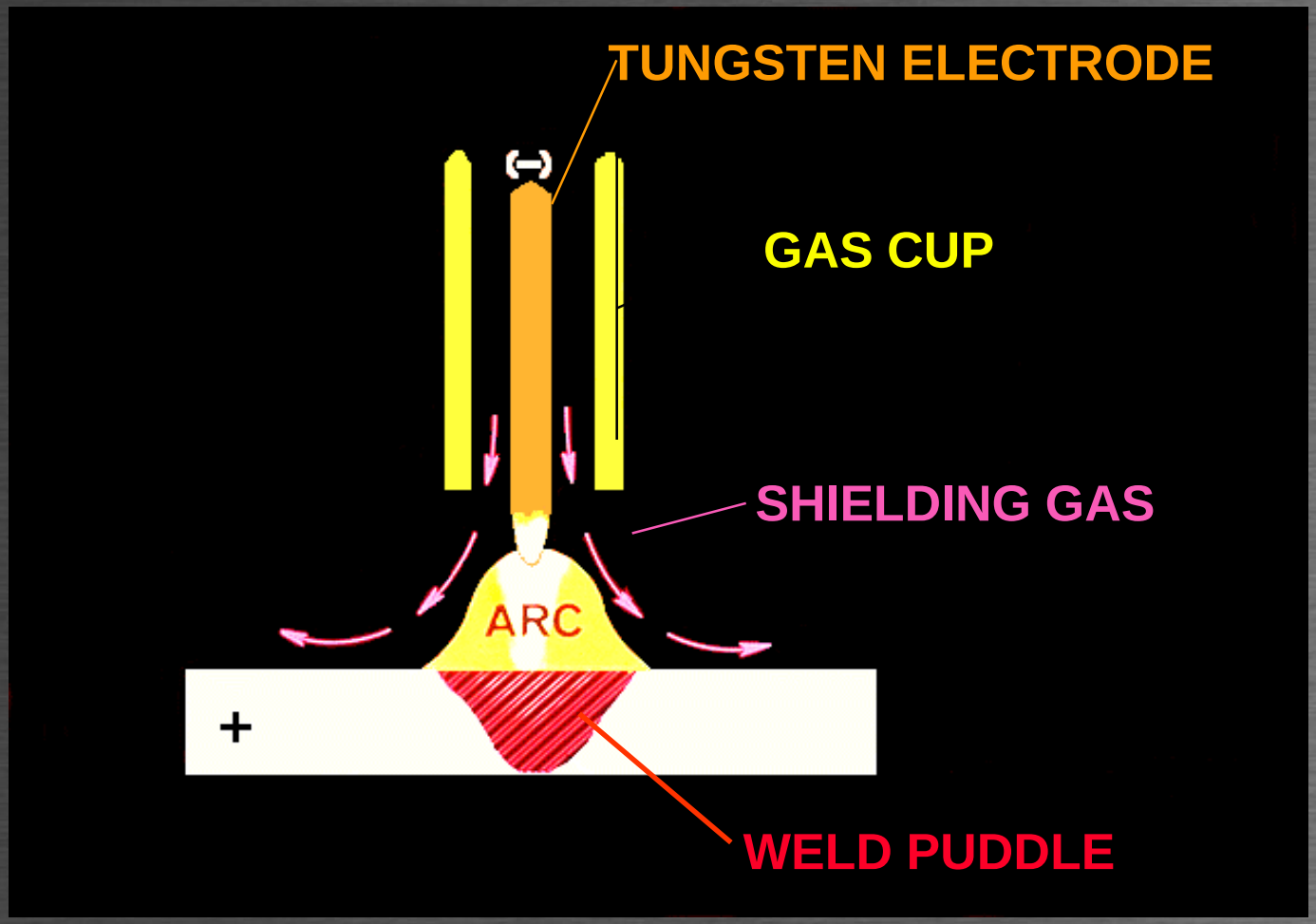
GTAW (TIG) ARC

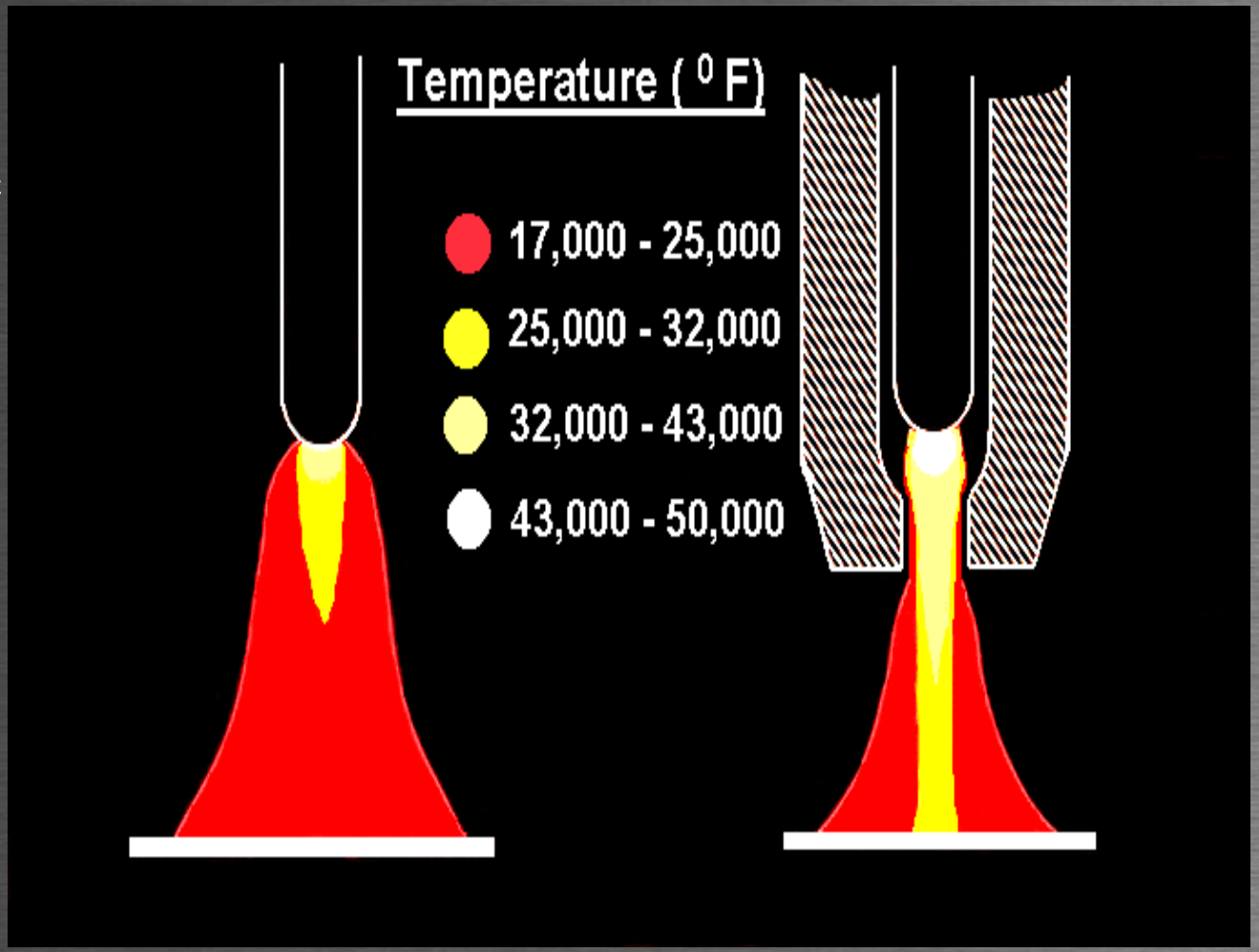


GTAW (TIG) ARC = OPEN ARC

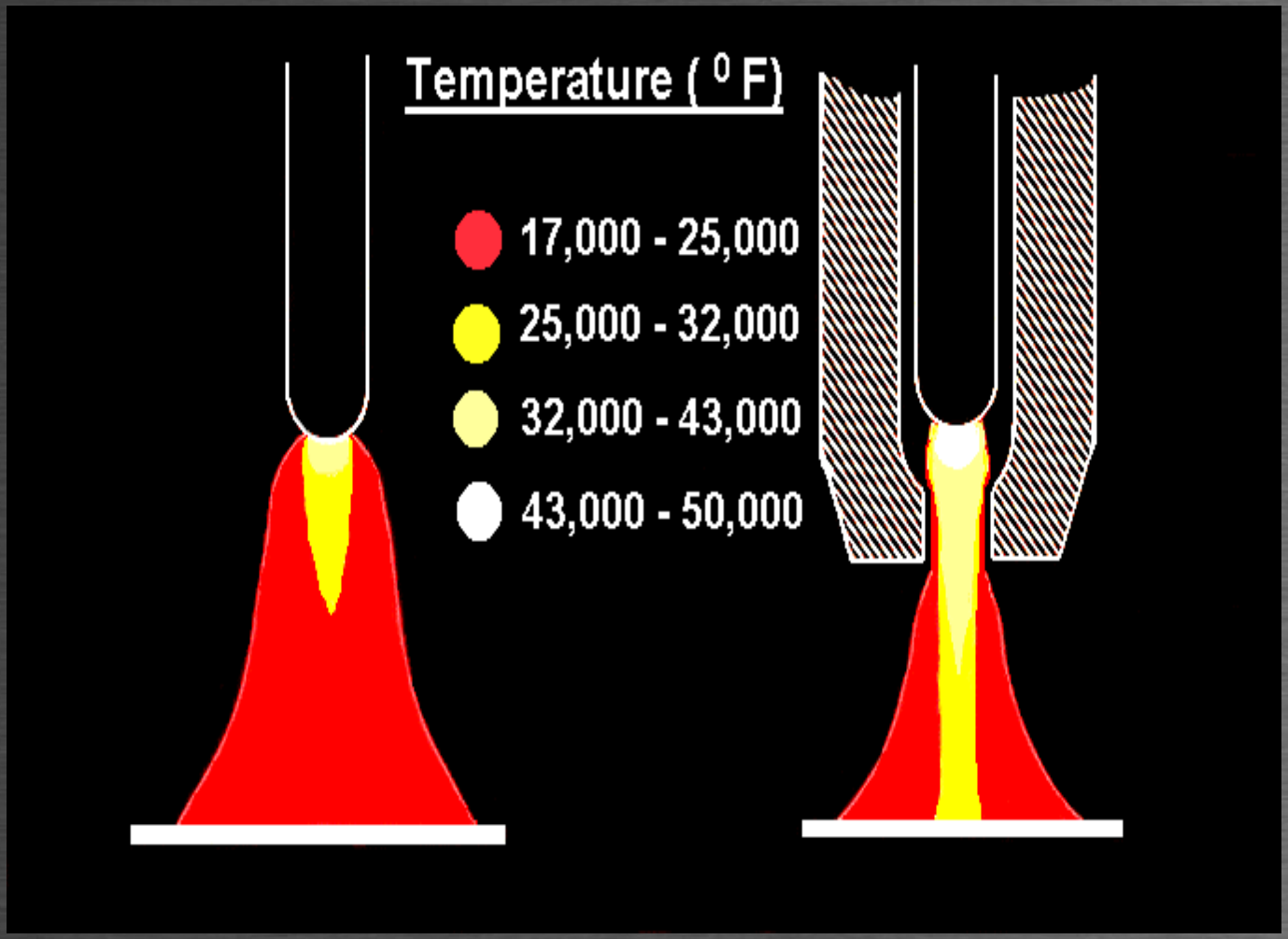
- Excellent heat source - 35,000 ^{0}F
- Arc lacks intensity or focus
- Arc lacks needed velocity to blow molten metal from kerf
- Excellent for welding - unsuitable for cutting or gouging

PLASMA = CONSTRICTED ARC

- Constriction focuses the arc
- Increases arc temperature
- Increases arc voltage
- Flow of gas controls plasma velocity



TEMPERATURE DIFFERENCE

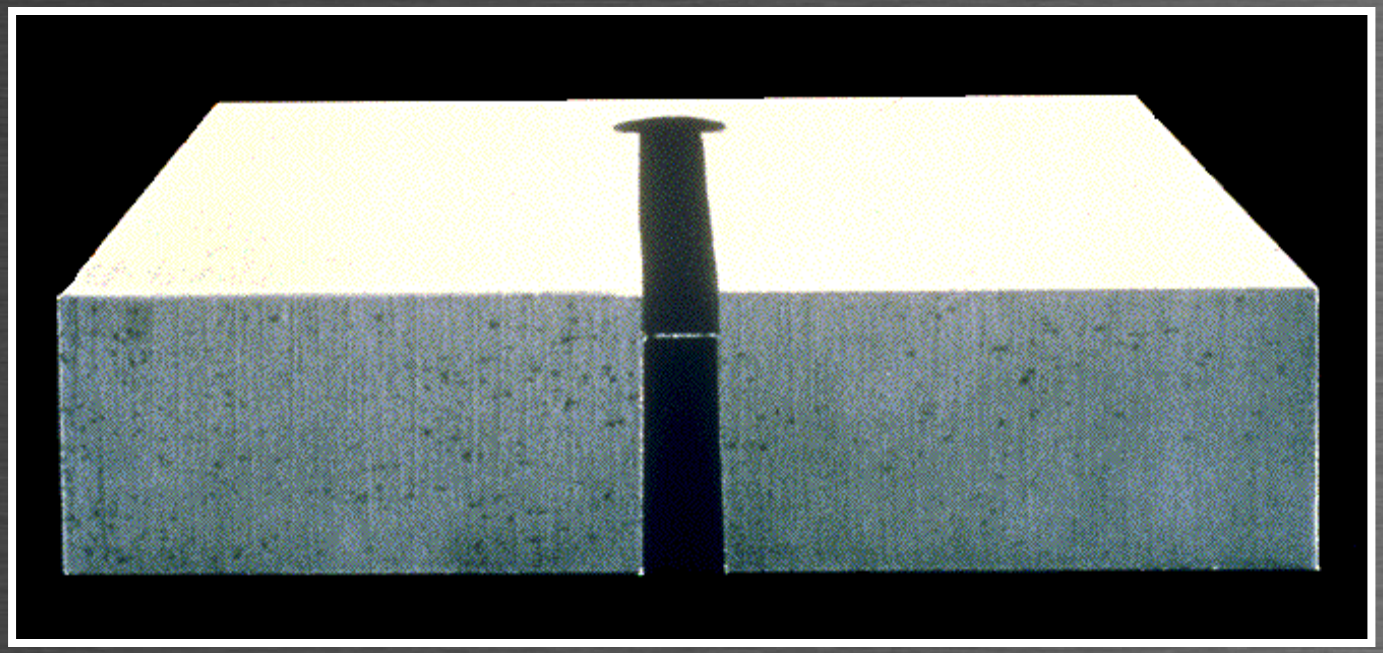


THERMAL SOURCE REQUIREMENTS

- High temperature - to melt metal
- Highly focused and intense source - to make a narrow kerf
- High velocity gas stream - to blow the molten metal from the kerf

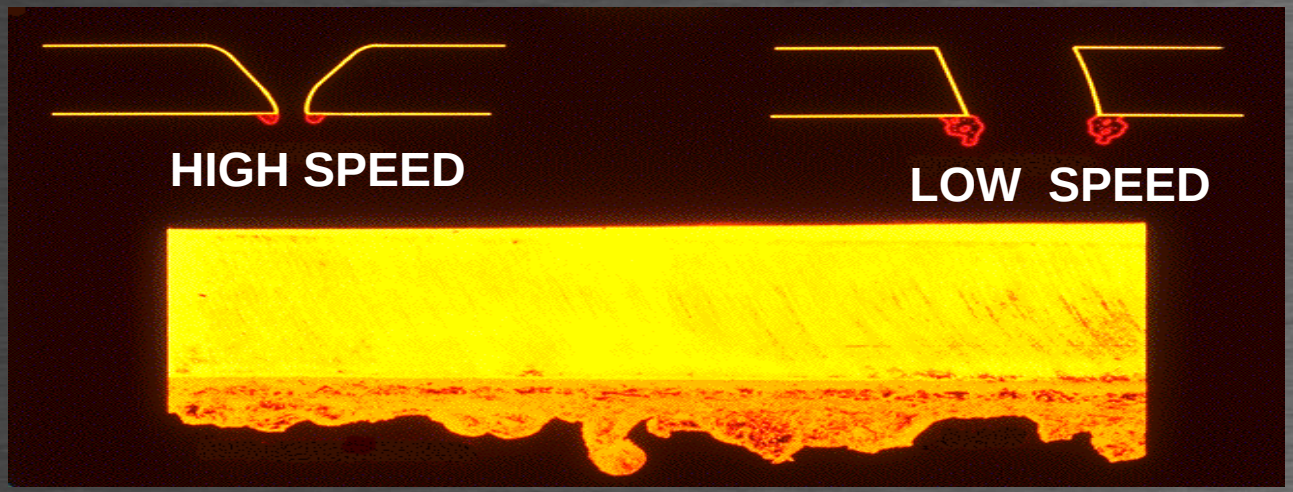
KERF

- **The narrow cut or void left by the cutting process**

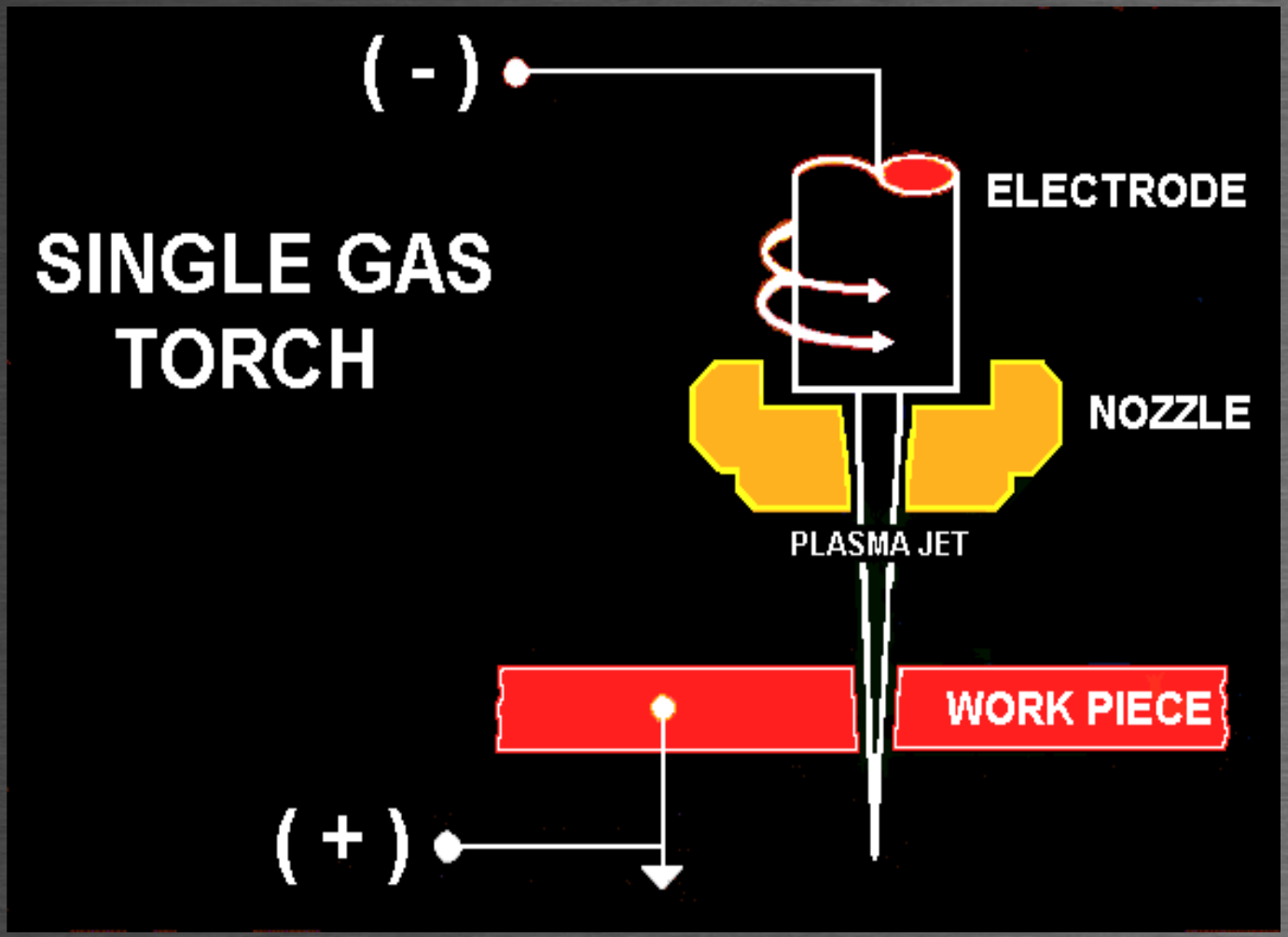


DROSS FORMATION

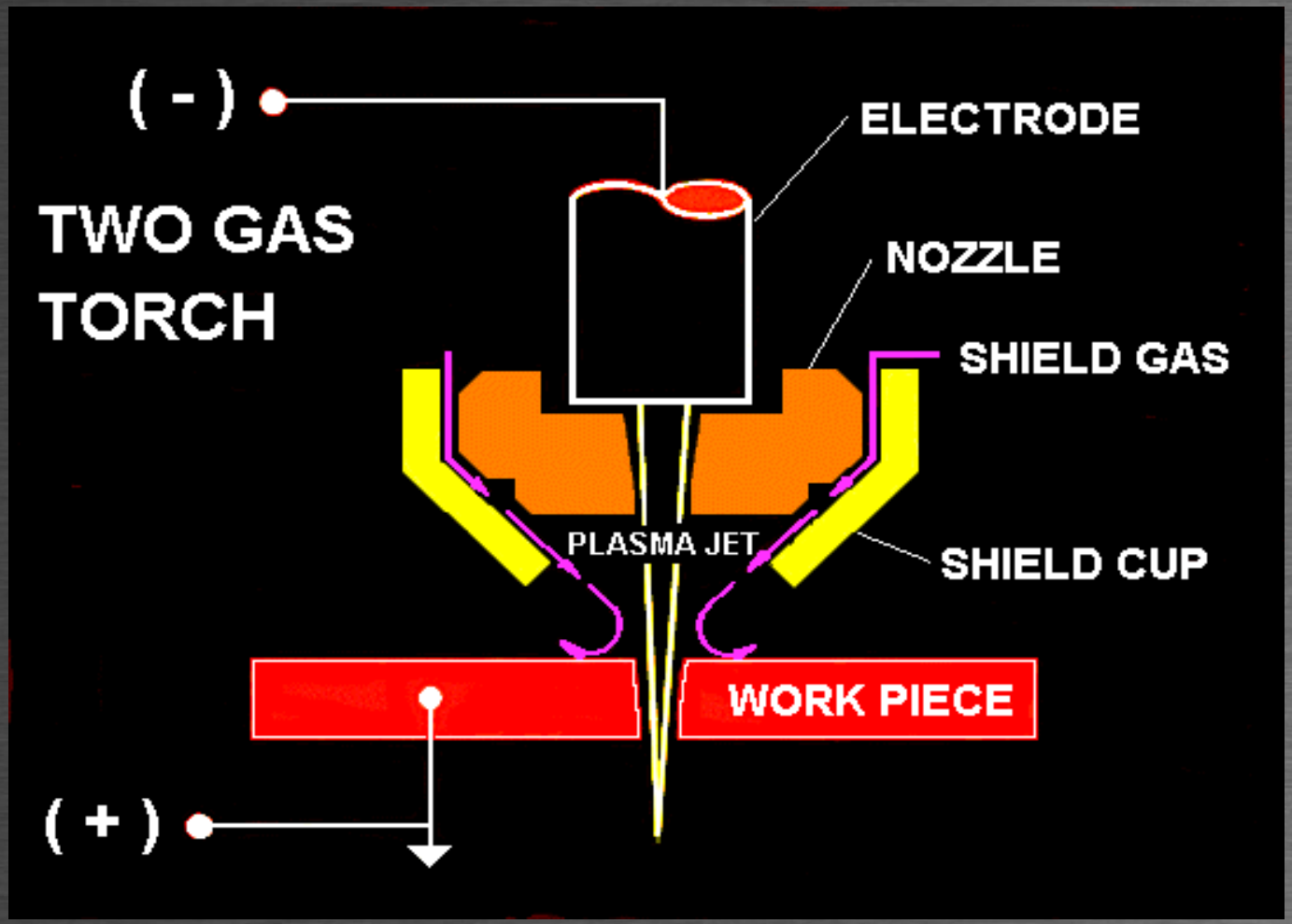
- The molten metal that was blown through the kerf and sticks (welds itself) to the bottom edge of the plate
- Low travel speed - easily removed
- High travel speed - Very difficult to remove



CONVENTIONAL TORCH

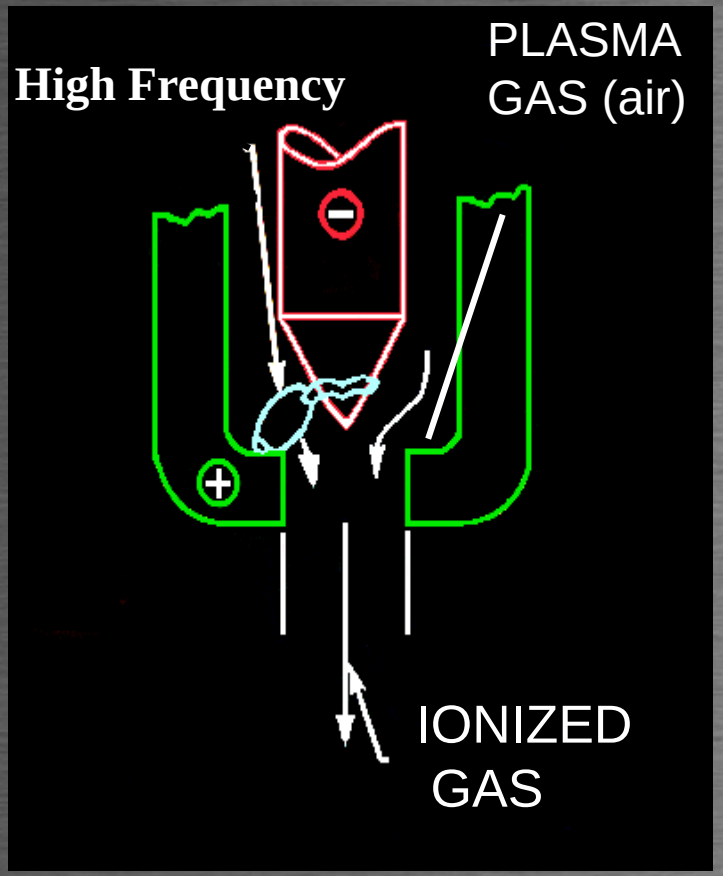


DUAL FLOW TORCH



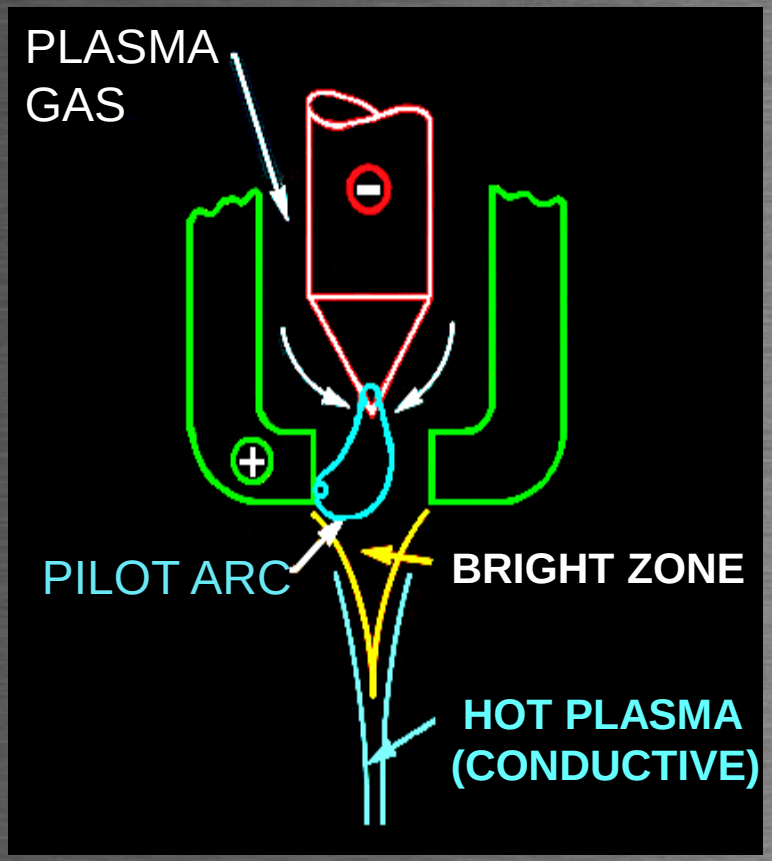
HIGH FREQUENCY STARTING

- High Frequency (HF) starting requires an arc of about 10,000 volt at 1.5 MHz
- This high voltage arc jumps the electrode to nozzle gap and ionizes a path through the gas
- When the cutting tip touches the work piece the main arc flows through this ionized path
- The PT-31XL torch uses a ***HF start***



PILOT ARC STARTING

- Pilot arc torches also require High Frequency to ionize the gas in the torch
- A low current (pilot arc) flows through the HF path. The plasma gas(air) blows this arc through the nozzle
- When the pilot arc comes close enough to the work piece the main cutting arc transfers and takes the place of the pilot arc
- **Advantage -** The cutting tip does not have to touch the work piece resulting in longer life



The PT-25, 26, 27 and PT-121 torches
use a ***PILOT ARC*** start.

PILOT ARC

- After two seconds of *preflow the HF energizes and the *PILOT ARC* fires

(Click on image to play video)

* Preflow: The gas (air) flow prior to the High Frequency and Pilot Arc

OPERATING TIPS

The Do's and Don'ts

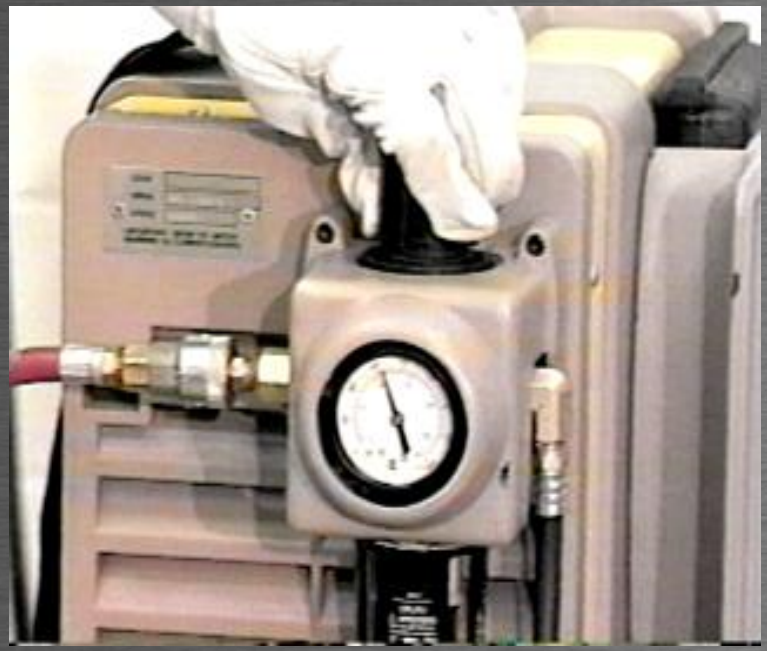
PT-25 / PT-26 / PT-27

TORCH SETUP

- With the POWER turned "OFF" - Check the torch consumables for wear and proper assembly

AIR SETUP

- With the POWER turned "ON" and the AIR CHECK switch in the "ON" position - set the air pressure per the instruction literature (usually 65-75 psi.)

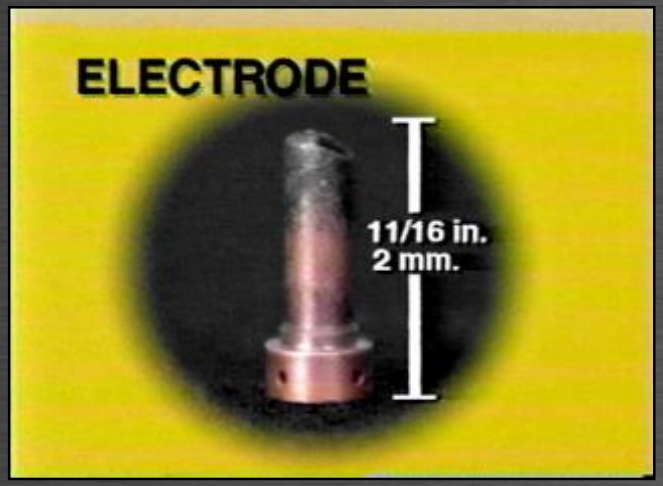


AIR SUPPLY

- Contaminated air supply will shorten electrode and nozzle life.
- Check filter bowl for water or oil.
- An additional air filter/dryer may be necessary. *Available for less than $100.*

WHEN TO CHANGE CONSUMABLES

- Cut speed and quality will deteriorate when the nozzle (tip) or electrode become damaged.



TECHNIQUE

(Click on image to play video)

PLASMA TORCH ARC STARTING

PILOT ARC - START

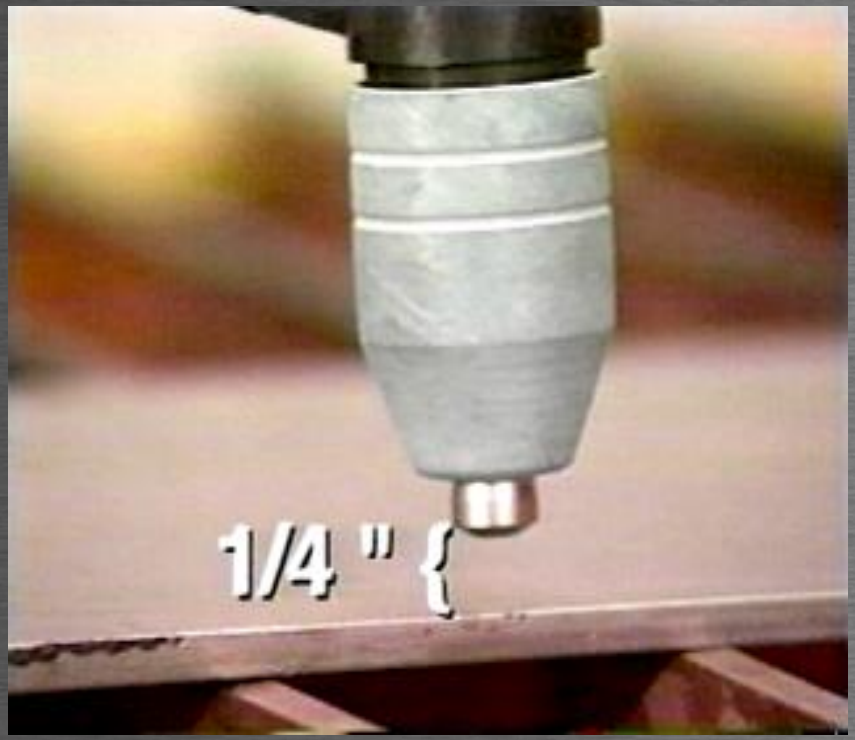
PLACE TIP 1/4” ABOVE PLATE - DO NOT TOUCH PLATE !

PT-25, 26, 27

EDGE STARTS

- *Always* start at the edge -
With some metal under the tip

PT-34, PT-31XL



PT-25, PT-26 or PT-27

EDGE STARTS

- NEVER PLACE THE TIP OVER THE EDGE - WITHOUT METAL UNDER THE TIP

PT-31XL, PT-34

PT-25, 26 or PT-27

PIERCE STARTS

- Never pierce with the torch in the vertical position and the tip touching the plate

PT-25
PT-26 / PT-27

PIERCE STARTS

ANGLE TORCH TO BLOW MOLTEN METAL
AWAY FROM CUTTING TIP AND TORCH HEAD

Pierce Starts

- Angle torch to blow molten metal away from cutting tip and torch head
- NEVER pierce with the torch in the vertical position

(Click on image to play video)

DRAG CUTTING

- Hold the tip against a straight edge
- Follow a template for irregular shapes

(Click on image to play video)

DRAG CUTTING TECHNIQUE

- You can drag the PT-31XL or PT-34 torch on the plate
- Hold the tip against a straight edge
- Follow a template for irregular shapes

CUTTING WITH A CONSTANT STAND OFF

- Hold the torch nozzle approximately 5mm above the plate
- Torch angled of 5º to 15º to plate surface

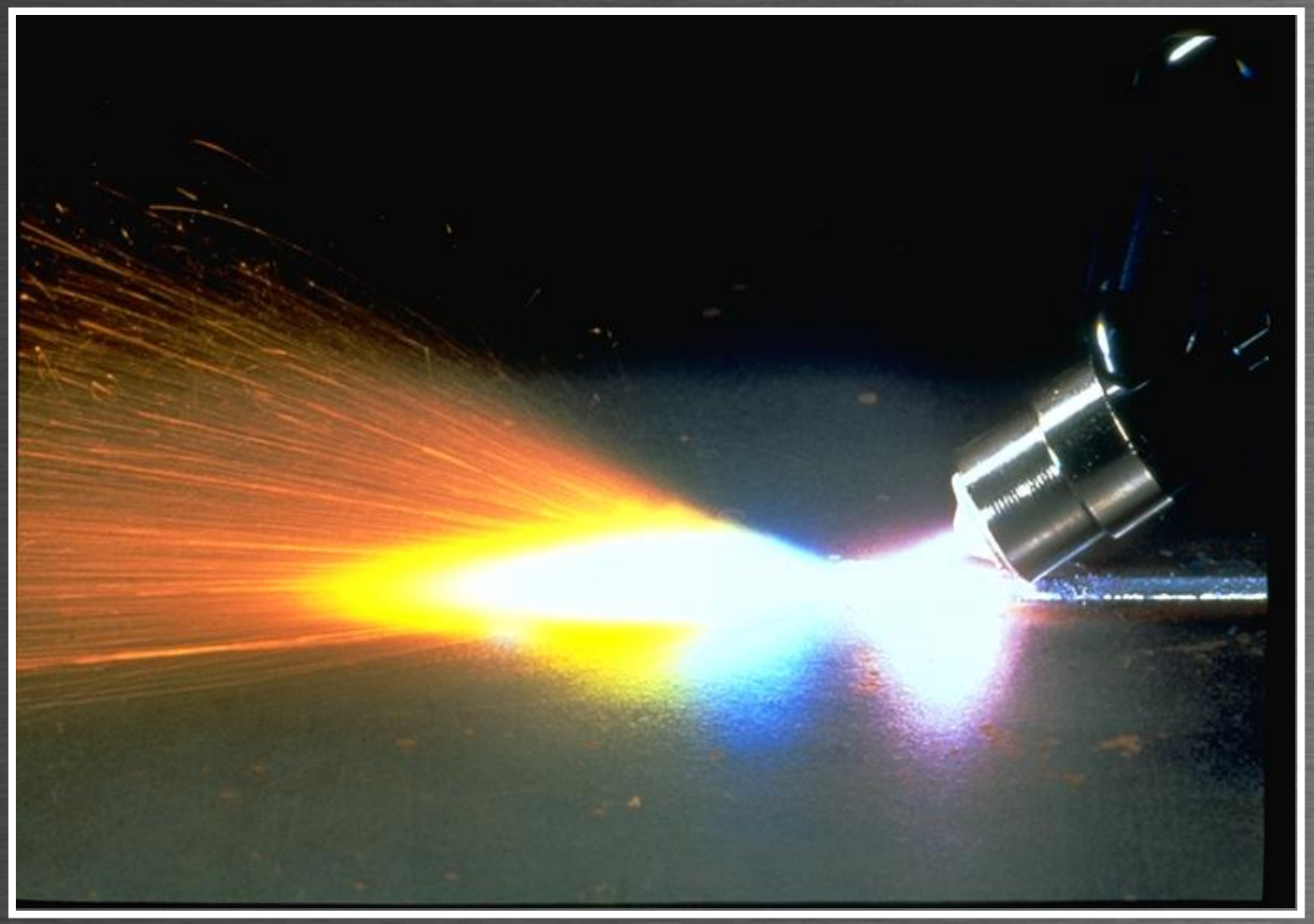
(Click on image to play video)

DRAG CUTTING WITH STAND OFF GUIDE

- Use stand off guide to optimize consumable life

(Click on image to play video)

PLASMA ARC GOUGING



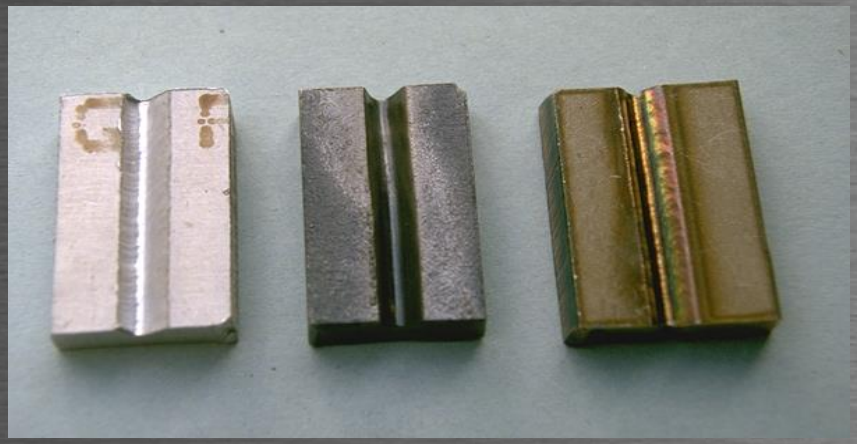
PLASMA GOUGES

AL CS SS

Plasma Gouging

- Torch angled 30º to plate surface
- Arc washes the surface instead of cutting

(Click on image to play video)

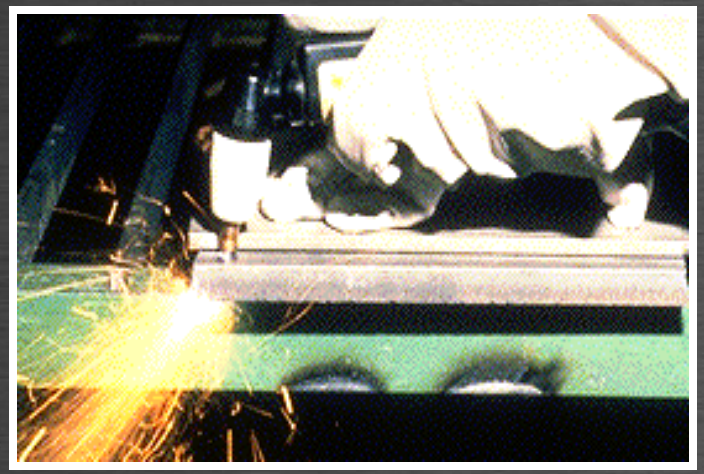


AL **CS** **SS**

PLASMA CUTTING vs GOUGING

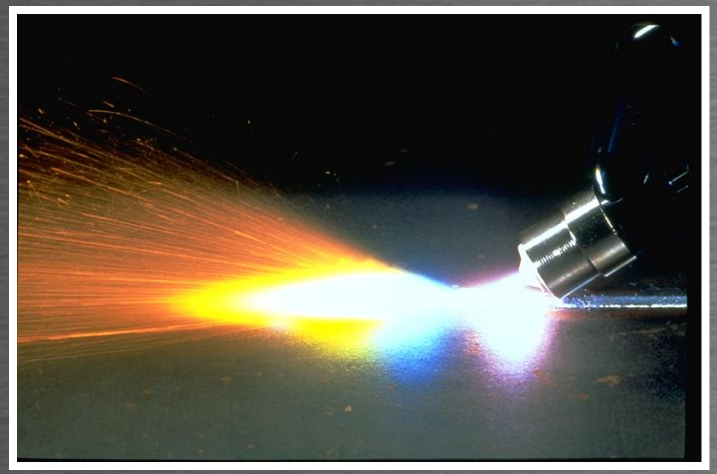
Plasma cutting

- Torch held 90º to plate surface
- Smaller orifice produces highly constricted arc
- High arc force produces cut



Plasma gouging

- Torch angled 30º to plate surface
- Larger orifice produces softer wider arc
- Arc washes the surface instead of cutting



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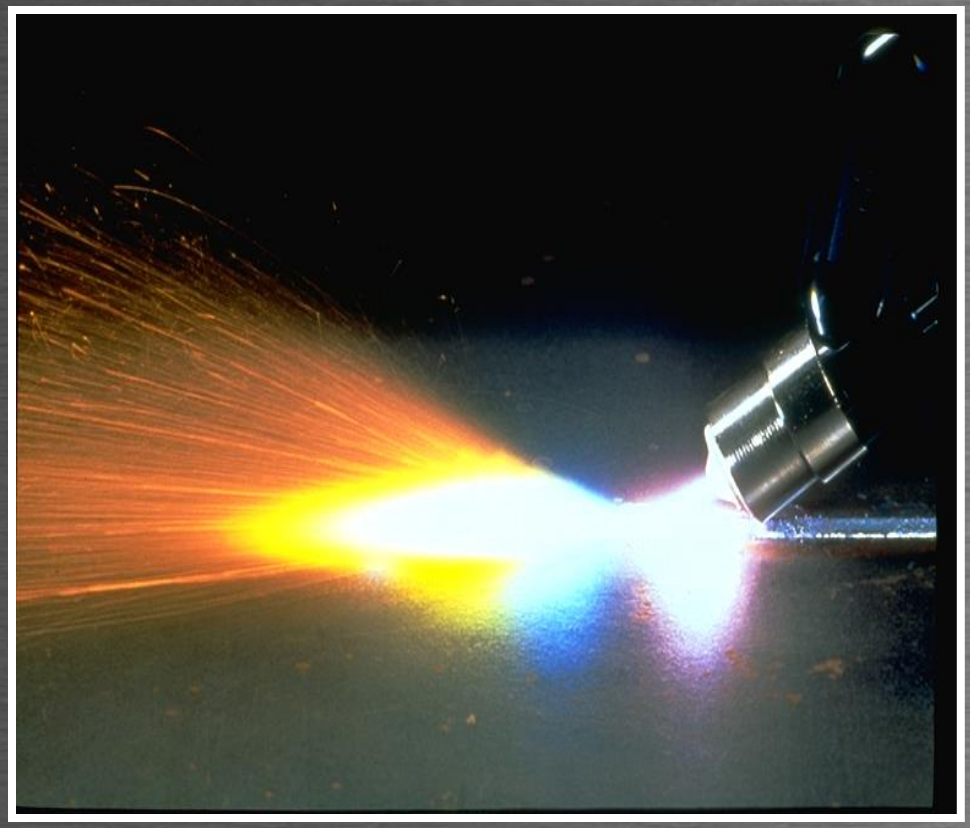
PLASMA GOUGING vs CARBON ARC GOUGING

- Lower fume levels
- Lower noise levels
- High quality surface
- Lower cost



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THE END

Thank You

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