



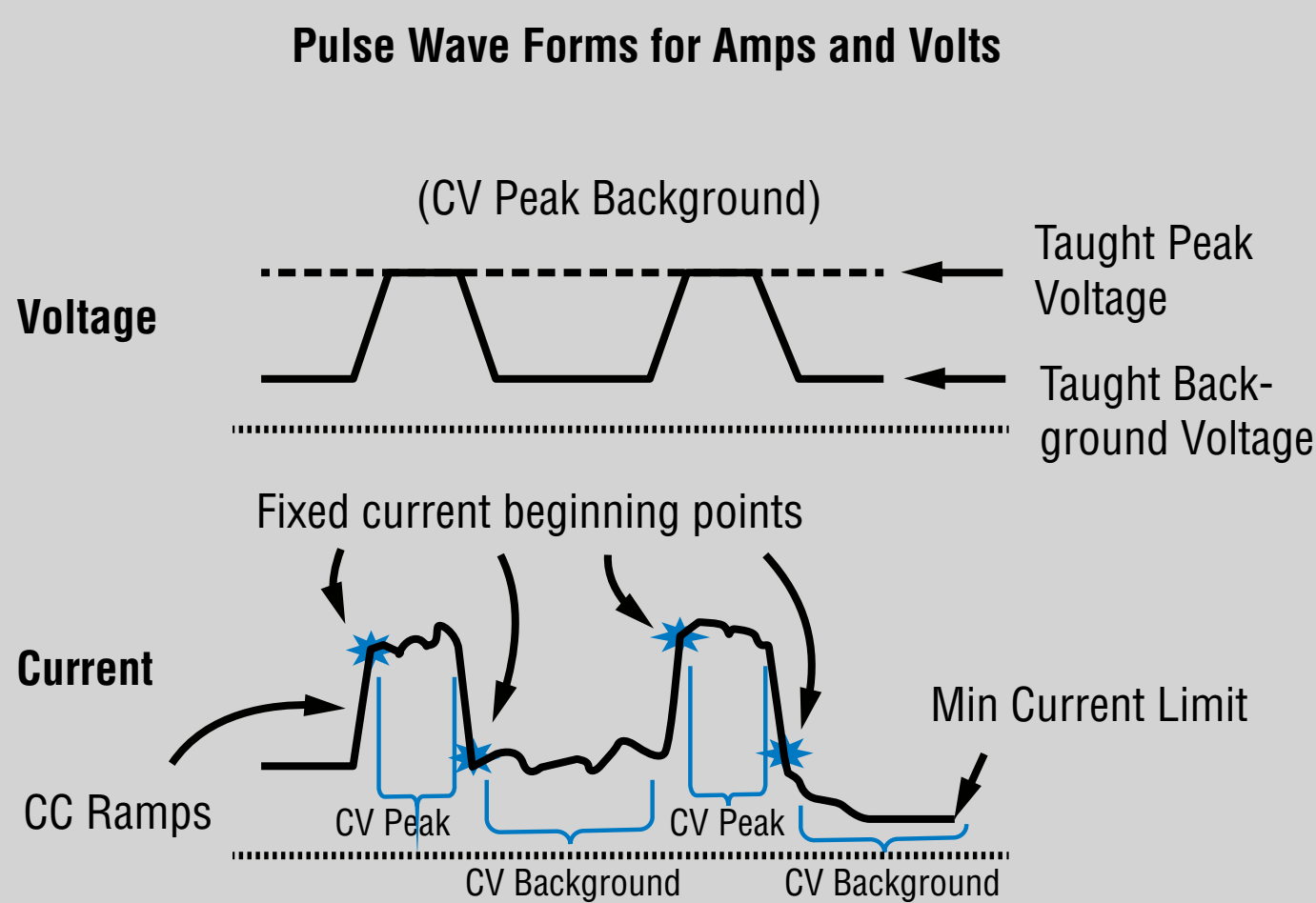
# PULSE/FILL CAP PASS TECHNIQUES

This is a basic set-up and technique guide to welding the fill and cap passes on pipe with the Miller PipeWorx 400 System or the PipeWorx 350 FieldPro™ System using Pulsed (GMAW-P) Gas Metal Arc Welding Transfer methods.

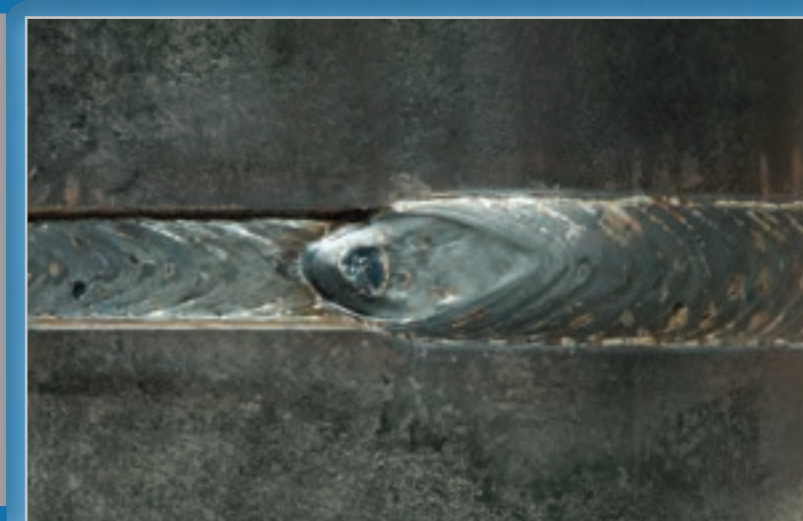
## Pulsed MIG (GMAW-P) Fill and Cap Pass Welding

Pulsed Gas Metal Arc Welding (GMAW-P) using the PipeWorx 400 System or the PipeWorx 350 FieldPro™ System provides a shorter arc length, narrower arc cone and less heat input than traditional pulsed spray transfer systems. Since the process is closed-loop, arc wandering and variations in tip-to-work distances are virtually eliminated. This provides easier puddle control for both in-position and out-of-position welding, reducing welder training time. The process also improves fusion and fill at the toe of the weld, permitting higher travel speeds and higher deposition. This process coupled with RMD® for root pass welding permits welding procedures with one wire and one gas to eliminate process switch-over time.

- Ideally suited to fill and cap pass welding
- Easier puddle control than conventional spray pulse
- Shorter arc lengths and narrow arc cone for out-of-position welding
- More tolerant of tip-to-work variation
- Improve fusion and fill at toe of weld
- Less heat input reduces interpass cooling time and improves weld cycle time
- Enables one-wire with one-gas weld procedures



Pulse MIG Carbon



Pulse MIG Stainless



### Grinding

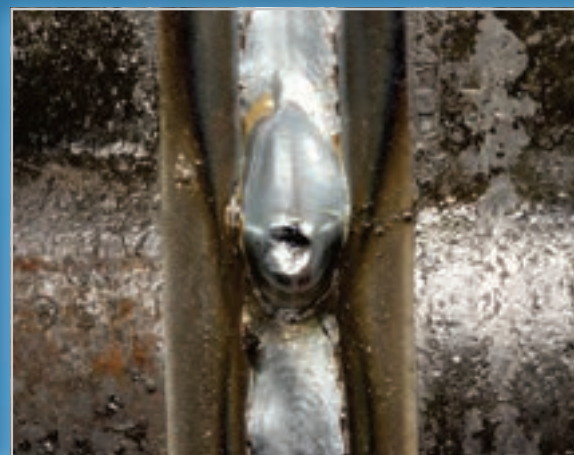
Prior to welding each layer, prepare the weld for the Fill and Cap passes by grinding:

- All high spots
- All arc starts and Stops
- All tie-ins
- Any excessive silicon islands

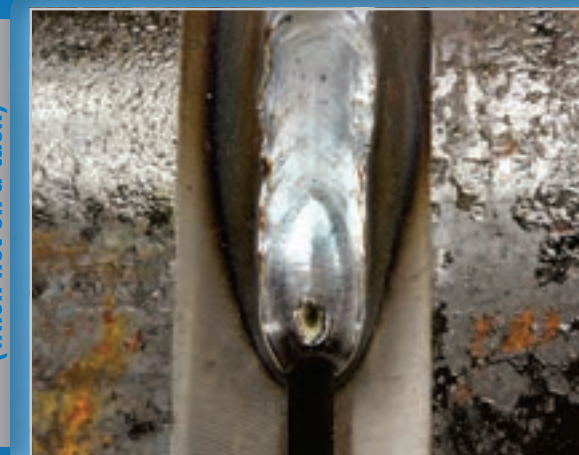
### High Spots



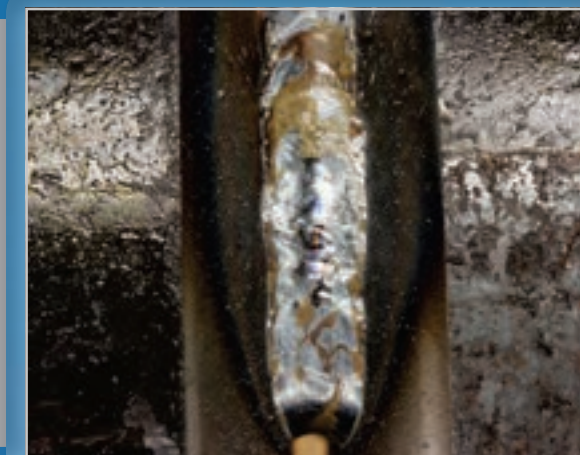
### Starts and Stops



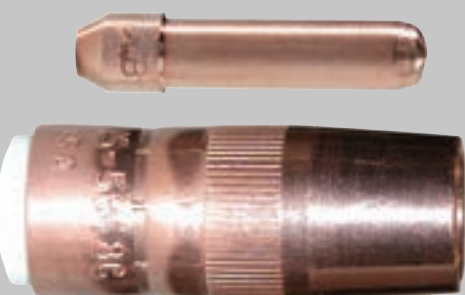
### Root Pass Tie-ins (when not on a tack)



### Excessive Silicon

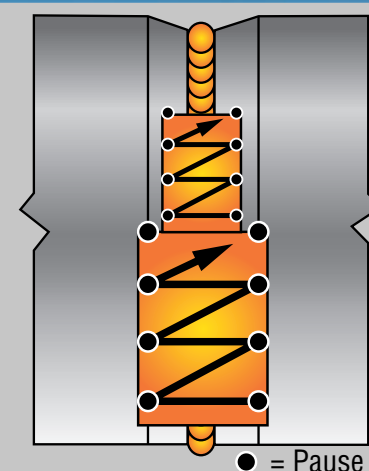


### Gas Nozzle



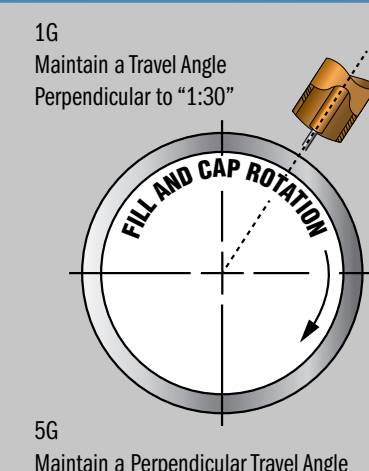
Use a 5/8 in. straight nozzle and tip to ensure proper shielding gas coverage.

### Weave Pattern



For the 1G and 5G positions, use a Z-weave pattern for fill and cap passes. Move quickly across the middle and pause at the sides to ensure the weld fuses and fills in along the toes of the weld.

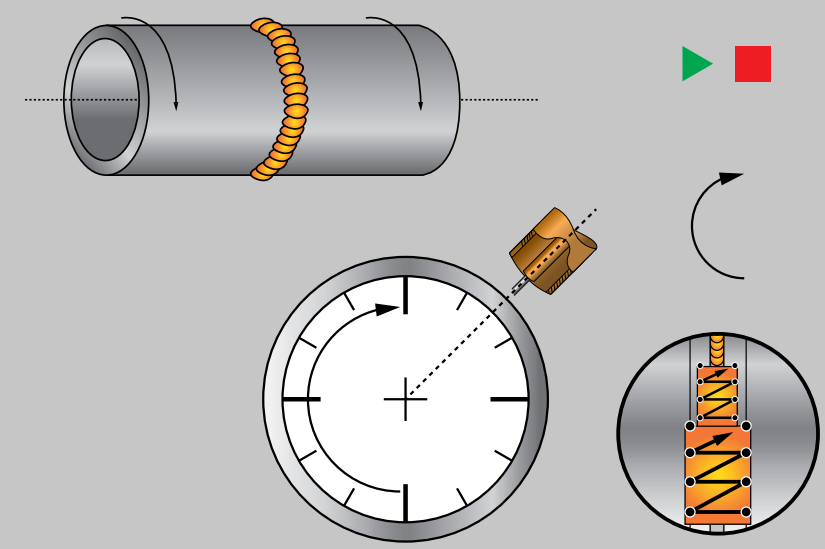
### Torch Position



Maintain a perpendicular Travel Angle (90 degrees).

Maintain a contact tip to work distance of 3/8 in. to 5/8 in.

### 1G

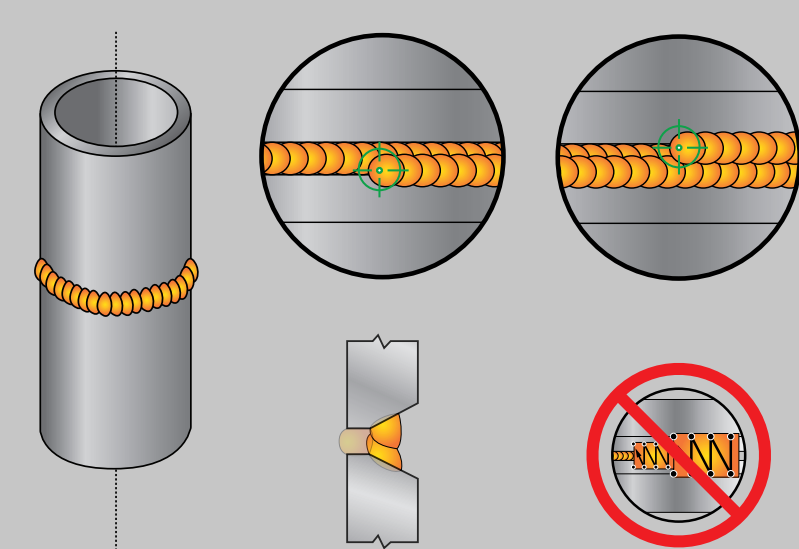


Start and Stop arc at the 1:30 position.

Rotate pipe towards you while maintaining the arc between 1:30 to 2:00.

Weave from side to side in a Z-pattern. Move quick through the middle and pause on the sides.

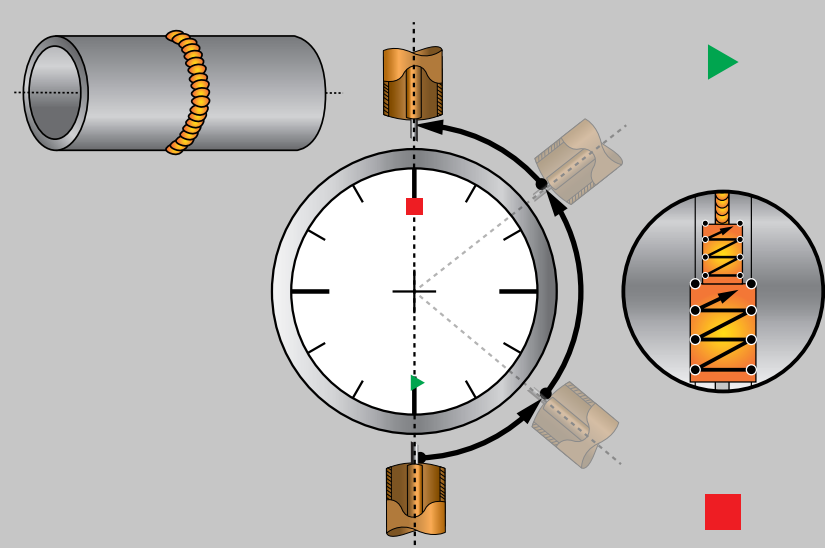
### 2G



Deposit stringer beads with the arc cone directed at the toes of the previous weld for sufficient tie in.

Avoid weaving as gravity could cause cold lap on the bottom portion of the weld.

### 5G

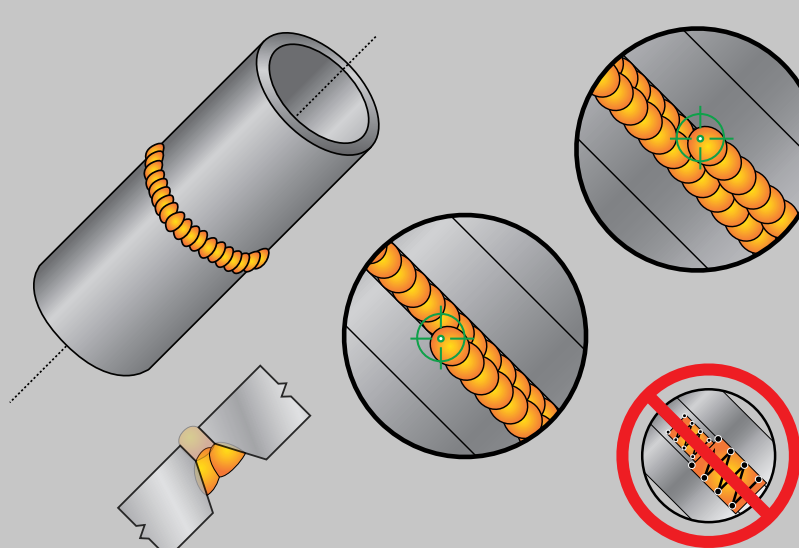


Start at the at 6:00 position.

Weave from side to side in a Z-pattern while traveling up the pipe. Move quick through the middle and pause on the sides.

End at the 12:00 position.

### 6G



Deposit stringer beads with the arc cone directed at the toes of the previous weld for sufficient tie in.

Avoid weaving as gravity could cause cold lap on the bottom portion of the weld.