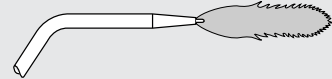


## Setting up for welding

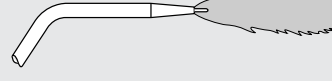
Correct welding practice requires a steady constant flame shape and this can only be achieved with Multi-Stage regulators. Good welds are the result of good "set up" and time should be taken to learn the correct pressure settings for each nozzle size. The recommendations given below are the result of careful study and their use will create the best flame shape with optimum gas economy, coupled with reduced risk of backfire or flashback. Never "force" a nozzle, use the right size.

Most welding operations require the neutral flame to produce quality joints. This flame burns equal proportions of each gas. Other flames are needed for specialised operations as shown below.

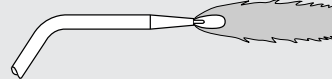
### Oxidizing Flame (excess oxygen)



### Neutral flame (equal quantities of oxygen and acetylene)



### Carburizing Flame (excess acetylene)



To ignite the blowpipe open the fuel-gas control valve and light gas with a sparklighter. When doing so ensure the sparklighter is held at right angles to the nozzle.

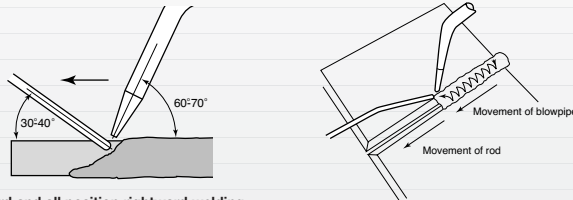
Adjust the blowpipe valve until the flame just ceases to smoke then gradually turn on the blowpipe oxygen control valve until the white cone of the flame is sharply defined with the merest trace of acetylene haze. In this condition the flame is neutral and is burning approximately equal volumes of oxygen.

## Welding Techniques

### Leftward welding

Leftward welding is used on steel for flanged edge welds, for unbevelled plates up to 5mm (3/16in) and for bevelled plates up to 8.0mm (5/16in). It is also the method usually adopted for cast iron and non-ferrous metals. Welding is started at the right-hand end of the joint and proceeds towards the left.

The blowpipe is given a forward motion with a slight sideways movement to maintain melting of the edges of both plates at the desired rate and the welding rod is moved progressively along the weld seam - The sideways motion of the blowpipe should be restricted to a minimum.

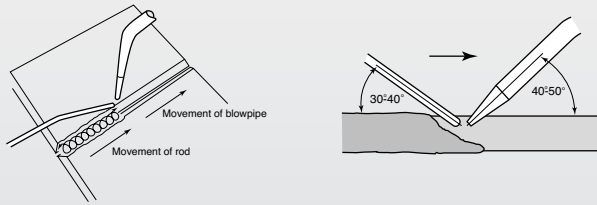


### Rightward and all position rightward welding

Rightward welding is recommended for steel plate over 5.0mm (3/16in) thick. Plates from 5.0mm to 8.0mm (3/16in to 5/16in) need not be bevelled; over 8.0mm (5/16in) the edges are bevelled to 30° to give an included angle of 60° for the welding V. Suitable for horizontal/vertical position.

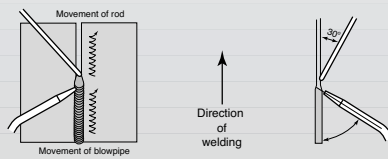
The weld is started at the left-hand end and moves towards the right with the blowpipe flame preceding the filler rod in the direction of travel. The rod is given a circular forward motion and the blowpipe is moved steadily along the weld seam - this is faster than leftward welding and consumes less gas; the V angle is smaller, less filler rod is used and there is less distortion. The all-position rightward technique is a modification of the above and is particularly suitable for mild steel plate and pipe in the vertical and overhead position.

The advantages are that it enables the welder to obtain a uniform penetration bead and an even build-up, particularly in fixed position welding; the welder can work with complete freedom of movement and has a clear view of the weld pool and the fusion zone of the joint.



### Vertical welding

Vertical welding may be used on bevelled steel plate up to 3mm (1/8in) thickness and up to 15mm (5/8in) when two welders are employed working on both sides of the joint; welding starts at the bottom and proceeds vertically. See below for methods of blowpipe and welding rod manipulation for single-operator techniques, (up to 5mm (1/8in) thick).



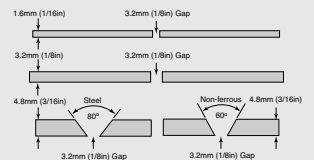
## Welding Preparation

Before any welding work is performed it is essential that the edges are correctly prepared and clean. All mill scale, grease, primer or rust must be thoroughly removed or welding will be difficult and the deposit contaminated. Weld integrity depends on preparation and below are recommended edges.

### Downhand Welding

Thickness of metal	Diameter of welding rod	Edge preparation	Speed ft per hour	Thickness of metal	
Less than 20 swg	3/64-1/16in		25-30	1/32in	
				1/16in	
20 swg -1/8in	1/16-1/8in		20-25	3/32	
				1/8in	
1/8-3/16in	1/8-5/32in		15-18	5/32in	
				3/16in	
3/16-5/16in	1/8-5/32in		10-12	1/4in	
				5/16in	
5/16-5/8in	5/32-1/4in		6-7	3/8in	
				1/2in	
5/8in and over	1/4in		3 1/2-4 1/2	5/8in	
				3/4in	
				2-2 1/2	1in

### Vertical Welding



### Pre and Post Weld Treatment

When welding brittle materials it is recommended that suitable Preheat be applied to prevent rapid thermal expansion and subsequent cracking. On completion of welding a Postheat treatment may also be used to allow the joint and parent metal to cool down together again to prevent cracking.

If fluxes have been used then the residue should be thoroughly removed as they exhibit post weld corrosive characteristics which will damage the weldment.

## Welding Nozzles



Saffire 3 swaged

### Saffire Swaged Nozzles

MILD STEEL Plate Thickness			NOZZLE Size	OPERATING PRESSURE		GAS CONSUMPTION	
mm	inch	swg		Oxygen bar	Acetylene bar	Oxygen L/min ft3/hr	Acetylene L/min ft3/hr
.9		20	1	.14	.14	.47	.47
1.2		18	2	.14	.14	.94	.94
2.0		14	3	.14	.14	1.65	1.42
2.6		12	5	.21	.21	2.83	2.36
3.2	1/8	10	7	.21	.21	3.77	3.3
4.0	3/32	8	10	.28	.28	5.2	4.7
5.0	3/16	6	13	.28	.28	7.1	6.5
6.5	1/4	3	18	.35	.35	9.4	8.5
8.2	5/16	0	25	.48	.4	12.7	11.8
10	3/8	4/0	35	.66	.66	17.9	16.5
13	1/2	7/0	45	.46	.4	22.6	21.2
25+	1+		90	.62	.62	44.8	42.5

### Saffire Lightweight swaged



### Saffire Lightweight Swaged Nozzles & Saffire DH Tips

MILD STEEL Plate Thickness			NOZZLE Size	OPERATING PRESSURE		GAS CONSUMPTION	
mm	inch	swg		Oxygen bar	Acetylene bar	Oxygen L/min ft3/hr	Acetylene L/min ft3/hr
.9		20	1	.14	.14	.47	.47
1.2		18	2	.14	.14	1.42	.94
2.0		14	3	.14	.14	1.42	1.42
2.6		12	5	.28	.21	2.83	2.36
3.2	1/8	10	7	.35	.21	4.72	3.3
4.0	3/32	8	10	.35	.28	5.2	4.7
5.0	3/16	6	13	.48	.35	7.1	6.13
6.5	1/4	3	18	.55	.41	9.4	8.5
8.2	5/16	0	25	.69	.55	12.7	11.8

### Saffire Model 'O' Tips

for Model 'O' Blowpipe



### Model 'O' Tips

MILD STEEL Plate Thickness			NOZZLE Size	OPERATING PRESSURE		GAS CONSUMPTION	
mm	inch	swg lb Lead		Oxygen bar	Acetylene bar	Oxygen L/min ft3/hr	Acetylene L/min ft3/hr
0.8	1/32	2-3	1	.1	1.5	.083	.175
1.6	1/16	4-5	2	.17	2.5	.2	.425
2.4	3/32	6-8	3	.21	3	.52	1.1
3.2	1/4	10-20	4	.28	4	1.03	2.2
4.8	5/32	18-30	5	.34	5	2.08	4.4