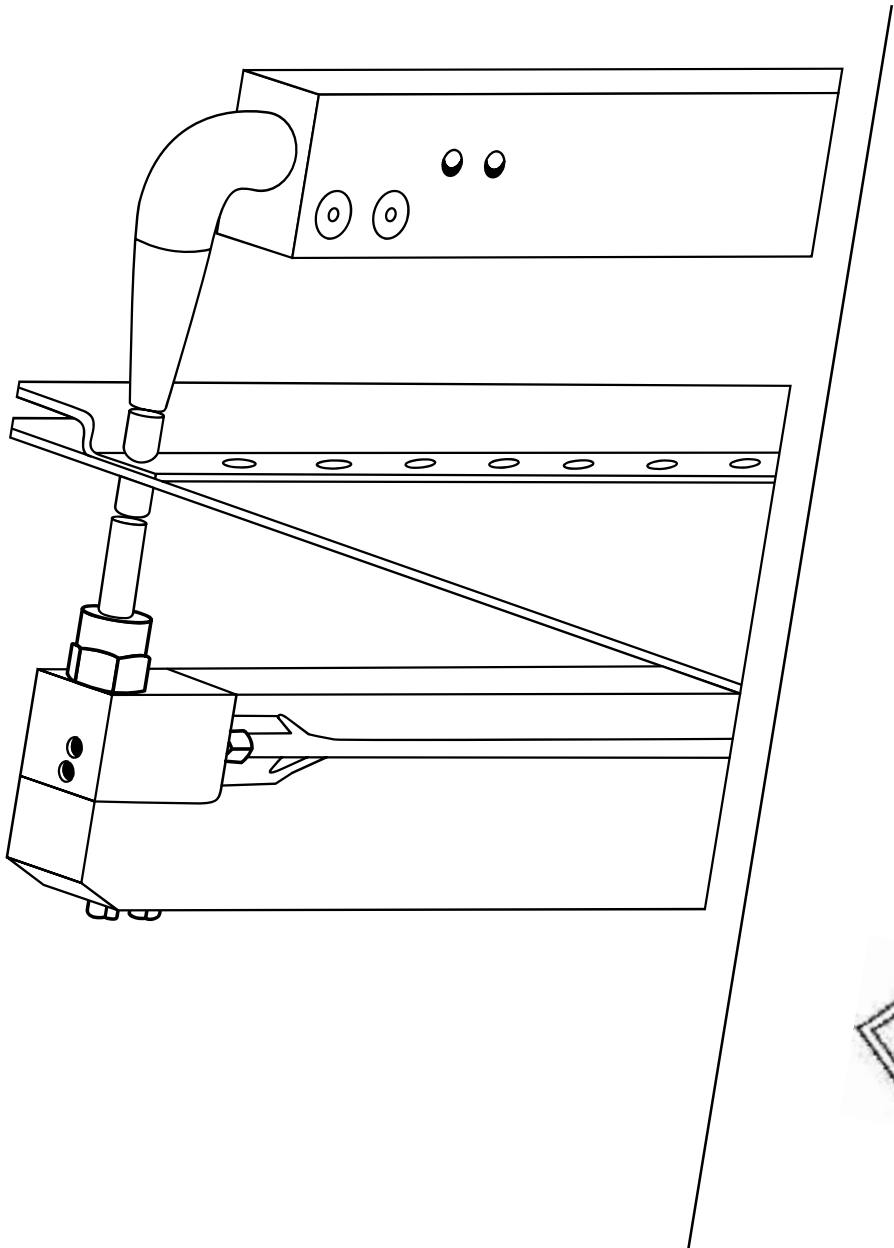




AWS RWPH:2011

Resistance Welding Pocket Handbook



American Welding Society

AWS RWPH:2011

Resistance Welding Pocket Handbook

1st Edition

Prepared by the
American Welding Society (AWS) J1 Committee on Resistance Welding Equipment

With guidance from the
AWS RWMA Committee

Under the Direction of the
AWS Technical Activities Committee

Abstract

General information relating to the operation of common resistance welding equipment.



American Welding Society

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Statement of Use. Although care was taken in choosing and presenting the data in this pocket handbook, AWS cannot guarantee that it is error free. Further, this Pocket Handbook is not intended to be an exhaustive treatment of the topic and therefore may not include all available information, including with respect to safety and health issues. By publishing this Pocket Handbook, AWS does not insure anyone using the information it contains, against any liability or injury to property or persons arising from that use.

This booklet contains:

- basic information on resistance welding
- important “do’s” and “don’ts”
- common weld defects and their probable causes
- various charts including sample weld schedules

While this pocket handbook contains important safety tips, it is NOT a safety manual. Nor is it an operator’s manual or a maintenance manual. It cannot take the place of any of these. Similarly, it is not an industry standard and does not replace any existing industry standards. Its sole purpose is to help you make better and more consistent welds.

For additional information please consult other AWS technical documents relating to resistance welding. Assistance can also be obtained from the members of the RWMA Committee of the American Welding Society.



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What is a Resistance Weld?

It is the localized fusion of metal where the heat required for coalescence is caused by the flow of electric current through the workpieces and pressure is applied by the electrodes to forge the parts together. An example resistance welding configuration is shown in Figure 1.

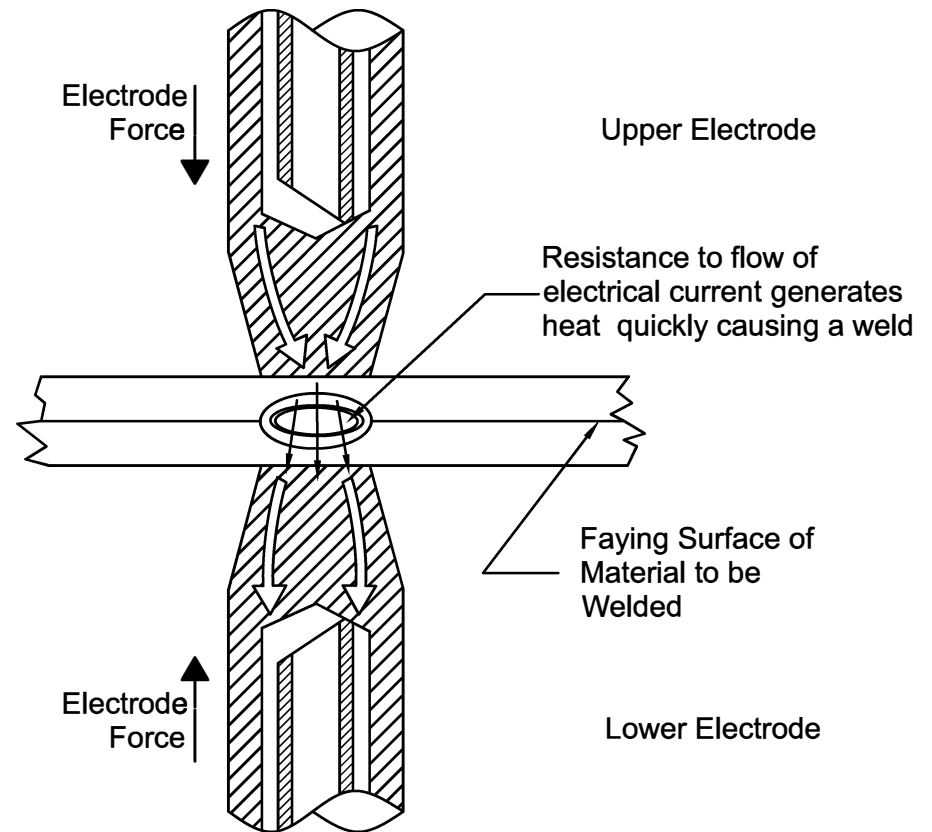


Figure 1—Basic Resistance Weld Configuration

Why Resistance Weld?

The advantages of resistance welding are many and include the fact that it is:

- An economical process
- Adaptable to a wide variety of materials including low carbon steel, coated steels, stainless steel, aluminum, nickel, titanium, and copper alloys
- Applicable to a variety of metal thicknesses
- A process with short cycle times
- A robust process
- Tolerant to fit-up variations

For additional information on the process or equipment, consult relevant literature from the list on pages 43 to 45, and/or contact any of the member companies of the AWS RWMA (Resistance Welding Manufacturing Alliance) Committee, or the resistance welding equipment members of the AWS WEMCO (Welding Equipment Manufacturers Committee).

The Resistance Welding Processes

Spot Welding

In this most widely used resistance welding process, two opposing electrodes apply force and current to metals that overlap (lap joint). Figure 2 shows examples of the various types of spot welds. Additional information may be found in Chapter 1 of the *AWS Welding Handbook*, 9th Edition, Vol. 3, or Chapter 2 of the *RWMA Resistance Welding Manual*.

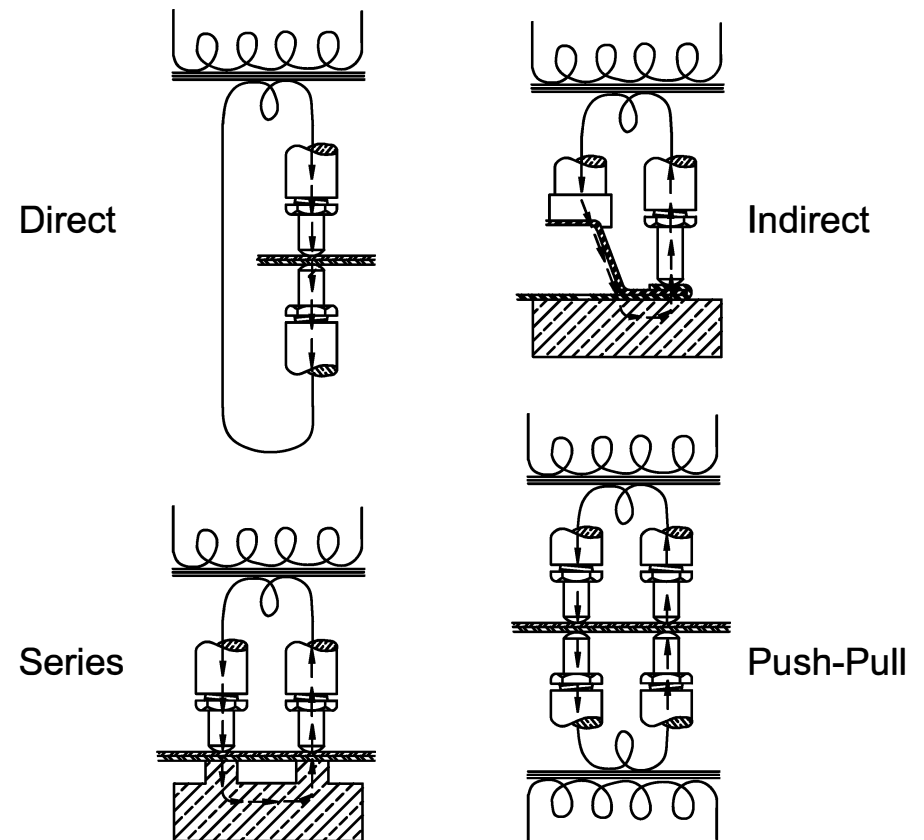


Figure 2—Types of Spot Welds

Projection Welding

In this variation of the resistance welding process, the metals to be welded meet at a localized point, which exists to concentrate the force and current. In some parts, such as cross-wire welding, the localized point of contact results from the natural part geometry. Most of the time, the projection must be formed or machined in one of the parts. Figure 3 shows some examples of projections before welding. Additional information may be found in Chapter 2 of the *AWS Welding Handbook*, 9th Edition, Vol. 3, or Chapter 3 of the *RWMA Resistance Welding Manual*.

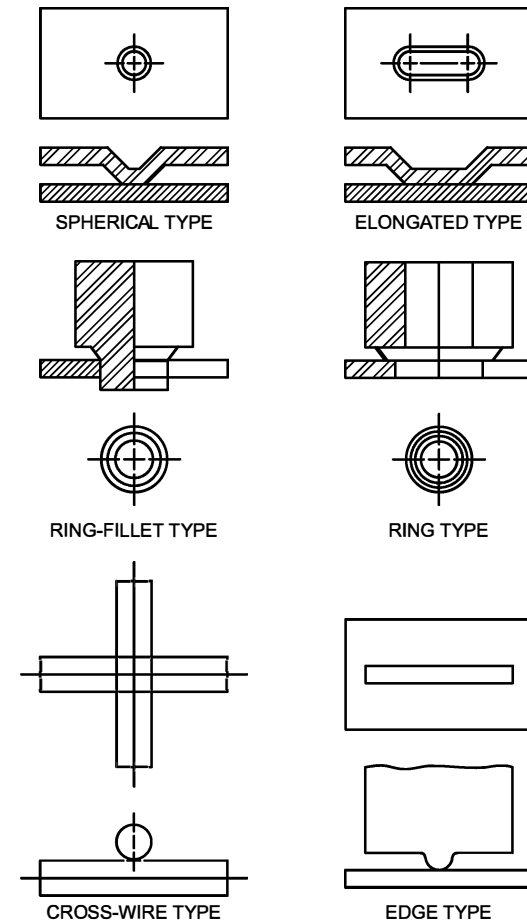


Figure 3—Types of Projection Welds

Seam Welding

Similar to spot welding, except the circular electrodes (seam welding wheels) are rotating when the weld is being made. If the time between the welds is increased such that the welds do not overlap to form a continuous seam weld, the result is known as a roll spot weld. Additional information may be found in Chapter 1 of the *AWS Welding Handbook*, 9th Edition, Vol. 3, or Chapter 4 of the *RWMA Resistance Welding Manual*.

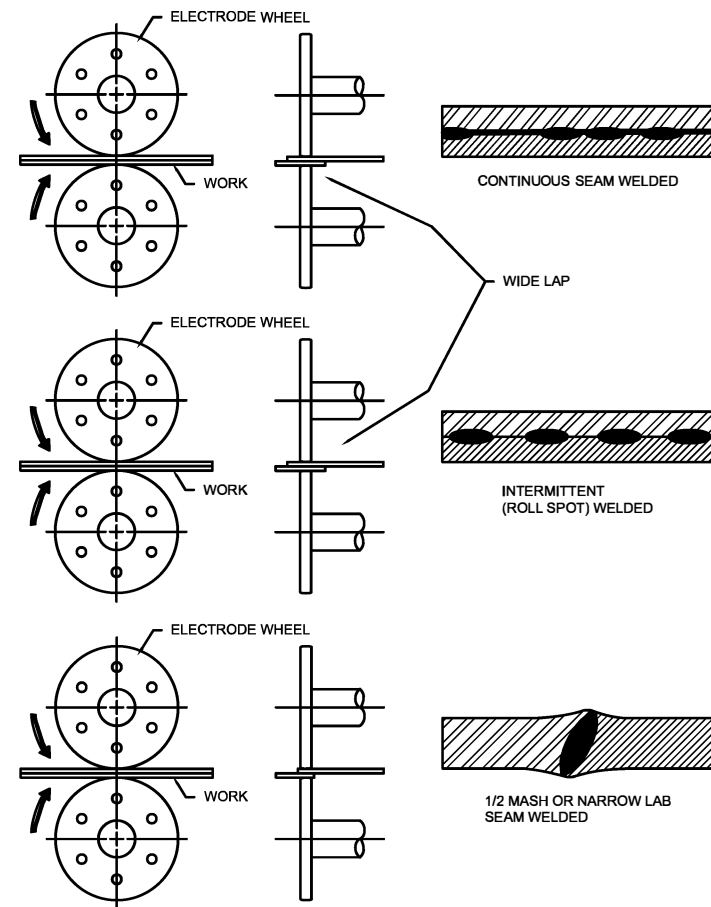


Figure 4—Seam Welding

Upset Welding (Butt Welding)

The ends of the two parts are forced together while welding current and force are applied.

Flash Welding

During the initial sequence, the parts are held lightly together while current is applied. Then as material is flashed away and the proper temperature is reached the parts are forced together to complete the weld.

Additional information on these processes may be found in Chapter 3 of the *AWS Welding Handbook*, 9th Edition, Vol. 3, or Chapter 5 of the *RWMA Resistance Welding Manual*.

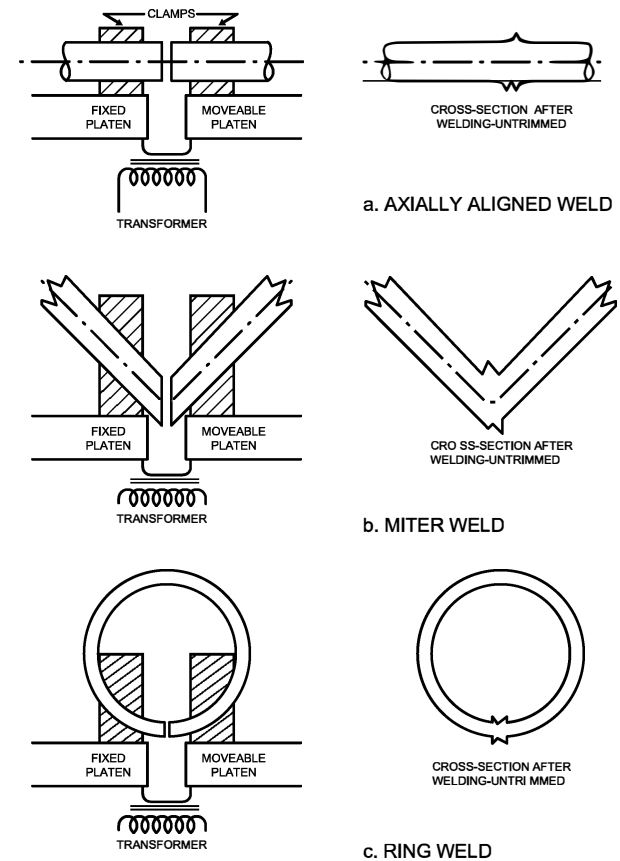


Figure 5—Common Upset and Flash Welding Configurations

Hot Upsetting

In this process, heat is created by electrical current and then the workpiece is upset by the electrode force. Hot upsetting is commonly applied to rivets and pins to lower the force required to create a head and/or bulge.

Resistance Brazing/Resistance Soldering

These are processes where the heat created by the resistance to current flow through two parts is used to melt a low-temperature filler metal.

Resistance Parting

As the metal is heated by the electric current in this process, force is applied to separate the workpiece midway between the electrodes.

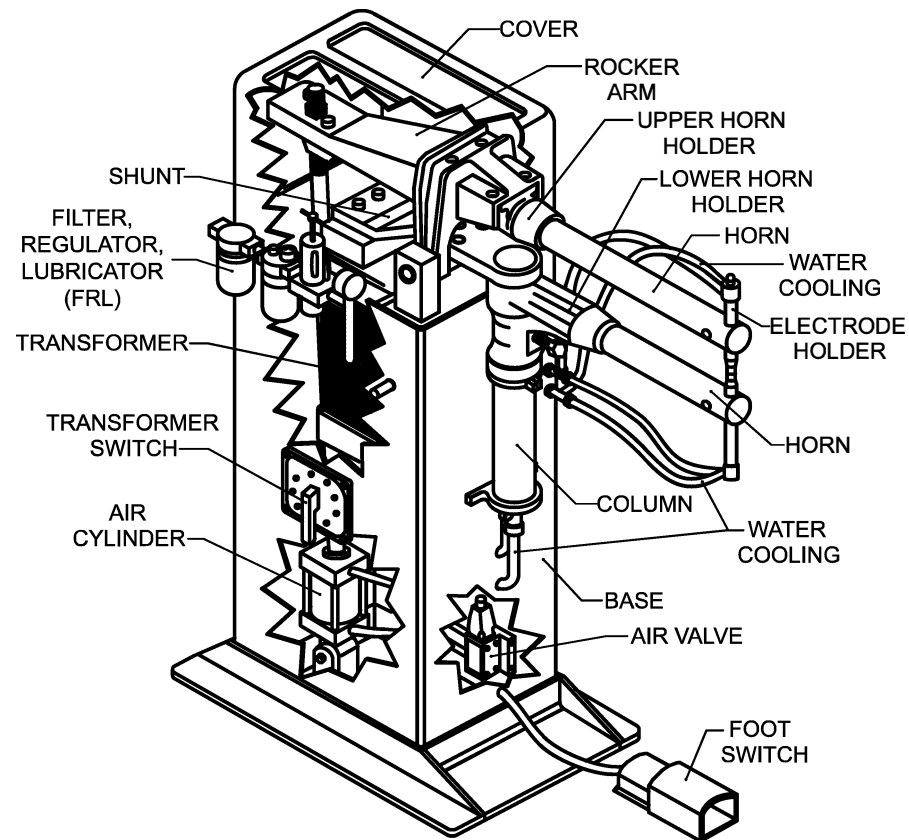
Resistance Heating

Heat is created in the workpieces for hot forming and heat-treating applications.

Additional information on these processes may be found in Chapter 6 of the *RWMA Resistance Welding Manual*.

Machine Nomenclature

Rocker Welder



Press-Type Welder

