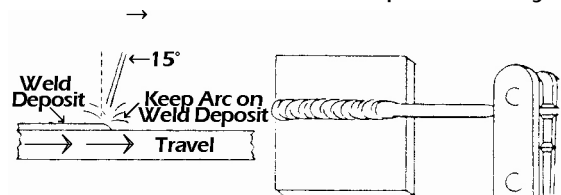




Glossary of Welding Terms

- **DC** Direct Current. Produced by most motor driven arc welding machines and the newer "rectifier" sets.
- **AC** Alternating Current. Produced by all transformer type welding machines.
- **STRAIGHT POLARITY** The machine will operate on straight polarity when the electrode holder cable is connected to the terminal marked **NEGATIVE, ELECTRODE,** or **MINUS SIGN.** The ground clamp is connected to the terminal marked **POSITIVE, GROUND, WORK,** or **PLUS SIGN.** If the machine is equipped with a polarity change switch, the switch should be in the position marked **NORMAL, NEGATIVE,** or **STRAIGHT.**
- **REVERSE POLARITY** The machine operates on reverse polarity when the electrode holder cable is connected to the terminal marked **POSITIVE, GROUND, WORK,** or **PLUS SIGN.** The cable to the ground clamp should be connected to the connection marked **NEGATIVE, ELECTRODE,** or **MINUS SIGN.** If the machine possesses a polarity changing switch, the switch should be in the position marked **POSITIVE** or **REVERSE.**
- **WEAVING** When wider beads are required the electrode is moved from side to side in a weaving motion. The greatest efficiency results from a weave of not more than 2½ times the diameter of the electrode.
- **DIRECTION OF TRAVEL** The direction of travel is the direction in which the deposits are going. The angle at which the electrode is held, in relation to the direction of travel, is the angle between the electrode and the surface of the part not yet welded.

Procedure sheets give the recommended angle, and this should be followed as closely as possible.



- **SKIP WELDING** Skip welding is, as its name implies, welding intermittently. Each pass is applied as far from the last pass as possible. The unconnected beads are finally joined with another series of passes. This method is used on heat sensitive material to prevent a local build-up of heat. It is possible to keep a casting to a com-hand-heat throughout the welding operation if this technique is used.



- **STRAIGHT BEADS** When the width of the weld deposit is approximately the same as the diameter of the electrode the beads are known as straight beads.
- **This applies also to oxyacetylene torch welding. Beads deposited without weaving are called STRAGHT or STRINGER beads.**
- **PEENING** The mechanical working of metal by light hammering with a round nose hammer. Peening has the effect of stretching the surface of the metal and this relieves contractual stresses.
- **SLAG REMOVAL** This is a term given to loosening and removing the slag adhering to the weld deposits. The deposit is struck with a chisel-shaped or pointed hammer and then brushed with a wire brush. This removes the slag and exposes the weld deposit. The slag forms a protective covering to prevent oxidation of deposits and should never be chipped or brushed until all signs of color have disappeared.
- **FLUX** Flux is applied to metal to prevent oxidation during the joining operations; to reduce surface tension; to promote the flow of the alloy and to facilitate the bonding action between the base metal and the deposited metal. The flux may be in the form of a paste, powder or liquid.

Flux should not be used to clean dirty, oxidized, or oily metal. If used for this purpose, its bonding characteristics will be weakened and joint failure result.

All foreign matter should be removed by mechanical means (chipping, grinding or wire brushing), or by chemical means (tetrachloride, trisodium phosphate, trichlorethylene, etc.). Heavily greased parts may be subjected to steam jets, followed by mechanical or chemical cleaning.

- **GROUND CONNECTION** An essential requirement for maximum welding efficiency, is a good ground connection between the welding machine and the work. This is often overlooked and pieces of scrap steel or iron are used as a connection to the work table. Such haphazard connections are a constant source of voltage drop and loss of current. This makes the arc perform erratically. The first beads may be perfect and yet beads at the end of the same pass may show signs of overheated and burned metal.

The ground cable of insulated copper wire should be as thick as or thicker than the cable to the electrode. If two pieces of cable have to be joined to obtain the necessary length, this should be done by a competent electrician and be well insulated.

High resistance and sparking will occur when a mild steel plate is bolted to the cable and laid loosely upon the work table.



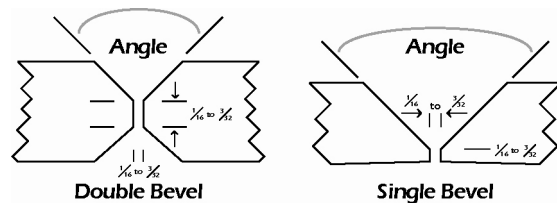
- **BEVELED BUTT JOINTS** When a butt joint is to be made with sections too heavy to permit a square butt joint, the sections are beveled, or chamfered, to an angle of approximately 90°.

The choice of a single or double bevel will depend upon the thickness of the metal and whether the sections can be welded from both sides.

A double bevel uses approximately one-half the amount of weld metal required for a single bevel.

The essential factor, in the preparation for welding, is that no part of the joint is left unwelded. This applies equally to single or double bevels.

These drawings show the correct preparation of a joint for welding. The angle of the bevel will vary according to the base metal and the electrode or torch alloy used.



The sections should be separated by a distance of 1/16" to 3/32" to allow the weld metal to flow through the joint without burning the base metal. Sections should never be beveled or chamfered to a knife-edge because the sharp edge will inevitably be burned. An important precautionary measure is to clean the metal adjoining the weld area for a distance of at least 2". This prevents oxides or foreign matter contaminating the weld.

- **FERROUS ALLOYS** Metallic alloys which are predominantly iron such as cast iron, wrought iron, steel and stainless steel.
- **NON-FERROUS ALLOYS** Alloys with little or no iron, such as copper, brass, bronze, nickel, Monel[®], magnesium or aluminum.
- **PHYSICAL PROPERTIES** The qualities of a material which are inherent characteristics of the material such as thermal conductivity, electrical conductivity, coefficient of expansion, density and color.
- **MECHANICAL PROPERTIES** The properties of a material which makes it withstand external forces or effects, such as yield strength, tensile strength, ductility, impact resistance and hardness.
- **ELASTICITY** The ability of a material to change dimensions without breaking when an external force is applied and then to return to the original dimensions when the force is removed.

[®] Monel is a registered trademark of Special Metals Welding Products Division.



- **STRESS AND STRAIN** Stress is the measurement of external forces applied to a material. Strain is the deformation of the material by the external force.
- **YIELD STRENGTH** In tensile testing, the yield strength is measured by the applied load, which permanently deforms the specimen. Many steels will, when tested, continue to elongate under a critical load without the addition of further load. This critical load is called Yield Point. The yield point can be observed during tensile testing by the drop of the beam or the drop of the indicator of the testing machine.
- **HOMOGENEOUS MATERIALS** Those materials which, to the naked eye, or at low magnification, are uniform and composed of only one distinct material.
- **HETEROGENEOUS MATERIALS** Those materials which, to the naked eye, or at low magnification, are composed of two or more distinct materials.
- **CRITICAL TEMPERATURE RANGE** A temperature range usually between 1450° – 1650°F in which carbon steels, low alloy steels and martensitic stainless steels transform to austenite on heating and reverse on cooling. Each composition of steel has its own critical temperature range.
- **ANNEAL** To soften by heating and cooling. To anneal carbon steels, low alloy steels and martensitic stainless steels, the steels are heated to a temperature greater than the critical temperature range and cooled slowly, usually by a controlled cooling rate in the furnace. To anneal austenitic stainless and manganese steel, the steel is heated to at least 1850°F and cooled rapidly, usually by quenching in water.
- **HARDENING** Carbon steel, low alloy steel and martensitic stainless steels are hardened by heating to a temperature above the critical temperature range and cooling at a controlled rate. The rate of cooling depends on the composition of the steel. The cooling may be accomplished by quenching in water (normally the fastest cooling rate), by quenching in oil or cooling in air.
- **TEMPERATURE OR DRAWING** A heat treating operation or reheating hardened steel to a temperature less than the critical temperature. Tempering usually increases the toughness and lowers the hardness of the steel.
- **STRESS RELIEVING** The heating of a weldment to a temperature usually higher than 1050°F, but lower than the critical temperature range and holding at heat (called soaking) to allow stresses, residual from heating and cooling during welding, to be relieved.