



Welcome to ACE Welding

ACE WELDING. Our Team is the Best in the Business.

Welding is the core service we have provided since the company's founding in 1949. Our shop has followed all the developments in the art of joining metals for more than 60 years. With that diligence and determination, we have grown to be one of the best – *and most respected* – manufacturers of parts and components to the aerospace and power generation industries.

In this document, we will hit upon all the topics you need to know as an ACE employee, whether you are new to our welding team, or just want to know more — and possibly train to move up to the welding crew yourself.

STARTING WITH THE BASICS...

Welding is the activity of bonding two pieces of material together. We work primarily with four types of metals: Stainless Steel, Aluminum, Titanium, and Nickel Alloys. We are specialists at all kinds of different welds.

[Square Butt Joint](#)

Used in TIG welding for welding two sheets together in the same plane, usually when the sheets are thin enough to be welded in a single pass and achieve full penetration. At ACE, we see butt joints joining many of our formed sections together. Usually welded with the goal of full penetration, which can be detected visually on the back of the weld, or by radiographic or ultrasonic inspection in cases where the weld root is not accessible. (can show examples of the butt welds in long ducts that join the halves together).

[V-Groove](#)

If you chamfer the edges on a square butt joint, you are left with a v-groove. Often used in TIG welding when the material is thick enough that multiple passes are required, or in order to facilitate complete joint penetration in a single pass.

[Lap Joint \(Fillet Weld\)](#)

Lap joints are created when one part is layered over another, and the edge is welded. The weld made along the overlapping edge is a fillet weld. All resistance welds are lap joints! This is because the current needs to run from the top electrode through all welded parts (*can be more than just two*) into the second electrode.

Tee Joint (or T-Joint) (Fillet Weld)

A tee joint is when two parts are fit up to one another to form – *yes, you guessed it!* – a tee shape. A weld can be made on one side, both sides, or all the way around in the case of a tube welded to a plate. These are harder to inspect for full penetration, particularly using radiographic (*or X-ray*) inspection. Because of that, and because of different strength requirements from fillet welds as opposed to butt or groove joints, fillet weld quality is often based on the size of the weld, where size is not as important a parameter (*most of the time*) in butt/groove.

There are many approaches to each of these different welds, and our processes are finely tuned from decades of welding technologies and experience. We do make recommendations to our customers when our expertise is needed. But mostly we provide our customers' engineers with the joints they specify.

These requested welding techniques formally come to us in drawings, models, and unique customer specifications. Aerospace suppliers (*like us*) rely on these documents. They assure our customers that their parts are made to the highest quality controls and exacting standards expected. As a welder at ACE, your role will include your dedication to documenting your procedures – a record of your adherence to the customers' requirements.

DRAWINGS and WORK INSTRUCTIONS

Every part you work on is a very finely measured and controlled piece. Dimensions, placement, alignment, consistency, finish – all are vital to a weld being accepted. Every job has distinct instructions for the production of the part. These are very detailed and written out in a number of documents you are expected to read before beginning any job.

Weld Schedules

Weld Schedules provide the recipe for each weld, and should be your primary source of information. On the weld schedule, you'll find the parameters vital to that particular weld, including filler metal, amount and type of shielding gas, electrode type, and current, among other things. One weld schedule may be used on multiple parts, so long as the part's thickness, material, and joint types fit – your welding engineer will determine which weld schedules are used for which parts, and will create new weld schedules as they are needed. If there's anything you don't understand, STOP. These descriptions are vital to your work being accepted...

ACE Travelers

ACE Travelers set out and then capture each work centers' activities. They feature special notes to each operation, including customer requirements, part or material

characteristics, difficulties in production from previous jobs....

[Job Instructions](#) *(found on Travelers, also called Job Orders)*

Job Instructions are provided by ACE Manufacturing Engineers for every step performed in the process of building a part. For welding, the Job Instructions will direct you to the correct weld schedule number, as well as tell you which filler metal to use, and any other important information you need to know about welding that particular part.

[Drawings](#)

Customer engineering drawings provide a highly accurate rendering of the parts, with exact dimensions and other important information, such as which specifications should be used for processing or inspecting the parts. Drawings are one of the tools used by Manufacturing Engineering to create Job Instructions, but they may need to be referenced by a welder to verify location of details being welded, weld size requirements, or simply to get a good view of what a finished part should look like!

[ACE Sketches](#)

When drawings or processes are particularly complex, ACE may create sketches to focus on certain elements of the part. In welding, sketches may be used to give you more detailed assembly instructions or particular welding techniques to apply.

[Fixture Instructions](#)

Properly using fixtures is extremely important. Most welded parts require a fixture to hold the parts in place while they are welded. This could be as simple as a few braces to help position a part, or complex enough to locate part details within ten thousandths of an inch. It is very important that you know how to use the fixture for your project; if work instructions are not sufficient, always ask your lead for guidance!

[Specifications](#)

“Specs” for short, give all the rules for a process – welding specs outline how a welder is qualified, rules for welding parts (such as fit-up and cleanliness requirements, or suggested filler materials) and requirements for post-weld inspections. They also dictate how to perform reworks when a part is rejected at post-weld inspection.

The industry specification that we see the most at ACE is AWS D17.1, which is a spec created for fusion welding in aerospace by the American Welding Society (AWS). Most of our customers, however, have created their own specs, which, although similar to D17.1, often outline specific unique requirements for welding and inspection of welds.

AVOIDING ERRORS

We are all human, and a slight amount of error creeps into all of our lives. But when error becomes commonplace, it ruins a company's profits and ability to perform. Its reputation.

The very best way to eliminate the causes of error is to check your work against all the above instructions, and when you are unsure about how to proceed, STOP and ASK!

DON'T SHORTCUT. (shortcut is about not reading instructions, documents)

Even when you have welded a part for many, many years, changes occur which affect what you are supposed to do. If you assume that a part is to be welded exactly the same as always, and do not read the work instructions, you may make a critical error.

DON'T ASSUME ANYTHING.

Make sure all your measurements, weld parameters, tools — everything is right for every job you do. Every time. And remember, if something doesn't seem right, STOP. ASK. It is far less expensive to get clarification than it is to scrap a part in production – if your lead doesn't know the answer to your question, he will find the person in operations, engineering, quality, or other area who does!

DON'T CUT CORNERS. (*Cutting corners means skipping a step – like cleaning or prep*)

You may be tempted to appear that you are faster if you "skip" steps in production. So, what happens to welders who skip steps to look quicker? They cause expensive problems, which burn up time and money to correct. So when you're tempted not to clean your setup each morning, check your lines, or double check that rod you're welding with... DON'T. It will cost you – and ALL of us – when it comes back to haunt you later.

DON'T GUESS.

Many of our customers measure our quality and ability to deliver parts on time, and these measurements affect whether we are chosen to perform future work with the customer. Making part faster is excellent, but it is not worth risking the quality of the parts. The operations and steps outlined to make each good part are there because someone (probably manufacturing or quality engineers) felt that they were necessary to create the best part. If you see a better way to do things, by all means, bring it up! But never assume that changing or skipping an operation is acceptable.

SCRAP.

When parts are damaged beyond repair, or damaged so much that it costs more to repair than replace, they are scrapped. Throwing away mistakes is the number one cause of avoidable cost to ACE. Double and triple check what you are doing, don't take anything for granted. Just as you rely on engineering and quality to provide you the proper work instructions to make a part, our customers rely on you and the rest of the operations team to create a perfectly made part.

FOD.

Foreign Objects and Debris, or FOD, is the culprit for many rejected parts. Dirt and grime can compromise your welds. Grit can scratch your part. Shavings can contaminate your work. Always be aware of the cleanliness of your parts and your welding area, and be sure to re-clean parts after grinding or other material-removal steps.

SAFETY, QUALITY, PRODUCTIVITY, and the importance of **ON-TIME DELIVERY.**

These are the ACE core values in everything we do. They are what our customers expect and demand. And that's what we deliver.