



**HI TECMETAL
GROUP**

Commercial, Aerospace Structural and Certified Welding and Brazing Capabilities

Whatever your requirements, HTG Brite Braze is a Welding Specialist that has the capabilities to serve as your company's needs in the area of aerospace Brazing, Heat-treating and Welding,

Several of our customers have become concerned that our pricing will become higher for jobs requiring Nadcap. That will not be the case for jobs that were previously quoted to Aerospace specifications. However, if we did not know the end use of the part or ultimate customer and we quoted to commercial rates; rest assured the price will be raised. All Aerospace welded WILL REQUIRE Documented Procedures: A documented procedure requires a procedure to be established, documented, implemented, and maintained. In addition to the documentation, all incoming components now require incoming inspection for dimensions and tolerances prior to start of the welding operation. Also, advanced operator training is required for each part number in the area of dimensional inspection of component parts and inspection tooling. Engineering sign off of all documents per part number is required. These additional steps, as well as, additional time required for contract review of every job will also add to the cost.

In order to properly communicate the scope of our work and the additional engineering time required to proceduralize all methods and techniques, we have included the following information:

Best Practice: Certification to Program Standards

The Nadcap certification for, welding, heat treating and brazing requires both documented procedures and process control. HTG found that many of the requirements of the certification were already in place as a result of its efforts in obtaining ISO 9001:2000 and: 2008 and AS 9100:2001 certifications and has resulted in an increased demand for engineering intervention during job development as well as Contract Review for work received.

This correspondence has been created to provide our customers with the requirements that HTG must meet to maintain its Quality and Welding Accreditations from Nadcap. Our intent is to:

- **Enhance Customer experience with the Nadcap process through education**
- **Describe Nadcap expectations**
- **Improve results and overall understanding of the processes and requirements**
- **The leading, worldwide cooperative program of major companies designed to manage a cost effective consensus approach to special processes and products and provide continual improvement within the aerospace industry.**
- **For Welding, in order for HTG to achieve a 24 month merit, currently we have two 2 successful 18 month audits•**
- **Provide the Implications if all work processed does not follow Nadcap guidelines for all work performed at our facility.**

- **Notify our customers that they are required to flow down to all of their vendors. Our Customers are required to notify all of their suppliers of the need for Nadcap requirements. This is an example of language that several of our customers use to notify their suppliers of the requirements:**

Special process suppliers must hold active NADCAP accreditations(s) for the special process performed, regardless of tier. There are no exceptions unless otherwise specified by the End Use Customer. This requirement is to be flowed down to our suppliers in contractual documentation at all times."

Also, we must add: Our customers must not black out the name of the end customers on all blueprints provided to us. Also, our customer is responsible to provide with a copy of the current blue print with the latest revision with every order.



Our continuing dedication to quality and many years of industry experience assures our customers of only the highest quality service in the welding of common as well as exotic materials - including: aluminum, magnesium, steels, stainless steels, copper, nickel, titanium and other refractory materials.

Manual welding for aircraft component maintenance and repair is all GTAW. The materials are thin, and the welds must be precise. Because filler metal doesn't cross the arc, spatter isn't a problem. The welding area is clearly visible, and postweld cleaning is minimal.

Our welder GTAW skill is relatively high, especially for aircraft component welders. Every test weld either is X-rayed or metallographically tested to spot various possible defects such as crater cracking or underfill, so preventing heat distortion is critical. All welders are trained to weld short runs—1½ to 2 in. depending on the part—to minimize heat input. Starting and stopping without creating defects is key to welding aircraft components

In order to meet Aerospace Welding Standards

We have imposed several new procedural requirements. All Welding performed by HTG must meet Nadcap AC 7110 requirements, as well as, the AWS D.17.1 specification.

All requirements must be met:

This is the **most extensive revision** ever to occur to our Welding Checklists.

CHECKLISTS:

In addition, all work must meet:

AC 7110 Nadcap Audit Criteria for Welding.

Core Document which addresses Quality System issues related to Welding. This document is required for all Weld / Braze audits.

AC 7110/1 Nadcap Audit Criteria for Brazing.

Includes supplemental requirements specific to torch and induction brazing. Note vacuum brazing is covered by Heat Treat Task Group (AC7102/1)

AC 7110/4 Nadcap Audit Criteria for Resistance Welding.

Includes supplemental requirements specific to Spot, Seam and Projection Welding.

AC 7110/5 Nadcap Audit Criteria for Fusion Welding.

Includes supplemental requirements specific to Fusion Welding. Includes GTAW, GMAW casting repair and other less common fusion processes.

AC 7110/12 Nadcap Audit Criteria for Welder / Welding Operator Qualification.

Includes supplemental requirements specific to welder / operator qualification.

AC 7110/13 Nadcap Audit Criteria for Metallurgical Evaluation Of Welds.

Requirements include supplemental requirements specific to evaluation of welds / weld coupons:

- AC7110/12 is invoked from processes that require welder / weld operator qualification AC7110/5, fusion welding; AC7110/1, torch/induction brazing, AC7110/5, fusion welding.
- AC7110/13 is invoked from processes that require weld metallurgical evaluation; Fusion AC7110/6; AC7110/12 welder qualification

External test facilities are required for all welder qualifications.

Documented Procedures:

A documented procedure requires a procedure to be established, documented, implemented, and maintained.

Process:

A process is an activity, which we will need to demonstrate, has occurred but would not necessarily need to be documented.

Pre-Weld Preparations

•All pre-weld preparations are defined and in accordance with customer requirements?

•Intent: Assure that parts are prepared (for example: cleaned, proper joint clearances and fit-up, alignment tolerances, joint run-out, joint configuration, cleanliness of filler material, etc.) and tooling and fixtures are in accordance with customer requirements prior to processing.

•**Acceptable Objective Evidence:** The process work instructions (routing, data cards, procedure, schedule, work station audits, etc) prior to joining must address items such as cleaning, time lapse between cleaning and joining, and part alignment. Cleanliness of filler material can be demonstrated if wiping with a solvent dampened cloth does not show a difference when wiped a second time.

Requirements:

- a) **Material certification control (Consumables including filler, flux and gas)**
- b) **Equipment control (including qualification, maintenance and calibration)**
- c) **Procedure Control**
- d) **Process Control**
- e) **Personnel Qualification Controls**
- f) **Inspection and acceptance Criteria**
- g) **Periodic Preventive Maintenance**
- h) **Compliance**

In addition to these baseline requirements, each checklist has supplements related to materials / processes / prime specific requirements. The supplements are assessed to the requirements, defined in the audit scope.

Welder Qualification

- Procedural control, including eyesight, revocation, re-qualification period, qualification records, activity records
- Welder not qualified for work being performed
- Test record completed incorrectly

Process Control

- Operator must work according to router/work instructions/travelers and weld schedules
- Equipment must be qualified
- Equipment must be calibrated / maintained
- Weld schedule correct /correctly qualified
- Weld schedule must be at workstation.

Training

- Provide evidence that Welders and Inspectors have been trained. Note it is not adequate to use acceptable welder qualification in lieu of training for welders. Training evidence must include training in our procedures and any specific requirements from our customer's specifications (E.g. training in weld acceptance criteria)

Preparation prior to weld

- Cleaning is defined as an operation and stamped / signed for. Cleaning must meet customer requirements?

- Tools need to be clean and defined on shop paperwork
- Tacking needs to be defined and performed by approved welder

Inspection

- Use of correct inspection methods and acceptance standards
- Appropriate, calibrated gauges available

Continuous Improvement - Requirement is that we are required to demonstrate that process improvement is applied to the welding processes.

We must:

- a) Show a Procedure and Schedule stating how we do this
- b) Show Evidence that we are reviewing welding processes
- c) If the data shows welding to be the cause of nonconformance, demonstrate that process improvement has been applied

Gas Compliance

- Demonstrate that Gas is ordered to the correct specification
- Demonstrate that certification for the gas is current. Minimum requirement is a certificate stating the gas meets the defined specification.

In process test piece control

- Mainly associated with resistance weld. Tests representative of the job performed at the required frequency and assessed to the correct customer acceptance standard.

Schedule Qualification

- Have schedules been correctly qualified
- Do schedules meet customer requirements for qualification
- Do schedules contain all parameters required by customer specifications

HTG had previously completed certification to ISO 9001 and AS 9000. The decision to become certified to the National Aerospace and Defense Contractors Accreditation Program (Nadcap) in the areas of welding, brazing and heat-treating was based on customer requirements. Through Nadcap, the Performance Review Institute accredits subcontractors and suppliers to aerospace and defense industry consensus standards.

HTG found that many of the requirements of Nadcap were already in place as a result of its efforts in obtaining ISO 9001 and AS 9000 certifications. However, certification for Nadcap introduced tighter process control for welding as well as improvements to process documentation.

Another improvement from obtaining the Nadcap certification was realized in the development of operation procedures for aerospace work. Operation procedures were the challenge for welding, heat-treating and brazing, due to few being in place and the variety of specifications and standards that had to be met. HTG increased its engineering staff to assist in writing and implementing the tighter process controls. HTG implemented new procedures and process documents for increased control of each method. Standardizing practices for the assemblies that HTG builds on a repetitive basis reduces the possibility of unforeseen circumstances later in the manufacturing process.

The sequences used to produce parts have been documented and is now the standard procedure in order to maintain Nadcap certification. This certification enhances quality all around. HTG does meet the high standards of Nadcap.

Commercial Welding and Brazing

Our background facilitates immediate throughput of aerospace and commercial requirements, based on established procedures.

Aerospace, Structural and All Certified Welding

HTG's engineering and welding technologies team will provide qualified Welding Procedure and Schedule Specifications (WPS) and substantiating Process Qualification Records (PQR) to meet our customers' most stringent specifications. Our experience extends through all seven basic aerospace material groups (steel, stainless steel, nickel, aluminum, magnesium, titanium and cobalt). HTG works to AWS D 17.1 for Aerospace Welding of Fabrications.

INDUCTION AND TORCH BRAZING

Currently, HTG does not plan to seek NADCAP accreditation for induction and torch brazing in 2010 because:

1. There is not a large demand for this requirement;
2. And, our next scheduled audit is not until May, 2011.

In the event that a customer wants to fund the cost of a NADCAP audit, HTG can provide a quotation upon the request.

In the event that our customers require us to perform the work knowing that we do not have NADCAP accreditation for induction or torch brazing; we do require our customers to provide a Waiver for each Purchase Order until such time as we receive the accreditation.

Value Stream Quality Planning and Concurrent Engineering

We will provide the engineering and welding technical support to assist in tooling development, determine the need for intermediate processing and establish the best stage of production for the welding process. This will minimize the effects of heat input, establish shrink rates and determine the preweld material allowance required to produce the postweld dimensions.

Summary

HTG is committed to meeting Aerospace Standards for brazing, heat-treating and welding. This document establishes the minimum requirements for the welding processes we perform. We used a minimum of explanatory information so that our customers will understand our responsibility and theirs in regards to the application and processing of work to Aerospace Standards. Since a great deal of responsibility for the parts integrity and the ultimate responsibility for braze or weld joint quality rests on HTG we take these requirements seriously. We acknowledge that we are permitted, with customer approval, to suggest modifications to the requirements if appropriate to the application. We may do this if the need arises.

Compliance and Responsibility for producing parts to Aerospace Standards are much more complex than is required for commercial products. Our responsibility is to make certain all requirements are met except when the end use customer supplies us with a deviation in writing specifically stating the change permitted. Our customers are responsible for flowing to HTG all requirements including a PO, all material and quality specifications, latest revision of blue print and process requirements with every job sent to us.

