

Machine Shop Processes

100-1122-00

Owner – Cody Alliss

Approvals:

Department	Approved.	Date
Engineering	D. Scott Timms	11/7/17
Manufacturing	D. Scott Emond	11/7/17
Quality	Andrew Ware	11/7/17

Change History

Rev	Description	By	Date
-	Initial Release	D. O'Dell	1/22/15
A	Added bullet for operators to write welding rod P.O.#on W.O. 12.0 Added : components with safety welds do not have to pass nugget test 14.0 Rewrote paragraph 6.0	D. O'Dell	2/16/15
B	New owner Updated Sections 4.0, 6.0, 7.0, and 13.0.	Cody Alliss	7/14/15
C	Added notes to sections 4.0, 5.0, 6.0, 10.0, and 11.0. Added section 15.1 & 15.2.	Cody Alliss	11/13/15
D	Add reference AWS C3.4 to section 2.0. Added section 3.4. Added detail to section 9.0 from C3.4.	Cody Alliss	01/14/16
E	Strengthened section 10.0 for inspection, and updated section 11.0 to more accurately describe modern method.	Cody Alliss	11/7/16
F	Added reference 100-1156-00 brazing qualification procedure. Updated section 9.0.	Cody Alliss	11/7/17

1.0 Scope

This procedure defines Captor's machine shop processes.

2.0 Reference documents

100-1122-MSCL	Machine Shop Check List (Previously defined as 100-646-CSCL)
100-646-00	Workmanship Manual (Chapters 2, 15, 16)
100-991-00	Safety Manual
100-990-00	Production and Material Control
100-1032-00	Material Handling
100-1063-00	Control of Non-Conforming Product Procedure
100-1065-0	Control of Monitoring and Measurement Devices
100-1113-00	FOD Procedure
100-1156-00	Brazing Qualification Procedure
AWS D17.1	Welding for Aerospace
AWS D9.1	Sheet Metal Welding
AWS C3.4	Torch Brazing

Forms - 100-1122-WCML	Welder Certification Maintenance Log
100-1122-TL	Training Log
100-1122-BQ	Braze Qualification

3.0 Workmanship standards

3.1 – When specific requirements are identified in the TDP (Technical Data Package), the TDP will take precedence.

3.2 - Welding guidelines will be to AWS D17.1 class C

3.3 - Machining, Modifications and Fabrication guidelines will be to 100-1122-MSCL and standard work practices.

3.4 – Brazing will be done in accordance with AWS C3.4M/C3.4 class C.

4.0 Product configuration

Follow the 100-1122-MSCL and 100-990-00 (section 5.2) to ensure paperwork (work order, print, layout, and programs) is all to the same revision. If any issues arise see machine shop line leader or technical support for clarification.

5.0 Material control

For raw material lot traceability, raw material will be identified with part number and purchase order number. When material is consumed against a work order, the P.O. number of the material used is recorded on the work order. If P.O. cannot be found see machine shop line leader for necessary information. Some materials may be issued from stockroom and should be collected from the incoming shelf at the beginning of the job. Follow 100-990-00 section 3.3.

6.0 Over-run Parts

All completed aluminum, brass, epoxy, and copper parts, complex parts with greater than 3hrs. build time and parts that are frequently run (line leaders discretion) may be kept for an unlimited time if they are compliant to print.

Prototype builds, modifications and any completed or compliant parts that do not fall under unlimited time can be kept for 3 months.

Any material that is not compliant to print cannot be kept.

- All completed over-run parts that are being held for any length of time must have the part #, P.O.#, revision, and date of completion clearly visible on the item and be up to date in the Machine shop master inventory list.
- Any completed over-run parts being used must be 100% inspected prior to use and be removed from the master inventory list.

7.0 Weld grinding

Weld grinding should be kept to a minimum. When grinding is required, the operator should keep the grinding surface parallel to the can wall. This helps to ensure weld strength is not compromised. Completed welds should have visual evidence of ripple to ensure that the weld is not over ground. During grinding, the ground area shall not reduce the weld bead size or the base metal thickness below drawing tolerances.

8.0 Mounting surfaces

When mounting patterns for the next higher level are identified, the surface of the mounting area and its surrounding welds should be flat. Sanding/ buffing /grinding of mounting surface plane is acceptable to ensure the product has a proper fit and is free of obstruction during the next higher level of assembly.

9.0 Inserts Brazing

Insert brazing should be a full 360° around the insert. Care should be taken to ensure braze build up does not interfere with hardware used at the next higher level. Inserts shall be no greater than 3° from perpendicular to the mating surface. Ensure that all threads meet thread class and perpendicularity after brazing as overheating can deform internal threads.

Standard hardware may be used by operator to check threads. Brazes must be free of cracks, voids, and pin holes. Operators are required to use materials 101-012-02 (flux) and 101-345-03 (rod) when brazing. The material called out by these Captor part numbers are found to be acceptable by AWS C3.4 and Captor for brazing. Brazing is done in compliance with AWS C3.4 class C spec.

10.0 Inspection

Each operator shall ensure that their parts are compliant to print requirements prior to submitting to inspection. A minimum of one part from each lot must be checked before turning in to inspection, and must be marked by sharpie on the inside to identify the checked part. Surface defects such as scratches, gouges, and dents will be checked as well and all dimensions including hole sizes and material thicknesses. Hole sizes small enough to be checked by pin gauge must be checked by pin gauge, all larger holes must be checked with calipers. A hole must always read .001" below its maximum call out. For example a hole

that is .110" +/- .003" may take the .112" pin gauge but not the .113" pin gauge. As part of this check the operator is required to initial the part history notes on the work order.

11.0 Departmental Cleaning

During and in-between jobs machines used must be lightly cleaned. This means all FOD, product, tools, and setups, must be removed and put in their designated areas. This cleaning should not exceed more than 5 minutes. The last 15 to 30 minutes on Fridays and when instructed by the line leader, a more in depth cleaning will be completed. This will include removing oxidation from the machines, brushing, blowing, or vacuuming out hard to reach places, emptying out catch trays, sweeping or mopping the surrounding floors, and organizing tools at the stations.

- At the end of each shift ensure all machines and displays are turned off. Make sure all welding cylinders are off and hoses drained.

12.0 Welding Rod Control

All welding rod will be kept in individual locked tubes outside of the welding booth. Each tube will be identified by P.O. number, part number, type of rod, and size of rod. Only the line leader and welder/operators will have keys to the locked tubes.

Welding rod used by Captor Corporation are as follows:

<u>100-1072-01</u>	<u>.062 x 36"</u>	<u>4043 Aluminum Rod</u>
<u>100-1072-02</u>	<u>.035 x 36"</u>	<u>4043 Aluminum Rod</u>
<u>100-1072-03</u>	<u>.062 x 36"</u>	<u>ER70-6 Carbon Steel Rod</u>
<u>100-1072-04</u>	<u>.035 x 36"</u>	<u>ER70-6 Carbon Steel Rod</u>
<u>100-1072-05</u>	<u>.062 x 36"</u>	<u>ER308L Stainless Steel Rod</u>

- All welding rod P.O. numbers will be documented on the Work Order of the job that is being completed.

13.0 Part Cleaning

Cold rolled steel – Clean in the Gen-Tech tank before welding.

Aluminum – Wipe down weld seams with alcohol.

Before brazing in inserts, inside corners of cold rolled cans will be blasted with glass bead to remove welding oxidation lines. Remove debris from sandblasting before moving the part to the next step. The outside of all cold rolled cans shall be clean and free of solder flux before next step.

- Before turning completed cans into inspection all cold rolled cans need to be sprayed inside and outside with WD-40 to prevent cans from rusting. (Ensure that the can is fully covered)

14.0 Resistance Welding

Setting up of the spot welder, nugget test, and safety while using the spot welder are all trained and documented per the 100-1122-TL. Users will be trained by the line leader to produce a good spot weld that is round with a light indentation in the center and able to pass nugget test. Any components with safety welds do not have to pass a nugget test.

15.0 Product Priority

15.1 All work orders have a delivery priority marked as (Del). This section projects the priority of that work order against other work orders. Operators must use the information provided by that delivery type to determine which work order to start next. Use document 100-990-00 section 5.2.1.7 to understand these priority value of each of the possible notes.

15.2 Any rework that comes through should be treated as a priority over other work excluding premium work orders. Having a T or R attached to the work order number will identify rework. Other document my accompany or be in place of a traditional work order when working with RMA's. Reference released procedure 100-990-00 section 4.9.