DCMA NSEO MANUFACTURING PROCESS SURVEILLANCE (MPS) CHECKLIST #28

BRAZING

|  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |  |
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| |  |  | | --- | --- | | **SUPPLIER & CAGE:** |  | |  |  | | **LOCATION:** |  | |  |  |   **Program Type:**   |  |  |  |  |  |  | | --- | --- | --- | --- | --- | --- | |  | Level I/SUSBAFE (LI/SS) |  | Navy Propulsion Program (NPP) |  | Deep Submergence Systems/Scope of Certification Program (DSS-SOC) | |  | Nuclear Plant Material (NPM) |  | Naval Nuclear Propulsion Program (NNPP) |  | Aircraft Launch & Recovery Equipment (ALRE) | |  | Fly By Wire Ships Control Systems (FBWSCS) |  | Ships Critical Safety Items (SCSIs) |  | Other: |   **Contractual Requirement(s) for this process:**   |  | | --- | |  |   **Supplier Procedure Number(s), Title(s) & Revision Level(s)/Date(s):**   |  | | --- | |  |  |  |  |  | | --- | --- | --- | | Surveillance Performed By: |  | | |  |  | | | Date(s) of Surveillance: |  | | | Contract Number(s): | |  | |  | |  | | Part Number(s)/Serial number(s)/NSN: | |  | |  | |  | | Part Nomenclature(s): | |  | |  | |  | | Supplier Personnel Contacted and Titles: | |  | |  | |  | | Drawing Number & Revision: | |  | |  |  |  |

**Process Concerns and Guidance:**

* **PROCEDURE**: the process must be controlled by a written procedure, which reflects the contractually imposed brazing specification requirements, and appropriate controls for each process input. A properly written procedure must detail process inputs such as
  + Operator Qualification
  + Technique
  + Materials (filler wire flux, etc.)
  + Equipment
  + Fit-up
  + Brazing Method
  + Pre-cleaning and post
  + Gas and the required psi
  + Temperature parameters
  + Atmosphere
* **QUALIFICATIONS**: only certified personnel having satisfied the qualification requisites specified in the applicable brazing specification are authorized to perform the metal joining process.
* **MATERIALS**: storage, marking, and handling of filler-metals and brazing flux aids in preventing material mix-ups, contamination, and damage. Brazing the wrong material and application of the wrong flux during the brazing process has resulted in failures in the field.
* **METHODS**: joint spacing (fit-up, gap) of the parts to be brazed is critical to the process because filler metal is drawn into the joint by a pulling force known as capillary action, which occurs during the heat cycle. So it is particularly important to maintain proper part spacing, as specified in the technical document in order to achieve the desired process outcome.
* **CLEALINESS/ATMOSPHERE**: Brazed joints require a high degree of base-metal cleanliness. Some brazing applications require the use of fluxing agents to control cleanliness. Pre-coating with flux, a chemical compound which protects the part surfaces from air, which is an atmospheric concern. Flux helps prevent oxidation when the metal heats up, and it improves filler metal flow. A point to remember flux should melt and become completely liquid before the alloy melts. Most often flux is sold in paste form so it can be brushed on to the parts just before the actual heating cycle. Flux is not the only method used to prevent oxidation. Nitrogen, hydrogen or dissociated ammonia, are used in a controlled atmosphere glove box or a vacuum furnace. Without oxygen in the surrounding atmosphere, there is no potential for oxidation.
* Inadequate cleaning or inadequate atmospheric control can diminish the structural integrity of the brazed joint and can result in failures.
* **Basic steps in brazing**

1. Ensure fit and clearance
2. Clean metal
3. Flux prior to brazing
4. Fixturing of parts
5. Brazing the assembly
6. Cleaning the new joint

QARs should use the “BASIS OF DETERMINATION” column to document the objective quality evidence and/or clarify the rationale used to support their decision. (e.g. direct observation, documents verified etc.)

S = Satisfactory U = Unsatisfactory

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| **SURVEILLANCE QUESTIONS** | **S** | **U** | **BASIS OF DETERMINATION** |
| 1. Are the personnel performing the Brazing and quality assurance functions of the appropriate skill/experience level and/or properly trained/certified to produce conforming product? ***What are the requirements?*** |  |  |  |
| 1. Does a written, detailed procedure exist, and is it readily available and utilized for the brazing process? Is the procedure based on contract invoked requirements or generic company-based standards? Is the procedure approved by the customer? List the procedure and reference approval number, if applicable. |  |  |  |
| 1. Is **brazing** equipmentadequate to produce/assess conforming supplies in compliance with contractual specifications and drawing(s)? *What Items were sampled and were they part of the supplier’s calibration program and within the calibration/check cycle?* |  |  |  |
| 1. Is **inspection and testing equipment** of the required adequacy, accuracy, precision, and range to assure supplies produced comply with specifications and drawings? *What Items were sampled and were they part of the supplier’s calibration program and within the calibration/check cycle?* |  |  |  |
| 1. Is the area where the work is being performed clean and free from dirt and debris? |  |  |  |
| 1. Is the correct flux and flux application utilized? Has the braze flux useable shelf life expired? |  |  |  |
| 1. Correct dimensions, alignment, gap, and joint fit up? |  |  |  |
| 1. Correct flame type, torch, tip size, gases, and gas pressure? (**flame brazing process**) |  |  |  |
| 1. Is heat properly applied to both base metals broadly and evenly, so the filler metal wets equally well on both metal surfaces and completely fill the joint? |  |  |  |
| 1. Has the flux melted and become completely liquid before the alloy melts? |  |  |  |
| 1. When post cleaning is required, is the cleaning process documented in the procedure? Are safety precautions noted in the procedure?   **NOTE**: Certain post cleaning operations require the use of baths. **Caution**, acid solutions are potent, so when quenching hot brazed assemblies (only as specified in the procedure) personal protective gear such as face shield and gloves are routinely required. After cleaning the flux residue from the brazed parts, pickling solution to remove oxides that remain on areas that were unprotected may be specified in the procedure. If pickling is specified using solutions such as bright dips containing nitric acid, the pickling time must be documented in the procedure. Excessive pickling time will attack the silver filler metal. |  |  |  |
| Other Observations: |  |  |  |
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| **Overall MPS Results:** | **SATISFACTORY** |  | **UNSATISFACTORY** |  |

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| **Corrective Action Generated?** | **No** |  |  | **Yes** |  |  | **CAR#** |  |

**FOLLOW-UP ACTION REQUIRED?**

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**SUMMARY/NOTES/COMMENTS/CONCERNS**:

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