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| **I: REQUIREMENTS** | | | | |
| 1. Identify the standard the supplier uses for performing brazing. | \_\_\_ MIL- B-007883B  \_\_\_ MIL- B-007883 Rev\_\_\_\_\_\_\_\_\_  \_\_\_ NAVSEA 0900-LP-001-7000 | | \_\_\_ OTHER  (IF Other, Specify :) | |
| **II: ATTRIBUTES:** | | **YES** | **NO** | **N/A** |
| 2a. Does a written detailed procedure exists and is it utilized for the brazing process? Identify procedure number and revision. | | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 2b. Does a written detailed procedure exist for assembly of components prior to brazing? Identify procedure number and revision. | | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 3. Are procedures readily available? | | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 4. Are inspection procedures utilized for brazing? Identify procedure number and revision: | | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 5. Are inspection and manufacturing personnel trained in use of procedures? Is this recorded and part of employee’s file? | | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 6. Are brazing procedures written based on contract invoked requirements or generic and company based standards? | | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 7. Is the procedure approved by the Customer? List  Reference Approval Number, if applicable: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 8. Are procedures/work instructions adequate for control of: | |  | | |
| a. Proper Equipment, etc. | | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| b. Proper Materials, etc. | | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 9. What types of tools are required in the use of the procedures? Specify sample of tools | | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| Remarks: | | | | |
| 10. Does procedure include system for identification of inspection status on parts and documentation? (e.g. inspection stamp) | | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |

|  |  |  |  |
| --- | --- | --- | --- |
| **SECTION II: Record Review:** | **YES** | **NO** | **N/A** |
| 11. Identify inspection methods used to verify conformance with procedures and standards | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 12. a. What inspection documents exist and are they maintained to confirm inspection process was performed? | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| b. Review and record number of samples: | \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | |
| **ATTRIBUTES:** | **YES** | **NO** | **N/A** |
| 13. Is trace ability maintained for material, which has been brazed? | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 15. Are all tools, gages, meters, utilized for monitoring and/or  Inspection a part of the manufacturer’s calibration program? | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 16. Are certifications for raw materials used in brazing process reviewed for acceptance and maintained on file for review? | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 17. Adequate inspection work records are maintained. | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 18. The shop traveler and work records can be traced to the inspection personnel. | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 19. Verify that all completed records are properly reviewed, approved and maintained. | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 20. Verify Brazer Qualifications. | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 21. Verify Qualifications database is correct and up to date. | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 22. Follow up on any past audit findings and corrective actions. | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 23. Review work packages, Drawings that identify brazing requirements. | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 24. Randomly select Braze records that have been completed over a period of three (3) months (or longer if few joints were completed) and verify compliance to procedure. | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 25. Select in-process Braze joint to audit. | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| SECTION III:  OBSERVATION OF BRAZING PROCESS | SAT \_\_\_\_ | **UNSAT \_\_\_\_** | **N/A \_\_\_\_** |
| **ATTRIBUTES:** | **SAT** | **UNSAT** | **N/A** |
| 26. Detailed observation of brazer (complete one section for each brazer observed). NOTE: if determined to be N/A, provide an explanation. | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| Additional Comments: | | | |

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| 27. Identify process observed. Specify class and type and/or grade. | | | | | | | | | | | | | |
|  | |  | | TY-I | | | Torch | | | | | | |
|  | | TY-II | | | Furnace Brazing | | | | | | |
|  | | TY-III | | | Induction | | | | | | |
|  | | TY-IV | | | Resistance | | | | | | |
|  | | TY-V | | | Dip | | | | | | |
| 28. Brazer identification: | |  | | | | | | | | | | | |
| NAME: | | | | | | | BADGE | | | CLOCK# | | | SHIFT |
|  | | | | | | |  | | |  | | |  |
| Base material(s) being brazed. | | | | | | | | | | | | | |
| **STAINLESS** | **CARBON STEEL** | | **COPPER** | | **NICKEL** | | | **CU/NI** | | | **ALUM** | | |
|  |  | |  | |  | | |  | | |  | | |
| \* If transition joint mark both materials | | | | | **SAT** | | | **UNSAT** | | | **N/A** | | |
| 29. Check Brazing process | | | | |  | | |  | | |  | | |
| 1. Procedure number: | | | | | | | | | | | | | |
| b. Is the Brazer familiar with details of the procedure? | | | | | | **SAT**  \_\_\_\_ | | | **UNSAT**  \_\_\_\_ | | | **N/A** \_\_\_\_ | |
| 30) Verify procedure compliance for: | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| a) Base material applicability | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| b) Fitting/Joint dimensions are in accordance with Military specifications or an approved Drawing | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| c) Braze alloy receipt inspection records are correct. | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| d) Braze alloy requirements are in compliance (specific combination allowed by procedure is allowed by specification). | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| **II: ATTRIBUTES:** | | | | | | **YES** | | | **NO** | | | **N/A** | |
| 1. Ensure Brazer qualifications are in accordance with procedure (training records, test, maintenance, requalification, eye exams, corrective lenses, proficiency records, etc.) | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| 2. Verification joint preparation (Squared, De-Burred, any required scribe marks are applied and noted if any deviation is required) | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| 3. Verification of the joint preparation and assembly is performed in accordance with approved procedures | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| 4. Markings Verification | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| 5. Identification markings on fitting for pipe or tube below  .125” wall thickness is per procedure. | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| 6. Pre-cleaning | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| 7. Fabrication process (proper brazing technique is being applied, proper size torch tip, joint bends are locked in place, proper face feeding, supplemental face feeding when required and Scribe Lines verified/documented). (When required preheat is verified by use of a surface contact pyrometer or other temp indicating device such as temp sticks, etc.) | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| 8. Type of Filler metal | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| 9. Type of Flux and correct consistency | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| 10. Re-Fit due to time limits (Flux Dries) | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| 11. Preheat | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| 12. Brazing Temperature | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| 13. Repair | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| 14. Face Feed | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| 15. Post cleaning | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| 16. Cooling | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| 17. Flux Removal | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| 18. Heat Treat | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| 19. Passivation | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| Remarks: | | | | | | | | | | | | | |
| **SECTION IV: INSPECTION** | | | | | | SAT ­­­\_\_\_\_ | | | **UNSAT** \_\_\_\_ | | | **N/A**  \_\_\_\_ | |
| **ATTRIBUTES:** | | | | | | | | | **SAT** | | | **UNSAT** | |
| 20. Aided Visual Inspection (5X) | | | | | | | | |  | | |  | |
| 21. Ultrasonic Test (UT) satisfactory? | | | | | | | | |  | | |  | |
| 22. Contour of joint? | | | | | | | | |  | | |  | |
| 23. Dimensions? (Especially for evidence of any deviation from fit-up dimensions (e.g., “pull-out” and angular distortion “cocked”, verification of material meets fit-up requirements by use of previously applied scribe line to ensure material fabrication is within limits). | | | | | | | | |  | | |  | |
| 24. Porosity limits? | | | | | | | | |  | | |  | |
| **Defects Present:** | | | | | | **YES** | | | **NO** | | | **N/A** | |
| Pinholes | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| Concentrated | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| Linear | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| Blisters | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| Residual Flux? | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| Excess Braze Metal? | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| Un-melted Alloy? | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| Undercutting? | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| Penetration? | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |
| Internal Defects (if applicable)? | | | | | | \_\_\_\_ | | | \_\_\_\_ | | | \_\_\_\_ | |

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| **SECTION V: MATERIAL CONTROL PROCESS** | | | | **SAT** \_\_\_\_ | | **UNSAT** \_\_\_\_ | | | N/A \_\_\_\_ | |
| **ATTRIBUTES:** | | | | | | **SAT** | | | **UNSAT** | |
| 25. Sample material process per ANSI Z1.4, AQL 2.5 or Other approved procedure? Document which  Procedure: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_  \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ | | | | | | \_\_\_\_ | | | \_\_\_\_ | |
| 26. Are their adequate methods of segregating accepted and rejected materials in use? | | | | | | \_\_\_\_ | | | \_\_\_\_ | |
| 27. Brazing wire, rings, flux, and raw materials have traceable markings on containers. | | | | | | \_\_\_\_ | | | \_\_\_\_ | |
| What types of brazing materials are used? (List) | | | | | | | | | | |
|  | **1** | **2** | **3** | | **4** | | **5** | | | **6** |
|  |  |  |  | |  | |  | | |  |
| SECTION V:  **CLEANLINESS\ENVIORMENTAL CONTROLS:** | | | SAT \_\_\_\_ | | **UNSAT** \_\_\_\_ | | | **N/A**  \_\_\_\_ | | |
| **ATTRIBUTES:** | | | **SAT** | | **UNSAT** | | | N/A | | |
| 28. Work areas are clean from debris and separate from other areas for brazing operations. | | | \_\_\_\_ | | \_\_\_\_ | | | \_\_\_\_ | | |
| 29. Exhaust equipment is utilized in brazing areas to provide fresh air for personnel. | | | \_\_\_\_ | | \_\_\_\_ | | | \_\_\_\_ | | |
| 30. Controls exist for handling and disposing of brazing waste. | | | \_\_\_\_ | | \_\_\_\_ | | | \_\_\_\_ | | |
| SECTION VI**: FURNACE CONTROLS** | | | **SAT** \_\_\_\_ | | **UNSAT** \_\_\_\_ | | | **N/A** \_\_\_\_ | | |
| **ATTRIBUTES:** | | | **SAT** | | **UNSAT** | | | N/A | | |
| 31. Are automatic temperature controlling and recording devices (potentiometer, e.g.,) provided to controls furnace temperatures? | | | \_\_\_\_ | | \_\_\_\_ | | | \_\_\_\_ | | |
| 32. Are de-carbonization tests run when carbon and low alloy steel items are furnace brazed? If so are the Decarburization limits allowed correct (e.g., .003”)? | | | \_\_\_\_ | | \_\_\_\_ | | | \_\_\_\_ | | |
| 33. Are periodic surveys conducted? Is data available? | | | \_\_\_\_ | | \_\_\_\_ | | | \_\_\_\_ | | |
| 34. Is calibration status noted on control/recording equipment? | | | \_\_\_\_ | | \_\_\_\_ | | | \_\_\_\_ | | |
| 35. Is the dew point and composition of atmospheres controlled to prevent oxidation or carbonization of carbon, low alloy and stainless steels? | | | \_\_\_\_ | | \_\_\_\_ | | | \_\_\_\_ | | |
| 36. What furnace atmosphere is used?  a. Argon  b. Hydrogen  c. Other? | | | \_\_\_\_ | | \_\_\_\_ | | | \_\_\_\_ | | |
| 38. Are joint clearances controlled:  a. Furnace Braze  b. Other Methods  c. Aluminum | | | \_\_\_\_ | | \_\_\_\_ | | | \_\_\_\_ | | |

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| **SECTION VII: OTHER PROCESS CONTROLS** | **SAT** \_\_\_\_ | **UNSAT** \_\_\_\_ | N/A \_\_\_\_ |
| **ATTRIBUTES:** | **SAT** | **UNSAT** | N/A |
| 39. Induction Brazing:  Are induction coils designed to assure uniform heating? | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 40. Is Dip brazing bath controlled? | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 41. Are written instructions provided for the removal of brazing salts and or fluxes? Verify if process is in control. | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| **SECTION VIII: REWORK CONTROLS** | **SAT** \_\_\_\_ | **UNSAT** \_\_\_\_ | N/A \_\_\_\_ |
| **ATTRIBUTES:** | **SAT** | **UNSAT** | **N/A** |
| 42. Are re-worked Braze joints controlled (documented and number of repair attempts prior to requirement for disassembly)? | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 43. Verify instruction for use of brazing alloy for repair. | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 44. Ensure Braze joint is re-fluxed prior to repair attempt. | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 45. Verify the same NDT is used for acceptance of repaired joints during initial fabrication. | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |
| 46. Ensure proper instructions are prepared and followed for routine repairs. | \_\_\_\_ | \_\_\_\_ | \_\_\_\_ |

Additional Comments/Concerns: