DCMA NSEO MANUFACTURING PROCESS REVIEW (MPR) CHECKLIST #22

WELDING

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| **SUPPLIER & CAGE:**  |  |
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| **LOCATION:** |  |
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**Program Type:**

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|  | 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:**

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**Supplier Procedure Number(s), Title(s) & Revision Level(s)/Date(s):**

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| **Process Reviewed By:**  |  |
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| **Date(s) of Review:** |  |
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**Process Concerns and Guidance:**

* Weld defects such as cracks, lack of fusion, undercut, incomplete penetration, inclusions, porosity and others compromise product integrity and can result in mission failure including loss of life.
* Proper setup
* Proper techniques
* Procedure compliance
* Shielded Metal Arc Welding (SMAW), also called *stick welding* *process,* **cannot** be used on steel thinner than about 3mm. Since it is a discontinuous process, it is only suitable for manual operation.
* Metal Inert Gas (MIG) or Gas Metal Arc Welding (GMAW) key issues are: selecting the correct gas mixture, flow rate, welding wire, speed, and current.
* Tungsten Inert Gas (TIG) or Gas Tungsten Arc Welding (GTAW); a high degree of skill and care is needed to prevent tungsten inclusion in the weld.
* Welds with inferior properties can result in concerns for strength, fatigue or brittle fracture.
* Welds deposited with incorrect filler materials can result in cracks, inferior properties or corrosion.
* Welds deposited with insufficient pre-heat, exceeding the maximum weld inter-pass temperature and improper post-weld stress relief can result in cracking.

**QARs *shall* complete sections A *through* F *and* *either* checklist G (General, non-Tech Pub 278 welding) *or* H (Tech Pub S9074-AR-GIB-010/278 welding) review.**

**A. MANPOWER:**

1. Are the welders and welding operators of the appropriate skill/experience level and/or properly trained/certified to produce conforming product? ***What are the requirements?***

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1. Is there a written procedure covering all aspects of training and associated responsibility? Is there evidence of approval by the authorized representative as required by Technical Manual S9074-AQ-GIB-010-/248, paragraph 5.2.3.1.a of this training procedure? (NAV22-VIIA1/2)

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1. Is there evidence of training in workmanship and detailed visual inspection requirements of all fabrication documents to which welding is performed? Are training records available (review sample) and are they accurate and complete? (NAV22-VIIA3)

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1. Have all welders passed written examinations covering detailed workmanship and visual inspection requirements with a grade of 75 percent or greater? (NAV22-VIIA4)

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1. Is there evidence of approval of Items 2, 3, and 4 above by a Level III examiner or other NAVSEA approved individual? (MIL-STD-248, paragraph 5.2.3.1.d) (NAV22-VIIA5)

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1. Do examination records for each welder include: name, fabrication/acceptance standards covered, date of test, and certifying signature of test administrator? Is each welder retested every 3 years? (NAV22-VIIA6/7)

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1. Is the entire training program audited by the Level III Examiner or other NAVSEA approved individual (MIL-STD-248, paragraph 5.2.3.1.d) at least once every 2 years to assure adequacy? (NAV22-VIIA8)

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1. Review and identify a sample of welding being performed by supplier personnel in accordance with procedures. Is the welder qualified for the observed welding procedure? Record welder name, the process observed, the base material being welded, and the electrode issue card on file. (NAV22-VIIIA/B/C/D/E)

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1. Is the welder familiar with details of the procedure? Is the procedure/technique sheet readily available? (NAV22-VIIIF/G)

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**B. MATERIALS:**

1. If Level I material is being used, is the product controlled and traceable throughout the process?

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1. Are certifications for base materials and welding filler materials (electrodes) used in the welding process reviewed for acceptance and maintained on file for review?

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1. If weld is a repair weld, does the Supplier have customer approval and approved procedures for the weld repair (i.e., size limitations, heat treatment, etc.)?

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1. Are weld procedures in use the correct procedure, correct revision, and approved by the customer for the type/classification of weld being performed?

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1. Are there records to assure that electrodes are purchased and issued to the required military specifications? Are weld electrodes verified for conformance by reviewing certifications for compliance to the applicable electrode specifications? (NAV22-IIA6/A)

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1. Are ferritic filler materials chemically analyzed for compliance to applicable Electrode Specifications? (NAV22-IIA6B)

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1. Are weld consumables adequately identified, segregated and controlled? In electrode room and ovens? While issued to Production? (NAV22-IIA7/A/B)

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1. Is an electrode issue card system in use? Are electrodes returned to the issuance point? (NAV22-IIA8/9)

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1. Does the supplier bake electrodes? Are controls in accordance with applicable specification requirements? (NAV22-IIA10/A)

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1. Does the supplier’s system control compatibility of electrode/flux combination to the base material? (NAV22-IIA14)

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**C. MACHINERY:**

1. Are Baking/Holding ovens properly used? (Flux and covered electrodes) Are Baking/Holding ovens adequately maintained? (NAV22-IIA11/13)

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1. Are electrode moisture tests performed? (NAV22-IIA12)

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**D. METHODS:**

1. Does the supplier have the necessary welding/welding repair controls and procedures in place to perform on existing contracts? (NAV22-IA1)

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1. Is there a procedure in place to assure compliance with welding procedures and fabrication documents and are they readily available? (NAV22-IA5A)

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1. Is there a QA audit/surveillance procedure in place to weld procedures and fabrication documents? (NAV22-IA5B)

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1. Do travelers/work instructions give detailed welding instructions or refer the welder to applicable documents? (NAV22-IA6)

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1. Does the supplier invoke all Customer contract/purchase order requirements for welding to his sub tier suppliers? (NAV22-IA7)

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1. Is there a system to assure qualifications are maintained? ( Quarterly - S9074-AR-GIB-010/248) (NAV22-IIA2)

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1. Is there a system to assure that welding (including Tack and Temporaries) is only performed by operators qualified in the procedure and position? (NAV22-IIA1)

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1. Does the Traveler, Process Sheet or Other Instruction identify each required inspection and NDT? (NAV22-IIA3)

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1. To what extent is welding process monitoring being done? (NAV22-IIA16)

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1. Is a written procedure in effect describing weld quality and completeness requirements? (NAV22-IIA15)

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1. Are contractual records maintained? (NAV22-IIA4) Are there records for each of the below items? ***Record records sampled and results.***
* Performance of inspections (NAV22-IIA4A)
* Records of defects found (NAV22-IIA4B)
* Welder identification where required (NAV22-IIA4C)
* Electrodes/Flux Test Reports (NAV22-IIA4D)
* Qualifications and Vision Tests (NAV22-IIA4E)

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1. Are all welding attributes and controls reviewed? Are records kept? (NAV22-IIA16A) Explain:

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1. Are workmanship inspections documented? (Workmanship attributes include: weld joint prep, back-gouge/grind roots, repair excavation contours, arc strikes, spatter, fabrication scars, alignment and fairness, tapers, snipes, intersecting butts, etc.) Describe below. (NAV22-IIA17)

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1. Are detailed records or a more generalized record of accomplishment used? Explain (NAV22-IIA17A)

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1. Are weld repair operations, including required evaluations and approvals, properly documented and traceable to the completed material? Explain documentation: (NAV22-IIA18)

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1. For a sample of welders, record and verify the following documentation for each welder: (NAV22-IA2A)

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| **Weld Processes Used (check applicable boxes) (NAV22-IA2)** |
| StickS M A | MIGG M A W | TIGG T A W | Sub ArcS A W | Spot Resistance | Other |
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| Define Other: |
| **Weld Procedure Qualifications (check applicable boxes): (NAV22-IA2B)** |
| A S M E | Tech Pub S9074-AQ-GIB-010/248(List Revision) | Navy Approved | Customer Approved | Other |
|  |  |  |  |  |
| Define Other: |
| **Materials Welded/Weld Repaired (check applicable boxes): (NAV22-IA2C)** |
| HY100 | HY80 | HSLA100 | HY100 | HY80 |
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| Stainless/Ferrous | Material Requiring Preheat/Interpass Temp.Control | Pipe/Mach | Other |
| Define Other: |
| **Applicable Weld Process Specifications (check applicable boxes): (NAV22-IA3)** |
| MIL-STD-1689 | MIL-STD-1681 | T9074-AD-GIB-010/1688 |
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| A S M E | S9074-AD-GIB-010/278 | PPD694 |
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| PPD720 | PPD689 | Other |
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| Define Other:  |
| Is there evidence of annual vision tests? (NAV22-IIA2A) |
| **Procedure Parameters/ Approvals: (NAV22-IA4)** |
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| Proc Number  | Materials to be welded  | Required filler material  | Approval No: |
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**E. ENVIRONMENT:**

1. Has sufficient work area been allocated to the process being performed? Is the area where the work is being performed uncluttered, clean, properly lighted, and free from dirt and debris?

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1. Is there adequate ventilation in the finishing area?

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1. Are there an adequate number of fire protection devices maintained and readily available for use?

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1. Are there eye-wash stations located in the work area, and are they easily accessible? Are Process appropriate welding PPE available and used in accordance with supplier procedures?

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**F. PRODUCT EXAMINATION:**

***The QAR must perform a product examination in order to verify the output of the process being reviewed and document the results below.***

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| Date(s) Conducted: |  |
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| Product Examination Performed By: |  |
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| Contract Number(s): |  |
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| Part Number(s)/Serial number(s): |  |
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| Part Nomenclature(s): |  |
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| Supplier Personnel Contacted and Titles: |  |
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| Drawing Number & Revision: |  |
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| Lot Size and Sample Size: |  |

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| Characteristics Examined: | # Observations |
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1. Identify the inspection methods (W, I, T, V) used to verify conformance with procedures and standards:

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| **W** |  |  | **I** |  |  | **T** |  |  | **V** |  |

**PE Comments/Concerns**

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**G. GENERAL WELDING PROCESS REVIEW QUESTIONS**

**(To be completed for all welding performed to specifications other than Tech Pub S9074-AR-GIB-010/278)**

1. Review for proper joint preparation and configuration: Is there evidence of correct configuration to plans, drawing, fabrication documents prior to welding? (NAV22-IIIA3/A)

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1. Is material to be welded positively identified (traveler, stamped, paint stick, other)? (NAV22-IIIA4)

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1. Is filler material properly identified on work traveler, production Records IAW approved procedure? (NAV22-IIIA5)

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1. Review Tack Welding. Is there evidence of NDT of tack weld if applicable (i.e. MT ) (NAV22-IIIA6/A)

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1. Has any preheat been used? What method of preheat? (strip heaters, radiant/infrared, torch-gas/air, oxygen-fuel) Were preheat temperatures monitored? (NAV22-IIIA7/A/B)

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1. Control of Heating: Is welding performed within a building? Is welding performed outdoors? Are ambient temperature recorded? (NAV22-IIIA8/A-C)

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1. Control of Minimum Temperatures: Was a minimum temperature established? Was MT required due to loss of minimum temperature? Was MT performed? (NAV22-IIIA9/A-C)

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1. Control of Maximum Temperatures: Was a maximum temperature established? Evidence of maximum temperature monitoring? (NAV22-IIIA10/A/B)

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1. Temperature Checks: Was inter-pass temperature checked? What was the method of temperature checks? Was surveillance of preheat temperature checks performed? (NAV22-IIIA11/A-C)

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1. Weld Repairs for Cracks: Were any cracks repaired by welding? What specification was used? Were requirements followed? (NAV22-IIIA12)

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1. Were defects repaired by grinding? Was minimum design thickness verified after grinding? (NAV22-IIIA13/A/B)

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1. Were any repairs by Welding performed? If yes, were all original weld processes and procedures utilized? Was filler material used for repair? (NAV22-IIIA14/A/B)

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1. Was arc stud welding utilized? What method of stud welding? What equipment was used? (NAV22-IIIA15/A/B)

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**H. TECH PUB S9074-AR-GIB-010/278 SPECIFIC WELDING PROCESS REVIEW QUESTIONS**

**(To be completed for all welding performed to Tech Pub S9074-AR-GIB-010/278)**

1. Is the classification of Tech Pub-278 type weld identified? (Para. 3.3.2 of Tech Pub-278). List the applicable classification below (Class M, Piping Class P-1, Machinery, Other Class P S\(specify), Pressure vessels and tanks - Class A, Steam turbines - Class T) Is the welding procedure for the type/classification of weld approved? (NAV22-IVA1/2)

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1. Do the filler materials used conform to the requirements of Table III of Tech Pub-278? (NAV22-IVA3)

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1. For Class P thin wall tubing, was the shield metal arc process used? (Tech Pub-278 para 6.2.2 specifies that the process may be used for wall thickness of 0.109 inch or over when welded on board ship or over when welded in the shop. Other welding processes will be permitted for thinner walls on the basis of welding procedure qualification tests) List other processes: (NAV22-IVA4)

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1. Does the pre-heat and interpass temperature for welded ferrous alloys conform to Table IV of Tech-Pub-278? Review records, travelers, and documentation. Specify sample size and results. (NAV22-IVA5)

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1. Does preheat and inter-pass temperature for welded non-ferrous alloys conform to Table V of Tech Pub-278? Review records, travelers, and documentation. Specify sample size and results. (NAV22-IVA6)

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1. For ferrous alloys, was the post heat requirements of Table VI of Tech Pub-278 complied with? (NAV22-IVA7A)

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1. Was post weld heat treatment performed? If performed, do the records and documentation conform to the requirement of Paragraph 8.2 of Tech Pub-278 for special requirements? (NAV22-IVA7B/C)

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| **Overall MPR 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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