DCMA NSEO MANUFACTURING PROCESS REVIEW (MPR) CHECKLIST #19

FLAME SPRAY

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

* Flame Spray is a thermal spray process which is grouped into three major categories; Plasma Arc Spray, Flame Spray, and Electric wire-arc spray.
* Wind, abrupt drafts, or brisk air movement in the area where the process is being performed can affect the quality of the molten spray deposited as well as the stability of the flame. To overcome this, the setup might have to be augmented with an enclosure, a spray booth, or a dedicated area limiting the air movement.
* Possible oxidation can be caused by ***compressed shop-air*** used to accelerate and propel the molten particles. A compressed, inert gas such as argon or nitrogen is preferred if oxidation is a concern.
* The surface of the part that is to be subjected to the Flame Spray process must be free from, moisture, oil, grit, contaminants, blisters, cracks, chips, pits, or coating separations.

**A**. **MANPOWER:**

1. Are the personnel performing the Flame Spray and quality assurance functions of the appropriate skill/experience level and/or properly trained/certified to produce conforming product? ***What are the requirements?***

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1. Are training records available (review sample), and are they accurate and complete? Have spray operators and personnel performing inspection/acceptance passed an annual vision test if required?

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1. Are personnel performing the Flame Spraying process knowledgeable in the use of applicable procedures, tools, and gages, meters, etc.? If applicable, has the spray operator passed a written exam approved by the customer? (NAV19-A13)

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1. Is there a system in place for remedial training when errors occur? Where is it documented, and are records of remedial training available?

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**B. MATERIALS**:

1. Are certifications for raw materials used in the flame spraying process reviewed for acceptance and maintained on file for review? (NAV19-A12)

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1. Is stored wire and powder protected, properly identified, and does it match the material specified in the procedure to be used?

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1. Are materials controlled and traceable throughout the process, if required? (NAV19-A8)

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1. Does the gas used for flame spraying meet the applicable specification requirements? If a gas is used other than those called out by specification, has the procedure been approved by the customer?

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1. Are the abrasive blasting particles the proper material and size to be used for the surface preparation as required by the applicable specification?

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**C. MACHINERY**:

1. Is flame spray 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? (NAV19-A11)*

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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? (NAV19-A11)*

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1. Are in-line water and oil filters located between the compressor and the metal spray equipment, and are they periodically inspected and serviced?

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1. Is any special handling equipment or special packaging required after the flame spraying process? Is the special equipment or packaging accomplished in accordance with the specification, drawing, or procurement spec? (NAV19-A15/A)

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**D**. **METHODS**:

1. What drawing, specification, or document invokes the requirements for flame spraying? (NAV19-A1)

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1. Does a written, detailed procedure exist, and is it readily available and utilized for the flame spraying process? Is the procedure approved by the customer? List the procedure and reference approval number, if applicable. (NAV19-A2A/B/A3)

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| 1. Are procedures/work instructions adequate for the control of the following?: (NAV19-A4A-H)
 | **SAT?** | **UNSAT?** |
| Proper Equipment (guns, filters, regulators, flow meters, wire feed control, etc.) |  |  |
| Proper Materials (gases, wire, etc.) |  |  |
| Temperature Monitoring (preheat, spraying temp, cooling, etc.) |  |  |
| Methods for masking areas |  |  |
| Pressure and Flow Settings |  |  |
| Gun to work piece distances and angles |  |  |
| Rate of application |  |  |
| Final Thickness |  |  |

1. Are pieces to be flame sprayed cleaned prior to the process? List methods and materials used, if applicable. Is cleanliness maintained prior to flame spraying? (NAV19-A5A-C)

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1. Identify and list all the inspection methods used to verify conformance with procedures and standards. (visual, tensile bond, hardness, thickness, and any others) Does the procedure identify acceptance criteria for the methods used? (NAV19-A6)

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1. Are inspection documents properly completed and maintained? What inspection documents exist? Is inspection data reviewed and accepted by qualified personnel? Review and record number of samples. (NAV19-A7/A/B/A9)

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1. Are corrective actions performed and documented after rejectable attributes have been found? (NAV19-A10)

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1. Are special precautions identified prior to performing the flame spray process (i.e. safety issues, hazardous material)? (NAV19-A14)

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**E.** **ENVIRONMENT**:

1. Is the flame spray process conducted under controlled environmental conditions (closed area with proper ventilation, wet dust collection system, open area with adequate protection etc.) as required by contractual and/or supplier-imposed technical requirements? ***What are the environmental conditions (open or closed area etc.) and how are they controlled?***

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1. Is the abrasive blasting accomplished in a designated blasting booth or another enclosed area? If abrasive blasting is accomplished in another enclosed area does the air in the area change out sufficiently in accordance with applicable specifications?

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1. Are all applicable safety and personal protective equipment, required by applicable specifications, available and in use for flame spray and blasting operations?

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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. If available, witness a flame spray operation on a component. If not available, verify by interview that the operator is familiar with the process and procedure/work instructions.***

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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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|  | # 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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| **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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