DCMA NSEO MANUFACTURING PROCESS SURVEILLANCE (MPS) CHECKLIST #38

FORMING OPERATIONS

INCLUDING BENDING OF PIPE, TUBING, AND BAR

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| **SUPPLIER & CAGE:**  |  |
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| **LOCATION:** |  |
|  |  |
| **PROCESS:** |  |

**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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| 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: |  |
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| Drawing Number & Revision: |  |

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**Process Concerns and Guidance:**

* The bar, tube or pipe can be formed into elbows, tees, reducers and other shapes. Improper lubrication, pressure, temperature, time, filler and etc. may cause out of round, wall thinning, wrinkles, buckles, bulges or other surface conditions.
* Inadequate procedures for forming / bending can result in unacceptable material being processed.
* Proper setup and alignment
* Contractor personnel may not be properly trained to perform forming operations.
* Raw material may not be pre-cut to the proper shape or size
* Use of marking materials and/or forming lubricants that do not meet contract requirements for detrimental materials can result in unacceptable product.
* Deviation from customer approved product qualification, procedure qualification or 1st Article test reports may require re-qualification testing and submittal of results.
* Weld repair of bar, tube, pipe or formed items may require authorization/approval prior to weld repair. The welding procedure requiring qualification and approval.
* Failure to maintain material control can result in the use of incorrect raw materials which can affect the mechanical properties of the material produced. Improper marking of rejected material has resulted in comingling with acceptable product.
* Forming methods and / or dies may not allow for the production of necessary testing materials / specimens, such as prolongations required for mechanical testing.
* Improper / inadequate starting material selection may result in product which does not meet dimensional requirements after forming – primarily bending operations.
* Improper pre-heating can introduce defects to material during forming operations.
* Required marking, “built in” to drawings and specifications, which is to be applied by / during forming operations, is overlooked.

**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 manufacturing/forming, testing, and quality assurance functions of the appropriate skill/experience level and/or properly trained/qualified to produce conforming product? ***What are the requirements?***
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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?*
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| 1. Is manufacturing equipment adequate to produce and assess conforming supplies in accordance 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?*
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| 1. Are procedures, work instructions, travelers, etc. being used adequate, clear, and up to date (latest revision)? *What documents (identifying number & rev) were reviewed?*
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| 1. Is there a documented procedure/process to determine the acceptability of raw materials (i.e. pipe, tube, bars, etc.)? Are certifications for raw materials reviewed for acceptance and maintained on file for review? Do the raw materials comply with contract/specification and/or supplier-imposed technical requirements?
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| 1. For Level I material, is the product controlled and traceable throughout the process?
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| 1. Is forming equipment controlled for use in a single alloy or family of alloys where cross contamination is not a concern?
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| 1. Does the organization have a documented procedure for controlling, storing, and issuing raw materials, filler, lubricants and etc.?
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| 1. Are heat/lot traceability markings marked immediately after cutting the raw material (i.e. pipe, tube, bar, etc.) to size prior to forming and after being formed? Or is a process in place to assure traceability is maintained until markings are applied?
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| 1. Are the mechanical properties of each heat/lot of metal verified after forming?
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| 1. Is inspection data reviewed and accepted by qualified personnel? Is operator identification recorded? (name, badge number, clock, shift, etc.)
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| 1. Does the organization use documented qualified procedures for performing welding repair? Has the procedure been approved by the Government / Custome? Does the organization maintain records showing the training and qualification of the welders?
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| 1. Is the correct forming machine (e.g. ram type, roll type, compression type, rotary type, rotary type with a booster, or other type) and/or dies used?
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| 1. Are adequate controls in place to assure that the correct forming machine, correct filler material and correct filler size is used during the process?
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| 1. Are required pre-forming and/or forming temperatures controlled per applicable requirements? If hot forming, identify the heating source (furnace, heat induction coil, torch, etc.)
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| 1. Does the organization use a documented procedure for performing and evaluating NDT on the final product?
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| 1. Does the organization have a process for reviewing repetitive forming defects in order make improvements to their process, which will improve the acceptability of the final product?
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| 1. Does the organization use a documented procedure for visually inspecting and evaluating the final product? Is magnification being used?
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| 1. Does the organization use a documented procedure for rework or repair (including weld repair)?
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| 1. Is the work area where the work is being performed, clean and free from dirt and debris?
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| 1. Does the organization have any process to clean the item to remove any lubricants, filler materials or other materials/ contaminants prior to heat treat or further processing?
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| 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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