DCMA NSEO MANUFACTURING PROCESS REVIEW (MPR) CHECKLIST #26

FASTENER TEST METHODS (ASTM-F606)

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

**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:**

* Long externally threaded fasteners, such as fully threaded rod, have had shorter sample pieces tested to certify mechanical properties of the rod when the parent fastener specification, such as MIL-DTL-1222, **requires** full-sized testing.
* Hex nuts have been tested for proof load properties to requirements other than those applicable to the style of nut, such as heavy hex nuts tested to the lower requirements of regular hex nuts.
* Headed externally threaded fasteners have been tested for wedge tensile strength properties with the wedge incorrectly installed in the tensile test equipment.
* Testing facilities must maintain unique traceability of the material throughout the performance of all processing and testing functions.
* Headed fasteners have been wedge tensile tested with the wrong wedge angle when the wedge angle requirement, based upon the product fastener specification, differs from that of the testing standard.
* Tensile testing of short externally threaded fasteners have been errantly waived based upon ASTM-F606 Table 1, when in actuality the governing fastener product specification requires test specimens representing the finished product, of sufficient length to accomplish the required testing, be utilized, thereby negating the waiver.
* An insufficient number of tensile tests have been conducted to satisfy product specification sampling requirements.
* Hardness testing. Machines not verified by an outside source. Machines not checked properly in-house – daily, number of readings, improper test blocks, improper placement of impressions.
* Hardness testing procedure inadequate: Daily checks or checks prior to usage not documented confirming the machine is operating properly. Limited number of test blocks. Improper care of test blocks (readings too close and on both sides).

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

1. Are the personnel performing the manufacturing, engineering, purchasing, testing and quality assurance functions of the appropriate skill/experience level and/or properly trained/certified to produce conforming product? ***What are the requirements?*** ***(Some fastener specifications have specific operator qualification requirements)***

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1. Record all operations observed (include type and specification, where applicable) and the corresponding operators’ names. Are any personnel certifications expired and are they still working in the process?

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1. Are training records available (review sample) and are they accurate and complete?

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1. Are the credentials of the training/certification official in accordance with specification requirements? ***What are the requirements?***

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1. Is there a system in place for remedial training when errors occur? Is the system documented, and are there records of remedial training available, if applicable?

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**B. MATERIALS**:

1. For Level I material, is the product controlled and traceable throughout the process?

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1. Are certifications for raw materials used reviewed for acceptance and maintained on file for review?

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1. Do the raw materials comply with contract/specification and/or supplier-imposed technical requirements? ***What were the materials reviewed?***

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1. Are raw materials traceable/identified, as required, and within shelf life, if applicable?

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1. Are there controls to ensure conforming material is consistently used in the process? Describe.

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1. Is all non-conforming material segregated, controlled, traceable, and do procedures exist for disposition of the non-conforming material?

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1. When wedge tension testing and proof load testing is required for bolts, does the activity use the proof loaded test bolts for the wedge testing as required by ASTM F606? (NAV26-9B)

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1. When wedge tension testing and proof load testing is required for studs, does the activity use the proof loaded test studs for the wedge testing as required by ASTM F606? (NAV26-9D)

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**C. MACHINERY**:

1. Is **manufacturing equipment** (tooling, fixtures, jigs, and measuring/test equipment) adequate 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?*

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1. Is **inspection and testing equipment** of the required adequacy, accuracy and precision (type & condition) 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. Does equipment (to include fixtures, jigs, and software [ATE]), requiring qualification or certification approval, have contractual approval for use? *For software, was the correct software in use? What program(s) and revision level(s)/date(s) was in use?*

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1. Is Government owned equipment adequately protected/maintained in accordance with a documented process?

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1. Are wiping and cleaning cloths for parts checked for grease, oil, etc., content?

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1. **ASTM-F606 Specific**: If the activity does not use a bolt extensometer, verify that a measuring instrument capable of measuring changes in increments of 0.0001" with an accuracy of 0.0001" in any 0.001" range is used for length measurement. (NAV26-4B)

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1. **ASTM-F606 Specific**: Does the activity uses the Total Extension Under Load Method to determine yield point? If so, do they use a class C or better extensometer? Has the extensometer been verified and calibrated as required by ASTM E 83? (NAV26-10D)

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1. **ASTM-F606 Specific**: Does the activity use the Offset Method to determine yield strength? If so, do they use an extensometer with a magnification of at least 250 to 1? Has the extensometer been verified and calibrated as required by ASTM? (NAV26-10E)

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

1. Are all applicable work instructions, test procedures, travelers, etc. adequate, clear, of the proper revision, readily available, and in use by personnel? ***What instructions (identifying number) were reviewed?***

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1. Do the procedures include the inspection process with a system for the identification of processing and inspection status (e.g. individual operation sign-off/inspection stamping), sample size requirements, and record maintenance requirements?

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1. Is the product adequately identified on the traveler/router to provide clear material traceability throughout processing?

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1. Are changes to methods (instructions) controlled and translated adequately and timely to affected personnel?

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1. Are there adequate methods of segregating accepted and rejected material in use? **Describe.**

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1. Is adequate care and protection taken to prevent damage during transport within the facility? Is adequate protection taken to prevent damage in shipment?

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1. Does the activity have written procedures for preparing test specimens and selection of test methods to be used for testing? (NAV26-1)

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1. **ASTM-F606 Specific**: Does the activity have a written requirement to verify that any surface oxide, decarburization, plating or other coatings have been removed prior to product hardness testing? (NAV26-2A)

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1. **ASTM-F606 Specific**: When performing product hardness testing, does the activity use the correct test method (i.e. ASTM E18 Rockwell -any size; ASTM E10 Brinell - ≥ 1 1/2" diameter) and select the proper test locations as required? (NAV26-2B/C)

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1. **ASTM-F606 Specific**: During Tension Tests, does the activity ensure that six complete threads (except for heavy hex structural bolts, which shall be based on four threads) are exposed between grips during testing? For continuous thread bolts, at least six full threads shall be exposed. Described the method used to verify thread exposure. (NAV26-3A)

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1. **ASTM-F606 Specific**: When determining Proof Load using Method 1 (Length Measurement), does the activity prepare test specimens and perform measurements on the specimen as required? (NAV26-4A)

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1. **ASTM-F606 Specific**: Verify that the testing speed when determining Proof Load using Method 1 (Length Measurement) does not exceed .12in/min and that the load is held for at least ten seconds. (NAV26-4C)

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1. **ASTM-F606 Specific**: If Proof Load re-testing using Method 1 (Length Measurement) is performed as allowed, is the load increased by 3%? (NAV26-4D)

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1. **ASTM-F606 Specific**: Does the method the activity uses to measure the total elongation when determining Proof Load using Method 2 (Yield Strength) include the exposed threads? (NAV26-5A)

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1. **ASTM-F606 Specific**: Does the activity use an offset equal to 2% of the length occupied by six full threads as required to determine the load/stress when determining Proof Load using Method 2 (Yield Strength)? (NAV26-5B)

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1. **ASTM-F606 Specific**: Does the activity determine the load/stress at an offset equal to 0.2% of the strain based on the length of the bolt between holders when determining Proof Load using Method 2A (Yield Strength) for Austenitic Stainless Steel and Non-Ferrous products? (NAV26-6/A)

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1. **ASTM-F606 Specific**: When determining Proof Load using Method 3 (Uniform Hardness), are hardness tests conducted as specified in 8 and 9 above? ***Applicable to Fasteners ≤ 1” in diameter*** (NAV26-7A)

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1. **ASTM-F606 Specific**: Does the activity perform core hardness as required when determining Proof Load using Method 3 (Uniform Hardness), and compare the results to the mid-radius results? The difference shall not exceed 3 points. ***Applicable to Fasteners ≤ 1” in diameter*** (NAV26-7B)

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1. **ASTM-F606 Specific**: Does the activity have a written procedure for Axial Tension Testing of Full-Sized Products (Bolts, Screws or Studs)? (NAV26-8A)

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1. **ASTM-F606 Specific**: Does the activity have a written procedure for Wedge Tension Testing Full-Sized Bolts and Screws? (NAV26-9A)

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1. **ASTM-F606 Specific**: Does the activity have a written procedure for Wedge Tension Testing Full-Sized Studs? (NAV26-9C)

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1. **ASTM-F606 Specific**: Does the activity have a written procedure for preparing and Tension Testing Machined Test Specimens? (NAV26-10A)

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1. **ASTM-F606 Specific**: Does the activity use the Drop of the Beam or Halt of the Pointer method to determine the yield point when Tension Testing Machined Test Specimens? (NAV26-10B)

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1. **ASTM-F606 Specific**: Does the activity use the Autographic Diagram Method to determine the yield point when Tension Testing Machined Test Specimens? (NAV26-10C)

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1. **ASTM-F606 Specific**: When Tension Testing Machined Test Specimens, does the activity determine the tensile strength, elongation and reduction in area as required? (NAV26-10F)

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1. Does the activity perform hardness testing when conducting testing of internally threaded fasteners? (NAV26-11A)

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1. When conducting testing of internally threaded fasteners, does the activity perform proof load testing? (NAV26-11B)

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1. Does the activity perform cone proof load testing when conducting testing of internally threaded fasteners? (NAV26-11C)

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

1. Is the area where the work is being performed uncluttered, clean and free from dirt and debris?

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1. Has sufficient work area been allocated to the process being performed?

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1. Is safety equipment available in the work area and easily accessible for use, if needed? ***What are the safety requirements for this process?***

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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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| **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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