

NAVSEA  
STANDARD ITEM

FY-27

ITEM NO: 009-015  
DATE: 01 OCT 2024  
CATEGORY: II

1. SCOPE:

1.1 Title: Rotating Machinery; balance

2. REFERENCES:

2.1 S9086-G9-STM-010/CH-231, Propulsion and SSTG Steam Turbines

2.2 MIL-STD-167-1A, Mechanical Vibration of Shipboard Equipment (Type I-Environmental and Type II-Internally Excited)

2.3 S9245-AR-TSM-010/PROP, Marine Propeller Inspection, Repair and Certification

3. REQUIREMENTS:

3.1 Measure and record the maximum eccentricity of the rotor shaft and installed components relative to the points of support using dial indicators.

3.2 Balance rotating machinery assemblies or components in accordance with the following requirements and procedures:

3.2.1 Balance multistage steam turbine rotors in accordance with 2.1.

3.2.1.1 Contact the SUPERVISOR prior to directing balance work for multistage steam turbine rotors.

3.2.1.2 Multistage steam turbine rotors must only be balanced at high speed (operating speed), in accordance with Section 231-8.13 of 2.1. Balance work must be performed by the OEM, OEM certified equivalent, or NAVSEA approved contractor who has a proven capability to high speed balance rotors in accordance with 2.1, 2.2 and the OEM balance specification for the rotor.

3.2.1.3 No attempt must be made to straighten a turbine rotor assembly.

3.2.1.4 Steam turbine rotors must be balanced with the overspeed trip governor installed.

3.2.1.5 Post-repair testing (sea trials for propulsion units) for multistage steam turbines where turbine repairs have been accomplished, must include a bearing cap vibration survey.

3.2.1.6 Submit one legible copy, in hard copy or approved transferrable media, of an equipment overhaul report to the SUPERVISOR. Report must include a balance report in accordance with Section 231-8.13 of 2.1. Unsatisfactory vibration balance levels recorded in the post repair testing, as determined by the SUPERVISOR, will be corrected by in-place balancing in accordance with Section 231-8.13 of 2.1.

3.2.2 Except for propellers, if the design operating speed of the component to be balanced is less than 150 revolutions per minute (RPM), the rotor including shaft must be balanced by symmetrically supporting the rotor on 2 knife edges and applying a correction to attain a gravity balance.

3.2.3 Except for propellers, if the design operating speed of the component to be balanced is equal to or greater than 150 RPM, the rotor including shaft must be balanced with equipment which requires rotation of the work piece.

3.2.4 Propellers must be balanced in accordance with 2.3.

3.2.5 Types of correction:

| TYPES OF CORRECTION | N 1/               | ROTOR CHARACTERISTIC 1/       |
|---------------------|--------------------|-------------------------------|
| Single-plane        | 0 - 1,000          | L/D Less than or Equal to 0.5 |
|                     | 0 - 150            | L/D Greater than 0.5          |
| 2-plane             | Greater than 1,000 | L/D Less than or Equal to 0.5 |
|                     | Greater than 150   | L/D Greater than 0.5          |

| TYPES OF CORRECTION | N 1/ | ROTOR CHARACTERISTIC 1/                          |
|---------------------|------|--|
| Multi-plane         |      | Flexible: Unable to correct by 2-plane balancing |

1/

L = Length of rotor mass, exclusive of shaft  
D = Diameter of rotor mass, exclusive of shaft  
N = Maximum operating RPM

3.2.6 Allowable unbalance: The values determined by Paragraph 5.2.2.2 of 2.2 are permitted in each plane of correction, except for multistage steam turbine rotors which must be in accordance with Section 231-8.13 of 2.1.

3.2.7 When the computation for converting displacement measurements to ounce-inches of force unbalance is an approximation, verification must be made by adding a trial weight to the rotor, equal and opposite to the calculated ounce-inches of force. If putty is used as a trial weight, it must be removed, weighed and a permanent compensating weight must be installed in its place.

3.2.8 Accomplish vibration testing and analysis in accordance with NAVSEA Standard Items. (See 4.2)

3.3 Submit one legible copy, in approved transferrable media, of a report listing results of the requirements of 3.1 and 3.2 to the SUPERVISOR. The report must include the following information:

3.3.1 Ship's name and hull number

3.3.2 Contractor and subcontractor

3.3.3 Job Order and Work Item number

3.3.4 Unit and component identification

3.3.5 Manufacturer and model number of balance machine

3.3.6 Date of last calibration, by whom it was calibrated, and when the next calibration is due for the balancing machine

3.3.7 Maximum total indicated runout of rotor or balancing arbor

3.3.8 Weight of rotor assembly in pounds

3.3.9 Design operating RPM of rotor

3.3.10 Computation of allowable unbalance in ounce-inches

3.3.11 Measured unbalance, prior to and after balancing, in ounce-inches

3.3.12 Computations or procedures for converting displacement measurements to ounce-inches of unbalance force, when the machine used to balance components indicates displacement measurements in lieu of direct unbalance forces.

#### 4. NOTES:

4.1 For multistage steam turbine rotors only:

4.1.1 Prior to performing machine or in-place balance, SUPERVISOR must contact NAVSEA 05Z22.

4.1.2 SUPERVISOR must forward as-found/final balance result and shipboard vibration and analysis report to NAVSEA 05Z22 and NSWCPD Code 412.

4.2 If vibration testing and analysis is required, the use of NAVSEA Standard Item 009-104 "Machinery Vibration and Analysis; accomplish" of NAVSEA Standard Items will be specified in the Work Item.