

# Preliminary - For Review Only

NAVSEA  
STANDARD ITEM

FY-06

ITEM NO: 009-104  
DATE: 29 JUL 2004  
CATEGORY: II

1. SCOPE:

1.1 Title: Vibration Testing and Analysis; accomplish

2. REFERENCES:

2.1 S9073-AX-SPN-010/MVA, Vibration Analysis, Machinery

2.2 Equipment Technical Manual

3. REQUIREMENTS:

3.1 Minimum personnel qualifications:

3.1.1 For vibration testing, personnel shall have the equivalent of 1,000 man hours of combined experience in: vibration concepts and terminology, the use of vibration equipment, performing equipment calibration, using electronic data collectors for monitoring and recording of vibration data, the attachment of transducer mounting disks and blocks, the selection and location of transducers, calculating machine frequencies, and have a qualified Vibration Category I certification from the Vibration Institute, or equivalent experience and training.

3.1.2 For vibration analysis, personnel shall have the equivalent of 3,000 man hours experience in: the use of FFT analyzers and data collectors, identifying machinery faults, performing spectral analysis, performing vibration testing, and have a knowledge of the engineering units involved, have a qualified Vibration Category II certification from the Vibration Institute, or equivalent experience and training.

3.1.3 Submit one legible copy, in hard copy or electronic media, of written substantiation of the credentials of the personnel to the SUPERVISOR seven working days prior to the start of vibration testing.

3.1.3.1 Submit any change of this information as it occurs to the SUPERVISOR.

(V) (G) "TESTING AND ANALYSIS

3.2 Accomplish vibration testing and analysis of the equipment in accordance with 2.1, using the ship's applicable Vibration Test and Analysis Guide (VTAG), and the following.

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3.2.1 Test the equipment at normal operational speed and load, using 2.2 for guidance.

3.2.2 Vibration data shall be recorded after obtaining stabilized bearing temperatures for continuous duty equipment.

3.2.2.1 Prior to collecting any data, operate pumps with electric motor drivers a minimum of four hours.

3.2.2.2 Operate pumps with auxiliary turbine drivers a minimum of two hours.

3.2.2.3 Operate other equipment a minimum of one hour.

3.2.2.4 For auxiliary turbine drivers or other variable speed equipment, data shall be acquired within plus or minus 5 percent of the specified speed.

3.2.3 Intermittent or special duty equipment shall have vibration data collected during the normal operating cycle.

3.2.4 Acceptable vibration data results shall not exceed like unit average machine values (statistically averaged signatures maintained in the ship's/Class program database). New or newly overhauled units shall be compared to the Mean plus one Standard Deviation of the statistically averaged machine data as criteria. If only one component, the driver or the driven component, was replaced or overhauled and no repair action was accomplished to the other, the unit vibration signature shall be compared to the Mean plus two Standard Deviations of the statistically averaged machine data as criteria.

**3.2.5 If VTAG information is not available, collect and analyze vibration data in accordance with the following:**

**3.2.5.1 Record vibration data in accordance with Paragraph 3.1.2 and 3.3 of 2.1.**

**3.2.5.2 Vibration data shall not exceed the criteria of Paragraph 3.4.3 of 2.1.**

**3.2.5.3 Test equipment in accordance with 3.2.1 through 3.2.3.**

**3.2.5.4 For reciprocating machinery, take a minimum of 2 data points, one at each end of the crankshaft centerline, or as close to centerline as possible.**

**3.2.5.5 Number each vibration measurement location, starting on the driver end furthest from the driven unit. For 2 drivers on a single driven unit, the numbering shall be from one driver end to the other. For 2 driven units from a single driver, the numbering shall be from one driven unit to the other.**

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**3.2.5.6 Provide a sketch of the unit with the following information:**

*Drive Unit(s)*  
*Driven Unit(s)*  
*Location of Bearings*  
*Location and numbering of vibration measurement points*

**3.2.5.7 Scale vibration amplitudes on plot to show the best representation of the magnitudes.**

**3.2.5.8 For machinery consisting of a drive and driven unit, take vibration data on both pieces of equipment, even if only one piece of equipment was subject to overhaul, to allow a complete analysis of the vibration data, including vibration transmitted between the pieces of equipment.**

**3.2.6** Record results of vibration analysis on a test data sheet, Attachment A.

**3.2.6.1** Submit one legible copy, in hard copy or electronic media, of the following to the SUPERVISOR **within 48 hours of completion of vibration analysis:**

Completed Attachment A  
Machine's vibration data plots  
VTAG applicable to the machine  
Average machine values applicable to the machine

#### 4. NOTES:

4.1 Equipment performance shall satisfy vibration requirements of specific average machine values if the machinery item is included in the ship's machinery vibration analysis (MVA) program. Such programs are in compliance with 2.1 and depend on the ship's applicable VTAG to identify machinery, provide pertinent measurement locations, numbering conventions, test conditions, manufacturer's configuration information, analysis ranges and major forcing frequencies.

4.2 For surface ships, other than aircraft carriers, VTAG and average machine values are available on a web site location.

Go to URL <http://aec-nt.navsses.navy.mil/production/login.cfm>

Complete User Registration Form

Upon receipt of User name and Password approval, return to System Assessment Website (TPOCs for website 215-897-7467 or 215-897-8471).

Select "Vibration Tools" from menu on left side of introductory screen.

Select "VIBADS MVA Utility By HULL" or "VIBADS MVA Utility By APL" under Vibration Tools Menu

From the "VIBADS MVA Utility", or "VIBADS APL/MVA Utility" Screen, the user may retrieve available machinery pictures showing sensor locations, VTAG data, and averaged vibration data by using an interactive criteria such as:

1) Ship Class

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- 2) Hull
- 3) Machine, or
- 4) APL
- 5) Select "Retrieve Criteria" - Available machinery pictures showing sensor locations, VTAG info, and averaged data will be displayed. For the CWP MVA site, you automatically get order-normalized low and high range spectral graphs of MEAN plus One STD. You can also select AVG and AVG plus 2 STD. If you wish to convert spectra to frequency format (i.e. 500 Hz and 5000 Hz) you need to fill in RPM (Machine fundamental) and Scale (500) and spectra data will be "stretched" accordingly. The "TEXT" option gives tabulated numeric values of each spectral line by sensor location.

4.3 For aircraft carriers, VTAG and average machine values are available from Supervisor of Shipbuilding Newport News, Aircraft Carrier Planning Office (757-688-5183).

4.4 Equipment Technical Manual will be listed in the invoking Work Item.

4.5 For new or newly overhauled equipment, start of vibration testing can only commence upon satisfactory completion of shipboard operational testing, which will be addressed in the invoking Work Item. Also consider any other adjacent work in the machinery space which may affect accomplishment of vibration testing.

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ATTACHMENT A

## MACHINERY VIBRATION ANALYSIS REPORT

DATE OF VIBRATION TEST: \_\_\_\_\_

SHIP NAME \_\_\_\_\_ HULL: \_\_\_\_\_

CONTRACT/JOB ORDER NO.: \_\_\_\_\_ WORK ITEM NO.: \_\_\_\_\_

IDENTIFY: DRIVER OVERHAULED [ ] YES [ ] NO  
DRIVEN OVERHAULED [ ] YES [ ] NO

EQUIPMENT NAME: \_\_\_\_\_ EQUIP. NO.: \_\_\_\_\_

DRIVER MANUFACTURER: \_\_\_\_\_ SERIAL NO.: \_\_\_\_\_

DRIVEN MANUFACTURER: \_\_\_\_\_ SERIAL NO.: \_\_\_\_\_

VTAG USED: HULL APPLICABILITY: \_\_\_\_\_, SWAB: \_\_\_\_\_, MID: \_\_\_\_\_

### RECORD ACTUAL OPERATING CONDITIONS:

(SPEED, LOAD, PRESSURE, ETC., OR OTHER CONDITIONS AFFECTING THE TEST)

\_\_\_\_\_  
\_\_\_\_\_

TEST RPM: \_\_\_\_\_

### RECORD VIBRATION TEST EQUIPMENT USED:

COMPONENT	MANUFACTURER	MODEL
ANALYZER		
ACCELEROMETER		
CALIBRATOR		

REPORTING CONTRACTOR: \_\_\_\_\_

PRINTED NAME: \_\_\_\_\_

TESTS RESULTS: SAT [ ] UNSAT [ ] (Provide recommendation for corrective action(s) if UNSAT)

\_\_\_\_\_  
\_\_\_\_\_

SIGNATURE: \_\_\_\_\_ PHONE \_\_\_\_\_

SIGNATURE OF PERSON PERFORMING ANALYSIS (INDICATES VIBRATION TESTING IS COMPLETE INCLUDING RECORDING RESULTS/DATA)

ATTACH COPY OF VIBRATION SIGNATURES, APPLICABLE VTAG AND AVERAGE MACHINE DATA.  
**FOR NON-VTAG UNITS, PROVIDE BASIC SKETCH.**