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MILITARY STANDARD

MECHANICAL VIBRATIONS OF SHIPBOARD EQUIPMENT (TYPE I - ENVIRONMENTAL AND TYPE II - INTERNALLY EXCITED)

FSC MISC

DEPARTMENT OF THE NAVY

NAVAL SHIP SYSTEMS COMMAND

WASHINGTON, D.C. 20360

Mechanical Vibrations of Shipboard Equipment (Type I - Environmental and Type II - Internally Excited)
MIL-STD-167-1(SHIPS)

1. This Military Standard was approved 1 May 1974 for use by the Naval Ship Systems Command.

2. Recommended corrections, additions, or deletions should be addressed to Commander, Naval Ship Engineering Center, Department of the Navy, Center Building, Prince George's Center, Hyattsville, Maryland 20782.

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FOREWORD

The purpose of this standard is to establish requirements for vibrations of Naval equipment including machinery.

Shipboard equipment which conforms to the requirements of MIL-STD-167 is generally found to satisfactorily perform its functions aboard ship.

Equipment designed and tested in accordance with type I of MIL-STD-167 generally passes the shock requirements of MIL-S-901 with little difficulty.

Equipment for which compliance with MIL-STD-167 is not specified or is waived is likely to experience failures induced by vibration in shipboard service.

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1. SCOPE

1.1 Scope. This standard covers the requirements of Naval equipment including machinery as regards both internally excited vibrations and externally imposed vibrations. In some special machinery, equipment, or installations, such as antennas, large machinery items, and certain unique designs it may be necessary to deviate from this standard. In those cases, special modifications shall be subject to approval by the command or agency concerned. All other deviations from, or waivers of this standard, are prohibited.

1.2 Purpose. The purposes of this standard are to aid in the choice of and ensure consistency in vibration requirements for equipment. The command or agency concerned should require conformance only to those sections of this standard applicable to the equipment concerned in a particular procurement document. For example, specifications for electronic equipment would normally only refer to type I, while those for a diesel propulsion system would also refer to types III, IV, and V of MIL-STD-167-2.

1.3 Classification. Mechanical vibrations of shipboard equipment are of three general categories: (a) those of the environment, (b) those arising from internal excitation (balance), and (c) those associated with reciprocating machinery and propulsion system and shafting. Category (c) is covered in MIL-STD-167-2. Categories (a) and (b) are covered herein and are classified under the following types:

Type I - Environmental vibration. This type applies to all equipment intended for shipboard use or which must be capable of withstanding the environmental vibration conditions which may be encountered aboard naval ships.

Type II - Internally excited vibration. This type applies to all rotating machinery which must operate smoothly from the standpoint of mechanical suitability. This does not apply to suitability from a noise standpoint nor does it apply to reciprocating machinery.

2. REFERENCED DOCUMENTS

2.1 The issues of the following documents in effect on the date of invitation for bids form a part of this standard to the extent specified herein.

SPECIFICATIONS

GOVERNMENTAL

MILITARY

MIL-P-15024 - Plates, Tags and Bands for Identification of Equipment.
MIL-P-15024/5 - Plates, Identification.
MIL-M-17185 - Mounts, Resilient; General Specifications and Tests for (Shipboard Application).

(Copies of specifications, standard, drawings, and publications required by suppliers in connection with specific procurement functions should be obtained from the procuring activity or as directed by the contracting officer.)

3. DEFINITIONS

3.1 Definitions. For the purpose of this standard, the following definitions shall apply:

3.1.1 Amplitude, angular vibratory displacement. Angular vibratory displacement amplitude is the maximum angular displacement of simple torsional harmonic motion from the position of rest. It is expressed in degrees or radians.

3.1.2 Amplitude, vibratory displacement. Vibratory displacement amplitude is the maximum displacement of simple linear harmonic motion from the position of rest. This is also referred to as single amplitude. It is expressed in inches or mils (0.001 inch).

3.1.3 Balancing. Balancing is a procedure by which the mass distribution of a rotor is checked and, if necessary, adjusted in order to ensure that the vibration of the journals or forces on the bearings, or both, at a frequency corresponding to operational speed are within specified limits.

3.1.3.1 Balancing, single-plane (static). Single-plane (static) balancing is a procedure by which the mass distribution of a rigid rotor is adjusted in order to ensure that the residual static unbalance is within specified limits and which requires correction in only one plane. (Note: Single-plane balancing can be done on a pair of knife edges without rotation of the rotor but is now more usually done on centrifugal balancing machines.)

3.1.3.2 Balancing, two-plane (dynamic). Two-plane (dynamic) balancing is a procedure by which the mass distribution of a rigid rotor is adjusted in order to ensure that the residual unbalance in two specified planes is within specified limits.

3.1.3.3 Balancing, multi-plane. Multi-plane balancing as applied to the balancing of flexible rotors refers to any balancing procedure that requires unbalance correction in more than two axially separated correction planes.

3.1.4 Mass elastic system. The mass elastic system is defined as the equivalent oscillating system which retains as closely as possible the dynamic characteristics of the actual system. This equivalent system consists of a series of masses and moments of inertia interconnected by linearly and torsionally flexible elements. Auxiliary drive elements such as camshafts, pumps, and blowers are as much a part of the mass elastic system as are the shafting, couplings, and masses of the main drive elements.

3.1.5 Method of correction. A method of correction is a procedure whereby the mass distribution of a rotor is adjusted to reduce unbalance, or vibration due to unbalance, to an acceptable value. Corrections are usually made by adding material to, or removing it from, the rotor.

3.1.6 Mode. Mode is the manner or pattern of vibration and is described by its natural frequency and relative amplitude curve.

3.1.7 Node. A node is a point of zero vibratory amplitude.

3.1.8 Order. Order is the number of cycles of vibration occurring during each revolution of the reference shaft.

3.1.9 Plane, correction. A correction plane is a plane transverse to the shaft axis of a rotor in which correction for unbalance is made.

3.1.10 Plane, measuring. A measuring plane is a plane transverse to the shaft axis in which the amount and angle of unbalance is determined.

3.1.11 Range, operating speed. The operating speed range of a ship's main propulsion system for purpose of this standard is considered to be from 0 to 115 percent of design full power shaft r.p.m.

3.1.12 Resonance. Resonance of a system in forced oscillation exists when any change, however small, in the frequency of excitation causes a decrease in the response of the system. (A resonance may occur in an internal part of the equipment, with no outward manifestation, in which case, if the equipment is electrical or electronic, the resonance may be detected by observing some output function of the equipment, such as voltage or current.)

3.1.13 Stress, vibratory. Vibratory stress is that stress induced by the vibration of a mass elastic system.

3.1.14 Tolerance, unbalance. The unbalance tolerance in a transverse plane (measuring plane or correction plane) is that amount of unbalance which is specified as the maximum below which the state of unbalance is considered acceptable.

3.1.15 Torque, vibratory. Vibratory torque is that torque associated with the torsional vibration of a mass elastic system.

3.1.16 Vibration, lateral. Lateral vibration is the vibratory deflection in a direction transverse to the principle axis.

3.1.17 Vibration, longitudinal. Longitudinal vibration is the vibratory deflection along the principle axis.

3.1.18 Vibration, torsional. A torsional vibration is a vibration that is characterized by angular oscillation of the mass elastic system relative to its axis.

3.1.19 Simple harmonic motion. A simple harmonic motion is a motion such that the displacement is a sinusoidal function of time.

4. GENERAL REQUIREMENTS

4.1 Identification plates. Any shipboard equipment that has met the requirements of this standard shall be so identified by a securely attached identification plate in accordance with the following, with choices striken out and blanks filled in:

"This Equipment / Duplicate Tested under MIL-STD-167-1 Type__________

With / Without Mounts Type__________ to__________ Hz"

4.1.1 The identification plates shall be in accordance with type A, B, or C of MIL-P-15024. Unless otherwise specified in the individual equipment specification, identification plates shall conform to the normal service requirements of MIL-P-15024/5.

5. DETAILED REQUIREMENTS

5.1 Type I - Environmental vibration. For type I vibration requirements, the equipment shall be subjected to a simulated environmental vibration as may be encountered aboard naval ships. Unwanted structural arrangements on board ship will cause the amplitudes of vibration to be magnified, and therefore, many items of equipment may be subjected to more severe vibrations than those imposed by normal hull vibrations or the levels designated by this standard. In addition, while normal vibration trials are conducted in quiet water in order to achieve repeatable and reliable results, actual ship operations occur in all sea states and headings with correspondingly large increases in vibration over long periods of time. Consequently, the requirements specified herein account for these increased vibrations by being more stringent than the minimal ones usually reported. This standard provides an amplitude sufficiently large within the selected frequency range to obtain a reasonably high degree of confidence that equipment will not malfunction during service operation.

5.1.1 Temporal characteristics.

5.1.1.1 Steady state. All machinery and equipment installed aboard naval ships will ordinarily be subjected to varying frequencies and amplitudes of vibration, possibly for long periods of time during which the machinery and equipment must continue to perform their normal function. Principal causes of steady state shipboard vibration are (a) propeller blade excitation, and (b) unbalanced forces of propeller and shafting. The vibration frequencies encountered aboard ship vary from zero to approximately 33 hertz (Hz) (2000 cycles per minute (c.p.m.)). In some of the latest surface ships, frequencies of up to 50 Hz (3000 c.p.m.) have been observed. The severity of vibration on a ship depends upon the type of ship, and location of equipment within the ship's structure.

5.1.1.2 Transient. Vibration measurements for steady state conditions are usually made in relatively quiet seas and during steady speed operations. However, ships do not operate under these conditions for any extended length of time as the speed, heading, and sea state may change. A change in any one of these conditions such as sea state has a great effect on the longitudinal, vertical and athwartship vibration levels. The increase in displacement amplitude is almost proportional to wave height. Vibration levels recorded on a ship during vibration trials cannot be compared with the levels shown in table I, because the measured data give vibration levels only for a relative quiet sea condition during the periods when changes in speed or heading are not made.

5.1.2 Basis of acceptability. Acceptability will be contingent upon the ability of the equipment to perform its function during and after the tests specified in 5.1.3. Minor damage or distortion will be permitted during test providing such damage or distortion does not in any way impair the ability of the equipment to perform its principal functions. Because of the numerous types of equipment covered by this standard, a definite demarcation between major and minor failures cannot be specified. Therefore, such decisions must necessarily be left to the judgement of the test engineer. In general a major failure is one which would cause maloperation or malfunction of the item of equipment for a long period. Nonrepetitive failures of such parts as vacuum tubes, condensers, and wiring, which can be easily replaced or repaired are generally considered minor failures. As such, the repair could be made and the test continued with no penalty to the remainder of the equipment. Sometimes the critical use of the equipment will determine the category of failure; that is, a failure of a part in a lighting circuit may be considered minor. The same failure in a control circuit may be major. Thus the test engineer, or command or agency concerned, shall be responsible for specifying a major or minor failure.

5.1.3 Test procedures. The test specified herein is intended to locate resonances of the equipment and impose a 2-hour endurance test at the most damaging amplitude and frequency. However, this test does not constitute an accelerated life test in the sense that compliance with the standard would automatically insure continuous satisfactory operation of the equipment.

5.1.3.1 Testing machine. Vibration tests shall be made by means of any testing machine capable of meeting the condtions specified in 5.1.3.3. Means shall be provided for controlling the direction of vibration of the testing machine and for adjusting and measuring its frequencies and amplitude of vibration to keep them within prescribed limits. If the lower frequency limit of 4 Hz specified in 5.1.3.3.1 cannot be reached, the available machine may be used upon approval of the command or agency concerned, provided the natural frequencies of the equipment in translational and rocking modes of vibration do not lie below the lowest frequency of the available testing machine. This may sometimes be determined by properly controlled transient excitation, such as bumping the equipment to see whether low frequency resonances exist. In no case shall a vibration testing machine be used which has a minimum frequency greater than 10 Hz.

5.1.3.2 Methods of attachment.

5.1.3.2.1 Shipboard equipment. For all tests, the equipment shall be secured to the mounting bracket of the testing machine in the same manner that it will be secured on shipboard. In case alternate methods of mounting are specified, tests shall be made using each method of mounting specified by the command or agency concerned. For equipment designed to be secured to a deck and a headbrace support, a vertical bracket shall be used to simulate a bulkhead. The bracket shall be sufficiently rigid to insure that its motion will be essentially the same as the motion of the platform of the testing machine.

5.1.3.2.2 Shipboard portable and test equipment. Portable and test equipment which is designed for permanent or semipermanent attachment to ship structure shall be attached to the vibration testing machines in the same manner it is attached to the ship. Equipment which is not designed for permanent or semipermanent attachment shall be secured to the testing machines by means of suitable straps.

5.1.3.2.3 Orientation for vibration test. Equipment shall be installed on vibration testing machines in such mannner that the direction of vibration will be in turn along each of the three rectilinear orientation axes of the equipment as installed on shipboard - vertical, athwartship, and fore and aft. On a horizontal vibration testing machine, the equipment may be turned 90 degrees in the horizontal plane in order to vibrate it in each of the two horizontal orientations. At no time shall the equipment be installed in any other way than its normal position.

5.1.3.2.4 Resilient mountings. Equipment which is to be installed on resilient mounts meeting the requirements of MIL-M-17185 or on distributed isolation material (DIM) shall be tested without mounts. Equipment which incorporates other resilient mountings integrally in the equipment box (such as electronic cabinets) shall be installed as supplied.

5.1.3.3 Vibration tests. Each of the tests specified herein shall be conducted separately in each of the three principal directions of vibration. All tests in one direction shall be completed before proceeding to tests in another direction. The equipment shall be secured to the vibration table as specified in 5.1.3.2 and shall be energized to perform its normal functions. If major damage (see 5.1.2) occurs, the test shall be discontinued and the entire test shall be repeated following repairs and correction of deficiencies, unless otherwise directed by the command or agency concerned. The manufacturer may, at his option, substitute an entirely new equipment for retest. If this option is taken, it shall be noted in the test report furnished in accordance with 5.1.3.4.

5.1.3.3.1 Exploratory vibration test. To determine the presence of resonances in the equipment under test, the equipment shall be secured to the vibration table and vibrated at frequencies from 4 Hz (or lowest attainable frequency) to 33 Hz, at a table vibratory single amplitude of 0.010 $\pm$ 0.002 inch. For frequencies from 34 to 50 Hz, a table amplitude of 0.003 plus zero, minus 0.001 inch shall be used. The change in frequency shall be made in discrete frequency intervals of 1 Hz and maintained at each frequency for about 15 seconds. The frequencies and locations at which resonances occur shall be noted.

5.1.3.3.2 Variable frequency test. The equipment shall be vibrated from 4 Hz (or lowest attainable frequency) to 50 Hz in discrete frequency intervals of 1 Hz at the amplitudes shown in table I. At each integral frequency, the vibration shall be maintained for 5 minutes.

5.1.3.3.3 Endurance test. The equipment shall be vibrated for a total period of at least 2 hours at the resonant frequencies chosen by the test engineer. If no resonance is observed, this test shall be performed at 50 Hz or at the upper frequency as specified in 5.1.3.3.4. The amplitudes of vibration shall be in accordance with table I and figure 1.

Table I - Vibratory displacement of environmental vibration.

Frequency range (Hz)	Table amplitude (inch)
4 to 15	0.030 ± 0.006
16 to 25	.020 ± .004
26 to 33	.010 ± .002
34 to 40	.005 ± .001
41 to 50	.003 + .000 - .001

5.1.3.3.4 Exception. Equipment intended for installation solely on a particular class of ship need be vibrated only up through the frequency range which includes the maximum exciting frequency of the ship (maximum shaft rpm x No. of propeller blades/60). For example, if equipment is to be installed on a class of ships with a maximum exciting frequency of 18 Hz, the equipment shall be vibrated at only the first two ranges shown in table I.

5.1.3.3.5 Endurance test for mast mounted equipment. Equipment intended for installation on masts, such as radar antennae and associated equipment, shall be designed for a static load of 2.5g (1.5g over gravity) in vertical and transverse (athwartship and longitudinal) directions, to compensate for the influence of rough weather. In addition, the equipment shall be vibrated for a total period of at least 2 hours, at the resonant frequencies chosen by the test engineer. If no resonance was observed, this test shall be performed at 33 Hz, unless excepted by 5.1.3.3.4. The amplitudes of vibration shall be in accordance with table II.

Table II - Vibratory displacement of environmental vibration for mast mounted equipment.

Frequency range (Hz)	Table amplitude (inch)
4 - 10	0.100 ± .010
11 - 15	.030 ± .006
16 - 25	.020 ± .004
26 - 33	.010 ± .002

5.1.3.4 Test report. The test report to be furnished the command or agency concerned by the testing laboratory shall include detailed descriptions of any damage or malfunctioning incurred and at what stage in the tests it occurred. When possible, photographs of physical damage shall be included. Recommendations are desired as to what corrective measure, if any, should be taken. At the discretion of the test engineer, it shall also include other pertinent information, such as the overall dimensions of the equipment, its weight, approximate location of the center of gravity, and a sketch or photograph of the methods used in mounting it on the test machines.

5.2 Type II - Internally excited vibration. Type II balance and vibration requirements shall be specified in the procurement of machinery. The limitations set forth herein may also be used as criteria on overhaul tolerances, but should not constitute a criterion for the need for overhaul, that is, if a turbo-generator set is vibrating plus or minus 10 mils, it would be obvious that an overhaul would be in order. In such case, the balance and vibration tolerances of this standard may be used as overhaul tolerances, but if the turbo-generator set is vibrating at a level 10 percent above the curve shown on figure 2, it need not be removed for overhaul, merely because the level exceeds the curve value.

5.2.1 Basis of acceptability. All rotating machinery shall be balanced to minimize vibration, bearing wear, and noise. The types of correction, as shown in table III shall depend on the speed of rotation and relative dimensions of the rotor.

Table III - Types of correction.

Type of correction	Speed (r.p.m.)	Rotor characteristics[1/]
Single-plane	0 - 1000 0 - 150	L/D $\leq$ 0.5 L/D $>$ 0.5
Two-plane	$>$ 1000 $>$ 150	L/D $\leq$ 0.5 L/D $\geq$ 0.5
Multi-plane		Flexible: Unable to correct by two-plane balancing

[1/] L = Length of rotor mass, exclusive of shaft.
D = Diameter of rotor mass, exclusive of shaft.

5.2.1.1 The limits of allowable unbalance shall conform to 5.2.2.2. In addition, the limits of vibration shall conform to 5.2.2.3.

5.2.2 Procedure.

5.2.2.1 Balancing methods. Except for machinery operating below 150 rpm, all balancing shall be accomplished by means of balancing equipment which requires rotation of the work piece. This may be either shop or assembly balancing type equipment. The minimum detectable unbalance of the balancing machine used shall be below the residual unbalance specified in 5.2.2.2. For machinery rated at lower than 150 rpm, the rotor including shaft, may be balanced by symmetrically supporting the rotor on two knife edges and applying correction to attain a static balance.

5.2.2.2 Balance limits for rigid rotors. When balanced in accordance with 5.2.2.1, the residual unbalance in each plane of correction of any rotating part shall not exceed the value determined by:

$$U = \frac{4W}{N} \text{ for speeds in excess of 1000 rpm.}$$

$$\text{Or} \quad U = \frac{4000W}{N^2} \text{ for speeds between 150 and 1000 rpm.}$$

$$\text{or} \quad U = 0.177W \text{ for speeds below 150 rpm.}$$

where U = maximum allowable residual unbalance in oz.-inches
W = weight of rotating part in pounds
N = maximum operating rpm of unit.

5.2.2.2.1 Balance limits for flexible rotors. The residual unbalance for flexible rotors shall not result in vibration amplitudes larger than those specified on figure 2.

5.2.2.3 Vibration test. When mounted as specified in 5.2.2.3.2 and measured in accordance with 5.2.2.3.3, the residual vibration amplitude shall not exceed the values shown on figure 2. In most machinery, the residual vibration will be principally at rotational frequency (first order). In these cases, the measurement may be limited to the evaluation of first order vibration only. In the case of complex machinery, which include reduction gearing, impellers, or other vibration exciting sources, it is expected that higher orders of vibration may exist. In such cases, measurements shall indicate that either:

(a) The overall vibration velocity is less than plus or minus 0.15 inch per second with a maximum allowable displacement of plus or minus 1.25 mils.
(b) The displacement amplitudes at all part frequencies shall fall below the level of figure 2.

5.2.2.3.1 Order of vibration. The individual equipment specification shall specify whether vibration measurements may be limited to first order or be extended to cover higher orders (see 6.2). In general, machinery such as motors, generators and simple rotating devices with no gears would have a principal vibration of only first order. Machinery such as gear driven units, units with internal gearing, rotary pumps or compressors, and fans and blowers would often have higher orders of vibration in addition to the first order.

5.2.2.3.2 Mounting. After balancing, the unit shall be completely assembled and mounted elastically at a natural frequency less than one-quarter of the minimum rotational frequency of unit. To accomplish this, the minimum static deflection of the mounting should be determined by figure 3 but in no case shall the deflection exceed one-half the original height of the elastic element. On machinery that cannot be mounted as described, and after approval by the command or agency concerned, the unit shall be mounted on a foundation the same as, or commensurate with, the shipboard mounting for which it is intended.

5.2.2.3.3 Measurements. On all machinery except turbines, amplitudes of vibration shall be measured on the bearing housing in the direction of maximum amplitudes. In the case of turbines, amplitudes of vibration shall be measured on the rotating shaft adjacent to the bearings. Care shall be exercised to ensure that the shaft is smooth and concentric. Eccentricity of shaft or high spots on the shaft may easily result in erroneous readings. Amplitudes of vibration shall be held within the limits shown on figure 2. On constant speed units, measurements shall be made at the operating speed. In the case of variable speed units, measurements shall be made at maximum speed and at all critical speeds within operating range.

5.2.2.3.4 Instruments. Amplitude and frequency measurements shall be made with a suitable calibrated vibration instrument with a sensitivity consistent with the amplitude and frequency specified on figure 2.

5.2.2.3.5 Exception. In the case of complex machinery items, such as assemblies employing reduction gears, the allowable amplitudes shown on figure 2 may be too high for proper operation of the equipment. In such case, allowable amplitudes based on manufacturing tolerances and clearances and operational requirements will be specified by the command or agency concerned (see 6.2).

6. NOTES

6.1 Type I of this standard supersedes that part of MIL-T-17113 covering vibration.

6.2 Attention of design engineers is called to the following items which must be specified in the individual equipment procurement document:

(a) Type(s) of vibration required (see 1.2).
(b) Whether vibration measurements for type II may be limited to the first order or extended to cover higher orders (see 5.2.2.3.1).
(c) Special limits for complex machinery items (see 5.2.2.3.5).

6.3 The following documents provide design guidance and definitions in the field of vibration:

UNITED STATES OF AMERICA STANDARDS INSTITUTE STANDARDS
- S1.1 - 1960, Acoustical Terminology (Including Mechanical Shock and Vibration).
- S2.2 - 1959, American Standard Methods for the Specifying of Characteristics of Auxiliary Equipment for Shock and Vibration Methods.
- S2.5 - 1962, American Standard Methods for Specifying the performance of Vibration Machines.
- S2.7 - 1964, American Standard Terminology for Balancing Rotating Machinery.

SPECIFICATION

MILITARY
- MIL-M-17185 - Mounts, Resilient; General Specifications and Tests for (Shipboard Application).

STANDARDS

MILITARY
- MIL-STD-740 - Airborne and Structureborne Noise Measurements and Acceptance Criteria of Shipboard Equipment.

PUBLICATIONS

NAVSHIPS

NAVSHIPS 94323 - Maintainability Design Criteria Handbook for Design of Shipboard Electronic Equipment.

NAVSHIPS 0967-316-8010 - BUSHIPS Reliability Design Handbook (Electronics).

NAVSHIPS 0967-309-3010 - Design of Shock and Vibration Resistant Electronic Equipment for Shipboard Use.

6.4 Superseding data. This standard covers the type I and II vibration requirements formerly covered in MIL-STD-167B(SHIPS). The types III, IV and V requirements are covered in MIL-STD-167-2.

Preparing activity:
Navy - SH
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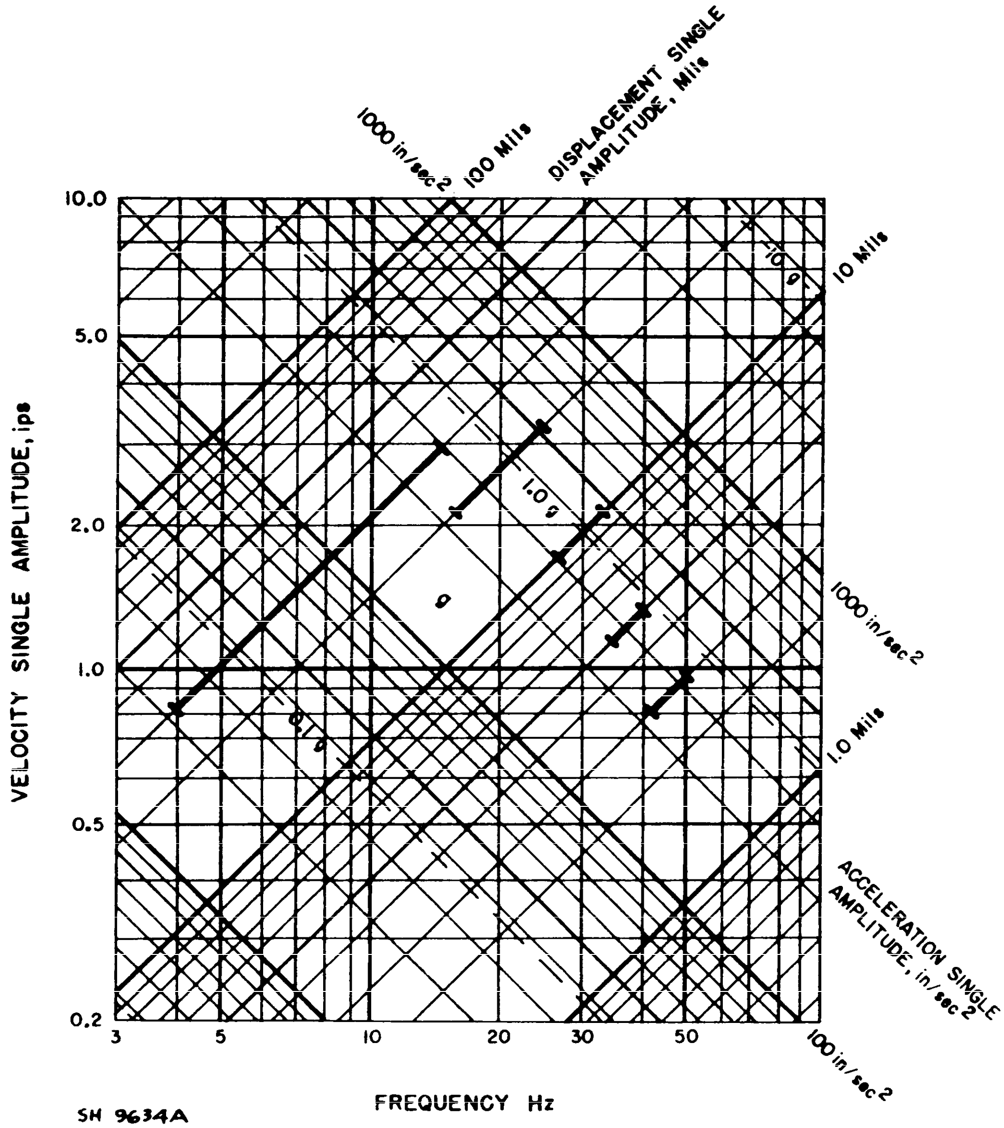

Figure 1 - Type I environmental vibration limits (graphical presentation expressed in displacement, velocity and acceleration).

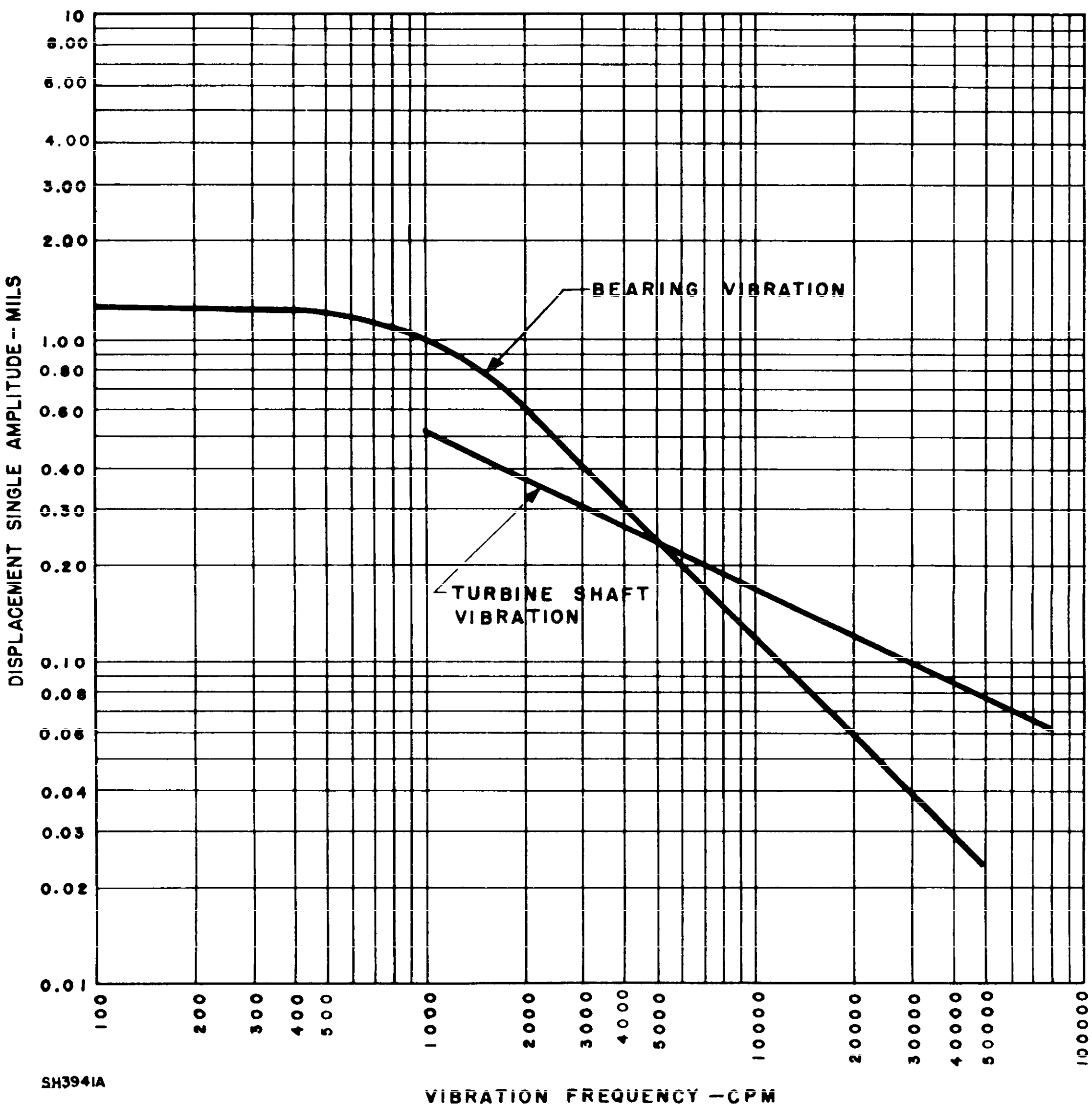

Figure 2 - Maximum allowable vibration, type II.

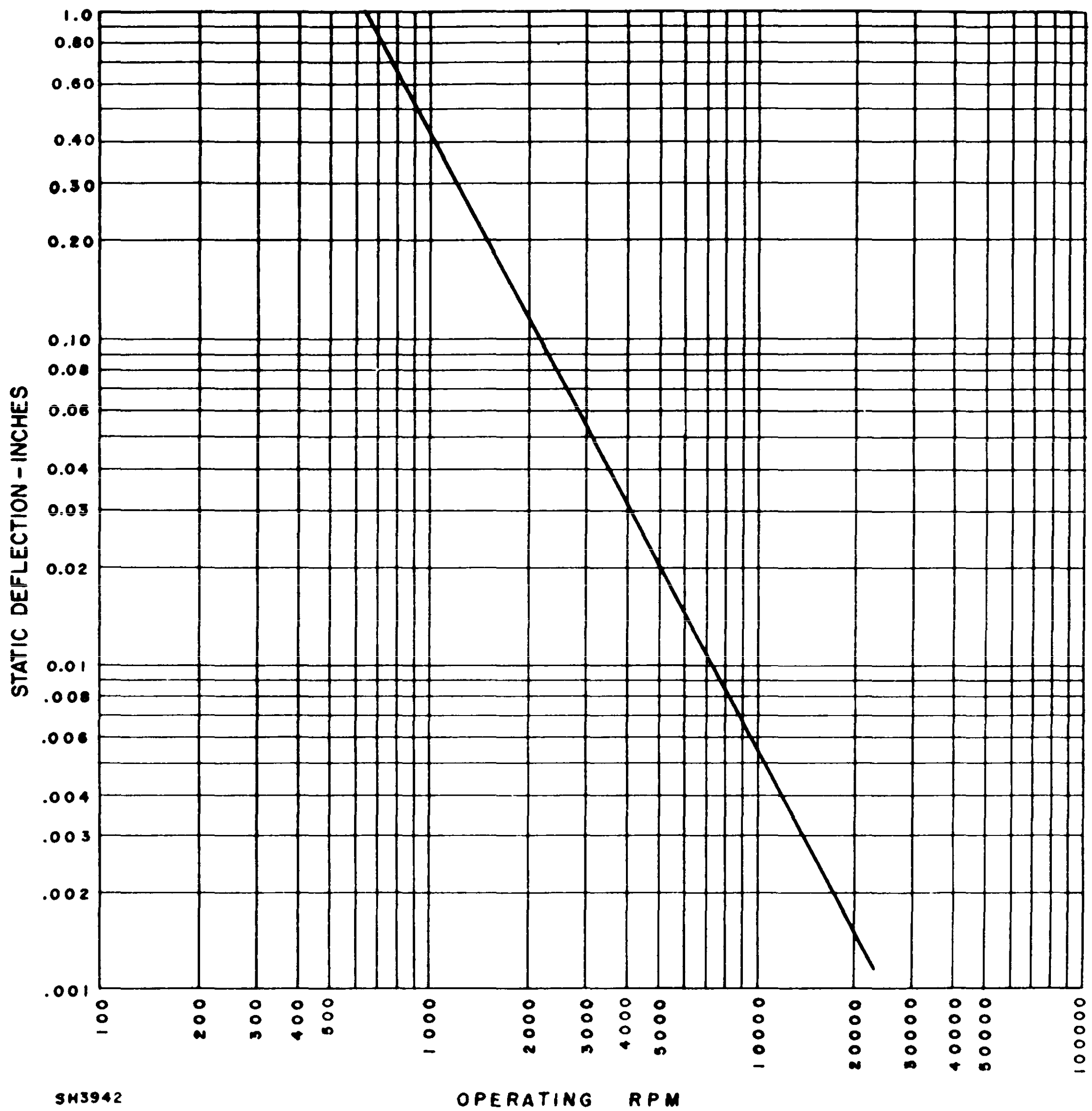

Figure 3 - Minimum static deflection of mounting for type II vibration test.

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1. DOCUMENT NUMBER	2. DOCUMENT TITLE

3a. NAME OF SUBMITTING ORGANIZATION	4. TYPE OF ORGANIZATION *(Mark one)* ☐ VENDOR ☐ USER ☐ MANUFACTURER ☐ OTHER *(Specify)*: ______
b. ADDRESS *(Street, City, State, ZIP Code)*	

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a. Paragraph Number and Wording:

b. Recommended Wo-ding:

c. Reason/Rationale for Recommendation:

6. REMARKS

7a. NAME OF SUBMITTER *(Last, First, MI)* – Optional	b. WORK TELEPHONE NUMBER *(Include Area Code)* – Optional
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