

EQUIVALENT SHOCK AND VIBRATION TESTS FOR QUASI-STATIC ACCELERATION

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Shock

The following paragraph is taken from Reference 1.

Acceleration loads are expressed in terms of load factors which, although dimensionless, are usually labeled as "g" loads. Shock environments (methods 516.5 and 517) are also expressed in "g" terms. This sometimes leads to the mistaken assumption that acceleration requirements can be satisfied by shock tests or vice versa. Shock is a rapid motion that excites dynamic (resonant) response of the materiel but with very little overall deflection (stress). Shock test criteria and test methods cannot be substituted for acceleration criteria and test methods or vice versa.

Random Vibration

The following guidelines are taken from Reference 2.

- a. Purpose. To determine if the test component can withstand an acceleration level at least twice the maximum predicted levels or a minimum of 20 G in each direction for each of the 3 orthogonal axes.
- b. Conditions. **NOTE:** If the peak acceleration is less than 3 times the square root of G (where G is the integrated area from 0 to 0.8 times the natural frequency response of a randomly vibrated system), then the random vibration test can usually be accepted in lieu of an acceleration test.
 1. A full functional test shall be conducted before the acceleration test and after completion of the test.
 2. Electrical components shall be powered during the test and critical parameters continuously monitored for failures or intermittents.

3. As applicable, the component shall be mounted, including dynamic isolator (if used), as in flight configuration with flight-type support structure, bracket, hardware, cable, and ETL.
 4. The component shall be tested in each of 3 mutually perpendicular axes.
 5. The specified accelerations apply to the geo-metric center of the test component.
 6. If a centrifuge is used, the arm measured to the geometric center of the test component shall be at least 5 times the dimension of the test component measured along the arm.
 7. The test acceleration level shall be at least twice the maximum predicted levels or 20 G, whichever is greater, in each direction for each of the 3 orthogonal axes.
 8. The duration of the test shall be five min per each axis in each direction.
- c. Pass/Fail Criteria. The test component shall be capable of meeting the requirements of the applicable specification(s) without any physical damage or degradation in performance.

References

1. MIL-STD-810F, Method 513.5, Section 1.3.3 Acceleration versus shock
2. EWR127-1, Eastern & Western Range 127-1 (version 1997), Section 4B1.4.1.5, Acceleration.