



SURFACE VEHICLE RECOMMENDED PRACTICE

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Elastomeric Bushing "TRAC" Application Code

RATIONALE

This technical report covers technology which is mature and not likely to change in the foreseeable future.

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Foreword—

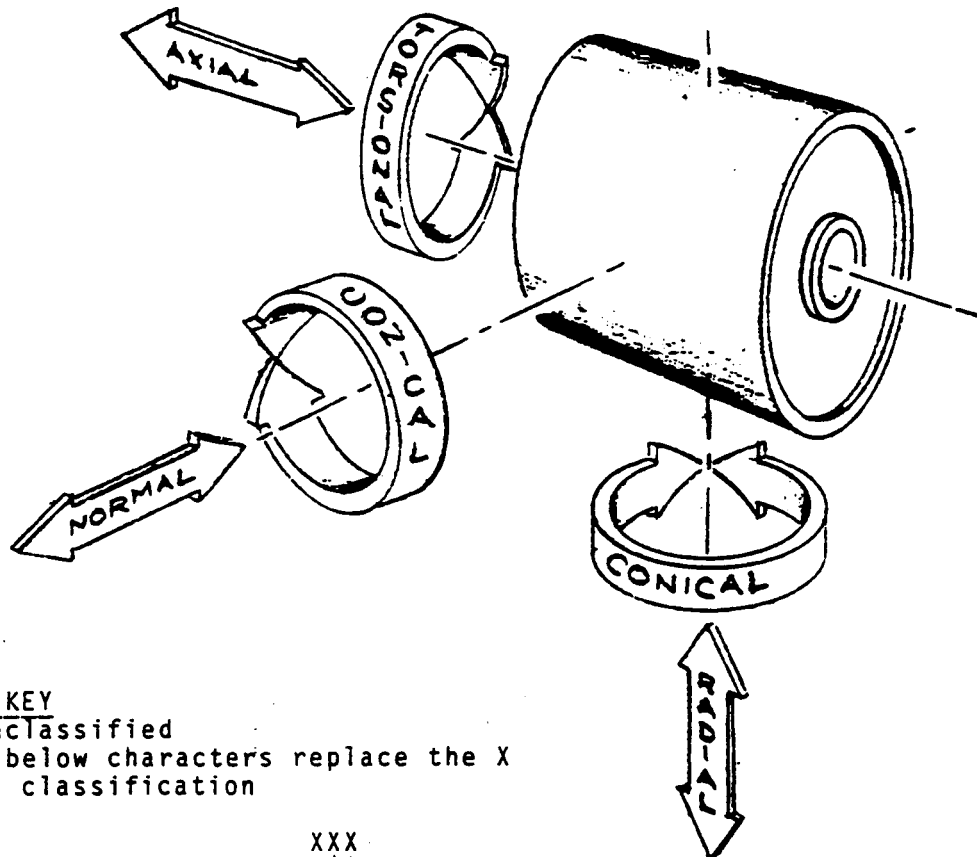
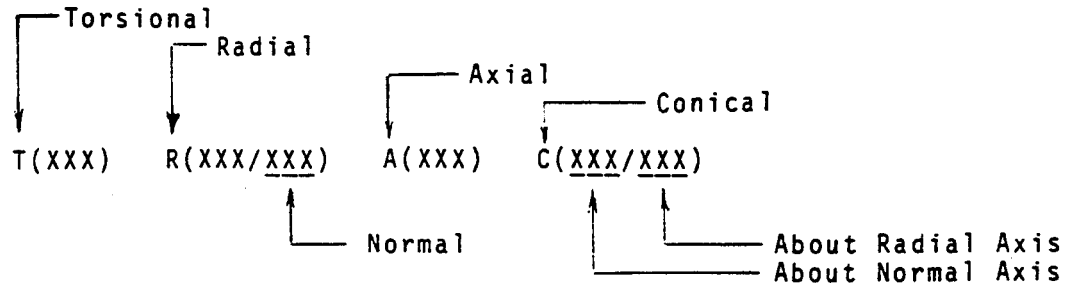
Elastomeric bushing life from different machines has resulted in significant data variations.

The designs of the test machines include differing approaches to creating similar geometric environments. When examined closely, these differing approaches actually affect the environment of the test specimen.

The "TRAC" code was developed to separate the axes of this environment, so that each may be examined and discussed individually.

The acronym "TRAC" is derived from the labels of the most commonly discussed bushing axes: **T**orsional **R**adial **A**xial **C**onical.

1. **Scope**—The bushing "TRAC" code is intended to be a tool that will aid in the definition of the geometric environment for the test, or use, of an elastomeric bushing.
2. **Reference**—There are no referenced publications specified herein.
3. **Test Axes**—Since radial load and torsional rotation are the most commonly controlled input quantities to a bushing, they are usually the principal determinants of axis orientation. (See Figure 1).
 - a. Radial—The translational axis on which the radial load is applied (by definition).
 - b. Axial—The translational axis coinciding with the bushing inner and outer sleeve axes.
 - c. Normal—The translational axis perpendicular to both the radial and axial axes.
 - d. Torsional—The rotational axis coinciding with the axial axis.
 - e. Conical (1st group)—The rotational axis coinciding with the normal axis.
 - f. Conical (2nd group)—The rotational axis coinciding with the radial axis.

AXIS KEYARGUMENT KEY

X=Unclassified
The below characters replace the X upon classification

MODE	PROGRAM	XXX	INPUT INTERFACE
F = Force	K = Time Invariant		I = Inner
D = Displacement	2 = Constant Amplitude Cycling		O = Outer
U = Unrestrained	3 = Block Cycling		C = Combination
	4 = Real Time History		
	5 = Random		
	6 = Matrix		
	7 = Impact		
	M = Combination		
	Y = Cross Coupled		

FIGURE 1—AXIS KEY

4. **Mode**

4.1 **F = Force**—A force being exerted along an axis.

Typical examples:

- a. A force exerted by an air cylinder.
- b. The force exerted by a spring supported in a stationary manner at the other end, and with a preload relatively high compared to its rate.
- c. The force exerted by a hanging weight.
- d. The force exerted by a servo-hydraulic actuator operating in load control.

4.2 **Displacement**—A controlled deflection of the specimen, whether fixed in a stationary position or time variant.

Typical Examples:

- a. The displacement caused by a rotating eccentric or cam.
- b. The displacement caused by a servo-hydraulic actuator being operated in displacement control.
- c. The displacement (or lack of) caused by securely holding a portion of the specimen in a fixed location.

NOTE—An immobilized (fixed) axis has not been readily perceived as being in displacement mode.

4.3 **Unrestrained**—The specimen may move freely without restriction.

5. **Program**

- a. K = Time Invariant—The condition that exists when the restrained (or unrestrained) portion of the specimen is subjected to a force or displacement that remains constant in time.

Typical examples:

1. The exerted force is caused by a hanging weight or a cylinder maintained at constant pressure.
2. The displacement is maintained in a fixed location, that is, by stationary fixturing.
3. The specimen is unrestrained—the force remains zero at all times.
- b. 2 = Constant Amplitude Cycling—When the specimen is subjected to a time varying force or displacement where amplitude of each peak and valley (usually a sine function) is the same as the previous one.
- c. 3 = Block Cycling—The same as constant amplitude cycling except that the amplitude and/or frequency is changed after a specified quantity of cycles. There may be any number of blocks in a test program.
- d. 4 = Real Time History—The load or displacement history is identical to that of one which has occurred during some actual event history. This history would include the amplitudes, order, and frequencies of the original events.
- e. 5 = Random—A load or displacement history, where the amplitudes, order, and frequencies occur nonperiodically.
- f. 6 = Matrix—A load or displacement history in which the event information is tabulated in the matrix format. In this form, the order and frequency of the events are lost.
- g. 7 = Impact—The sudden application and removal of a load or displacement.