

Electrical Shock Hazard From Production Line Spark Testers

by Henry H. Clinton

The commonly accepted maximum values of 60 Hz. current passing through the human adult body which permit a subject to let go of electrodes are nine milliamperes for males and six milliamperes for females. At 3000 Hz. this value increases to about 22 milliamperes for men or 15 milliamperes for women. DC currents do not present the same let-go problems, but a subject can readily let go at a level of 60 milliamperes.

A continuous 60 Hz. current above 18 milliamperes stops breathing for the duration of the shock only. Ventricular fibrillation may occur above a level of 67 milliamperes.

The reaction current level of 60 Hz. is about .5 milliamperes. Above this level a muscular reaction can occur which can cause a secondary accident. The DC and 3 kHz. levels are probably considerably higher.

Capacitor discharge energy of 50 Joules (watt-seconds) is regarded as hazardous.

Clinton DC spark testers are current limited to 5 milliamperes or less. Three kiloHertz spark testers are limited to 4 milliamperes or less, and 60 Hz. types to 7 milliamperes. Impulse spark testers can deliver a maximum charge of about .2 Joules 248 times per second. All these spark testers have current outputs above the reaction level, but none above the let-go threshold level. Because of the possibility of secondary accidents caused by muscular reactions, operators should be protected against accidental shock. Electrodes are supplied with interlock switches, and these should not be disabled. The conductor under test should be grounded. If an operator must inspect the product by touching its surface while it is being spark tested, he should be electrically insulated from his environment, and any possible cause of a secondary accident caused by reaction should be eliminated.

For references, see: Dalziel, Ogden, Abbot, "Effect of Frequency on Let-Go Currents," Transactions of A.I.E.E., Volume 62, December 1943, and Dalziel, "Electric Shock Hazard," I.E.E.E., Spectrum, February 1972.