

WORKER PROTECTION

Safe levels of current in the human body. Resistance is the key

TABLES FROM IEC STANDARD 60479-1:2018, ET 213: 2007

Current (mA)	Effect	Time Duration
0.2 to 1.0	Threshold of perception	Not Critical
10 to 16	Limit of "Let Go", muscles contract	Minutes
30*	Breathing difficult, "safe" limit	Seconds
50	Irregular heartbeat	1 heartbeat or about 1 second
60	Respiratory problems, cannot breathe	
>60	Heart fibrillation, electric burns	

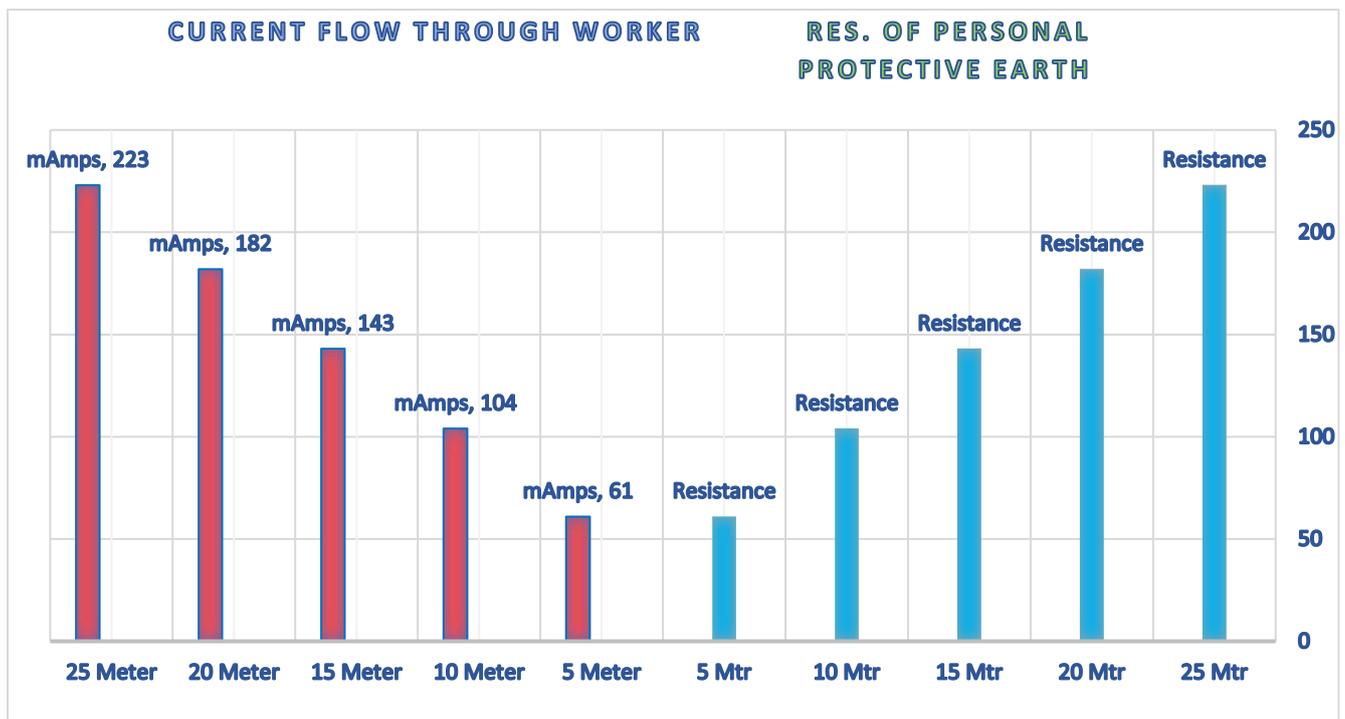
"Safe limit of 30 mAmps. To achieve this level of protection, the resistance of the personal earth surrounding the worker must not exceed 3 mOhms for a 10kA fault, 6 mOhms for a 5kA fault and 10 mOhms for 3kA fault.

The use of Equipotential Bonding Zone (EPZ) for worker protection is based on the principle of creating a parallel current path around the workers body, of sufficiently low resistance to prevent dangerous current flow in the worker. Generally referred to as a personal earth.

As the worker and the personal earth are in parallel the same voltage appears across both **and fault current will flow through both, in direct proportion to the resistance of each.** Quite simply, the resistance of the personal earth determines the amount of fault current that will flow in the workers body.

Calculation: Assuming a 10kA fault and a 15 mt. personal earth. (as below)
 Voltage drop across personal earth and worker is $V = IR = 10kA \times 0.0143 = 143$ volts.
 Current flow through workers body $I = V/R = 143/1000 = 0.143$ A (143 mA)

Note: This is an example of the critical importance of resistance in EPZ bonding for worker protection.



Calculations for 25 sq mm Personal Earth: Copper 0.00078Ohms/mtr, Joints 0.0006Ohms ea. Connections 0.00078Ohms ea. Human Body resistance 1000 Ohms (may be as low as 500 Ohms)