ELECTRICITY

Everyone knows that electricity is dangerous, but few workers really understand that just a small amount of electrical energy can cause electrocution.

Be aware that normal household current can be lethal. Electrocutions may result from contact with an object as seemingly harmless as a broken light bulb or as lethal as an overhead power line.

ELECTRICITY BASICS ***Electricity*** is the flow of an atom's electrons through a conductor (metal, wet surfaces, etc.). ***Current*** is the flow of electrons from a source of voltage through a conductor. It is measured in ***amperes*** (amps). ***Alternating current*** (AC) flows back and forth (a cycle) through a conductor, with the normal rate in the U.S. being 60 cycles per second, or 60 hertz [Hz]. ***Direct current*** (DC) flows in one direction only, as in a car battery. ***Voltage*** is the fundamental force or pressure that causes electricity to flow through a conductor and is measured in volts. ***Resistance*** is anything (rubber, dry wood, ceramics, etc.) that impedes the flow of electricity through a conductor, and is measured in ***ohms***. These three elements are related in Ohm's Law: *Current = Voltage/Resistance.* A ***ground*** conducts current, intentionally or not, between an electrical circuit or conductive material and the earth.

ELECTRICAL INJURIES Electrical injuries consist of four main types: *electrocution* (fatal), *electric shock*, *burns*, and *falls* caused as a result of contact with electrical energy. Electrical arcs and sparks can also cause fires. The extent of electrical injury received depends on the amount of current (measure in amps or milliamperes), the pathway of the current through the body, and the duration of current flow through the body.

CURRENT	POTENTIAL RESULT
1 mA	Barely perceptible
16 mA	Maximum current an average man can grasp and "let go" – current greater than this causes so much involuntary muscle contraction that the victim is unable to let go of the electrical source
20 mA	Paralysis of respiratory muscle; may be fatal
100 mA	Ventricular fibrillation threshold
2 Amps	Cardiac standstill and internal organ damage
15/20 Amps	Common fuse or breaker opens circuit. (A common household circuit breaker may be rated at 15, 20, or 30 Amps)

Standing water, wet clothing, high humidity, or perspiration increases the possibility of a low-voltage electrocution. The level of current passing through the human body depends on the resistance of its path through the body. Under dry conditions, the human body can have a resistance as high as 100,000 Ohms. Wet or broken skin may drop the body's resistance to 1,000 Ohms. Use Ohm's Law to illustrate this:

Under dry conditions: Current = Volts / Ohms is: 120/100,000 = 1 mA — a barely perceptible level of current.

Under wet conditions: Current = Volts / Ohms is: 120/1,000 = 120 mA — enough current to cause ventricular fibrillation.

LOOK FOR ELECTRICAL HAZARDS The Occupational Safety and Health Administration (OSHA) estimates that there are approximately 350 electrical-related fatalities a year, roughly equaling *one fatality per day*.

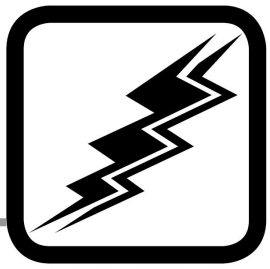
A study of workplace electrocutions showed that at least one of the following five factors was present in all of the incidents evaluated:

1 - established safe work procedures were either not implemented or not followed;
2 - adequate or required personal protective equipment was not provided or worn;
3 - lockout/tagout procedures were either not implemented or not followed;
4 - compliance with existing OSHA, national Electric Code, and other standards was not implemented; and
5 - worker and supervisor training in electrical safety was not adequate.

100 DAYS OF SUMMER

KEEP IT SAFE OUT THERE

"TOOLBOX TALKS" SERIES



ELECTRICITY

DATE: _____ **JOBSITE:** _____

DISCUSSION LEADER: _____

ATTENDANCE SIGN-IN:

OTHER SAFETY ISSUES DISCUSSED:

RESULTS OF JOBSITE INSPECTIONS