

SAFETY

EFFECTS OF CURRENT ON THE BODY

Before learning safety precautions, you should look at some of the possible effects of electrical current on the human body. The following table lists some of the probable effects of electrical current on the human body.

AC (mA)	DC (mA)	Effects
0-1	0-4	Perception
1-4	4-15	Surprise
4-21	15-80	Reflex action
21-40	80-160	Muscular inhibition
40-100	160-300	Respiratory failure
Over 100	Over 300	Usually fatal

Note in the above chart that a current as low as 4 mA can be expected to cause a reflex action in the victim, usually causing the victim to jump away from the wire or other component supplying the current. While the current should produce nothing more than a tingle of the skin, the quick action of trying to get away from the source of this irritation could produce other effects (such as broken limbs or even death if a severe enough blow was received at a vital spot by the shock victim).

It is important for you to recognize that the resistance of the human body cannot be relied upon to prevent a fatal shock from a voltage as low as 115 volts or even less. Fatalities caused by human contact with 30 volts have been recorded. Tests have shown that body resistance under unfavorable conditions may be as low as 300 ohms, and possibly as low as 100 ohms (from temple to temple) if the skin is broken. Generally direct current is not considered as dangerous as an equal value of alternating current. This is evidenced by the fact that reasonably safe "let-go currents" for 60 hertz, alternating current, are 9.0 mill amperes for men and 6.0 mill amperes for women, while the corresponding values for direct current are 62.0 mill amperes for men and 41.0 mill amperes for women. Remember, the above table is a list of probable effects. The actual severity of effects will depend on such things as the physical condition of the work area, the physiological condition and resistance of the body, and the area of the body through which the current flows. Thus, based on the above information, you must consider every voltage as being dangerous.

ELECTRIC SHOCK

Electric shock is a jarring, shaking sensation you receive from contact with electricity. You usually feel like you have received a sudden blow. If the voltage and resulting current are sufficiently high, you may become unconscious. Severe burns may appear on your skin at the place of contact; muscular spasms may occur, perhaps causing you to clasp the apparatus or wire which caused the shock and be unable to turn it loose.

RESCUE AND CARE OF SHOCK VICTIMS

The following procedures are recommended for rescue and care of electric shock victims:

Remove the victim from electrical contact at once, but do not endanger yourself. You can do this by:

- Throwing the switch if it is nearby
- Cutting the cable or wires to the apparatus, using an ax with a wooden handle while taking care to protect your eyes from the flash when the wires are severed
- Using a dry stick, rope, belt, coat, blanket, shirt or any other nonconductor of electricity, to drag or push the victim to safety

Determine whether the victim is breathing. If the victim is not breathing, you must apply artificial ventilation (respiration) without delay, even though the victim may appear to be lifeless. **DO NOT STOP ARTIFICIAL**

RESPIRATION UNTIL MEDICAL AUTHORITY PRONOUNCES THE VICTIM DEAD.

Lay the victim face up. The feet should be about 12 inches higher than the head. Chest or head injuries require the head to be slightly elevated. If there is vomiting or if facial injuries have occurred which cause bleeding into the throat, the victim should be placed on the stomach with the head turned to one side and 6 to 12 inches lower than the feet.

Keep the victim warm. The injured person's body heat must be conserved. Keep the victim covered with one or more blankets, depending on the weather and the person's exposure to the elements. Artificial means of warming, such as hot water bottles should not be used.

Drugs, food, and liquids should not be administered if medical attention will be available within a short time. If necessary, liquids may be administered. Small amounts of warm salt water, tea or coffee should be used. Alcohol, opiates, and other depressant substances must never be administered.

Send for medical personnel (a doctor if available) at once, but do NOT under any circumstances leave the victim until medical help arrives.

For complete coverage of administering artificial respiration, and on treatment of burn and shock victims, refer to *Standard First Aid Training Course, NAVEDTRA 10081 (Series)*.

SAFETY PRECAUTIONS FOR PREVENTING ELECTRIC SHOCK

You must observe the following safety precautions when working on electrical equipment:

- Never work alone. Another person may save your life if you receive an electric shock.
- Work on energized circuits **ONLY WHEN ABSOLUTELY NECESSARY**.
- Power should be tagged out, using approved tag out procedures, at the nearest source of electricity.
- Stand on an approved insulating material, such as a rubber mat.
- Discharge power capacitors before working on reenergized equipment. Remember, a capacitor is an electrical power storage device.
- When you must work on an energized circuit, wear rubber gloves and cover as much of your body as practical with an insulating material
- (Such as shirt sleeves). This is especially important when you are working in a warm space where sweating may occur.
- Reenergize equipment prior to hooking up or removing test equipment.
- Work with only one hand inside the equipment. Keep the other hand clear of all obstacles that may provide a path, such as a ground, for current to flow.
- Wear safety goggles. Sparks could damage your eyes, as could the cooling liquids in some components such as transformers should they overheat and explode.
- Keep a cool head and think about the possible consequences before performing any action. Carelessness is the cause of most accidents.
- Remember the best technician is **NOT** necessarily the fastest one, but the one who will be on the job tomorrow.

Uninhibited New Transformer Oil Data

Description	Uninhibited Transformer Oil, meeting IEC 60296 (03) General Specifications, ASTM D3487 Type I, AS1767, 1-1999 and BS 148:98 Class I and II.		
TYPICAL TEST	TEST METHOD	UNIT	SPECIFICATION LIMIT
Appearance Density @ 15 ° C.	IEC 60296 ISO 12185	Kg/dm ³	Clear, free from Max 0.895
Viscosity: @40 C @-30 C	ISO 3104	mm ² /s	Max. 12
	ISO 3104	mm ² /s	Max. 1800
Pour Point	ISO 3016	Deg. C	Max. -40
Corrosive Sulphur	DIN 51353		Non-corrosive
Aromatic Content	IEC 60590	%	
Antioxidant Phenols	IEC 60666	WT%	Not Detectable
Water Content	IEC 60814	mg/kg	Max. 30
Furfural Content	IEC 61198	mg/kg	Max. 0.1
Breakdown Voltage (after treatment)	IEC 60156	KV	Min. 70
Breakdown Voltage (before treatment)	IE 60156	KV	30
Total Acidity		mg KOH/g	Max. 1.2
Sludge		Wt %	Max. 0.8
Gassing Tendency, Hydrogen	IEC 60628 (A)	mm ³ /min.	Max. +5
Flash Point (PM)	ISO 2719	Deg. C	Min. 140
PCB Content	IEC 61619		Not Detectable