



המוסד לבטיחות ולגיהות
בטיחות ובריאות בעבודה - זה אנחנו.

ELECTRICAL SAFETY

APPLICATION DEVELOPMENT TRENDS

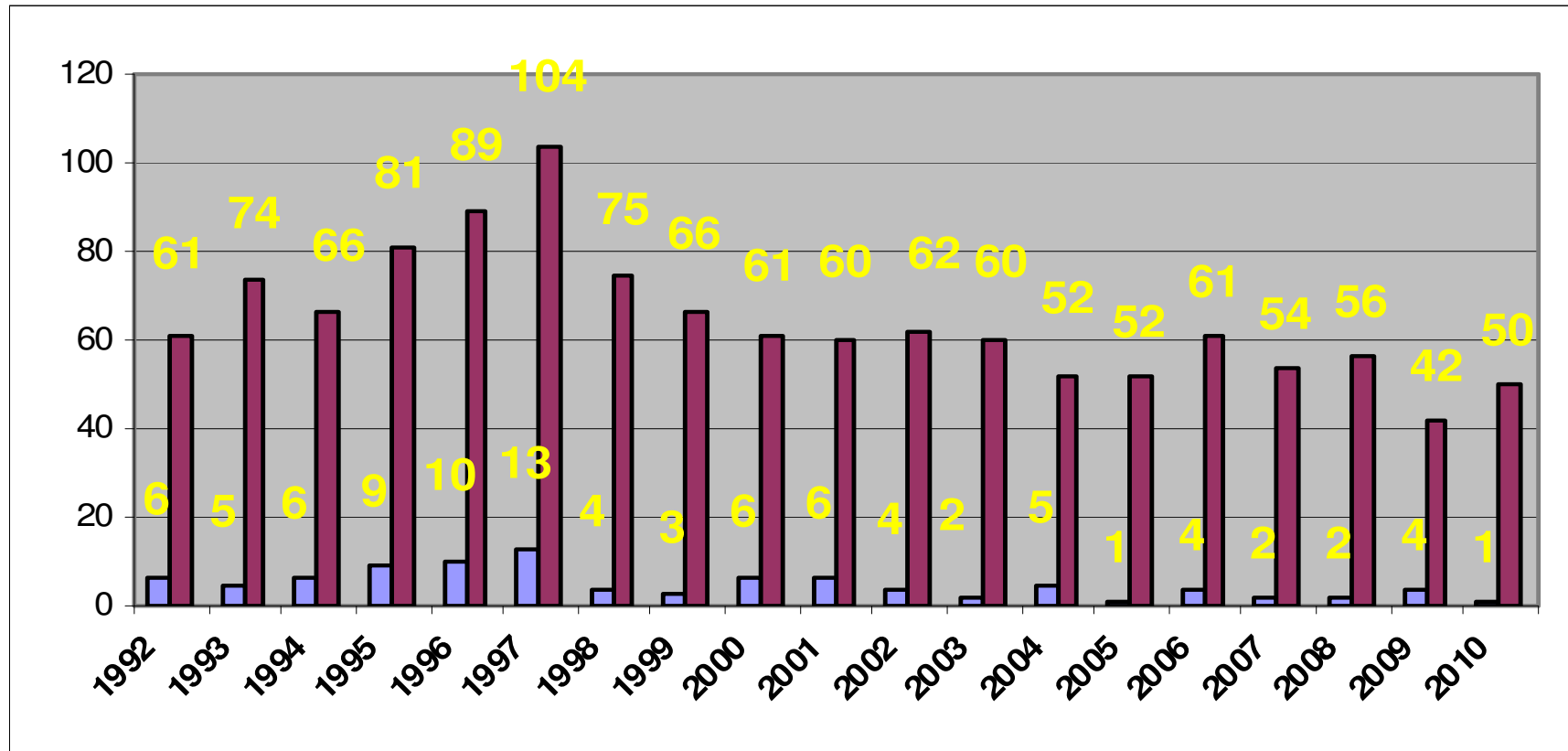
**Israel institute for occupational
safety & hygiene (OSHI)**

TUREZKY ALEX PhD

System safety plan

- Hazard identification & analysis
- Risk assessment
- Risk control
- Risk management

WORKPLACE FATALITES IN ISRAEL



 ——— **ELECTRICAL accidents death**
 ——— **TOTAL**

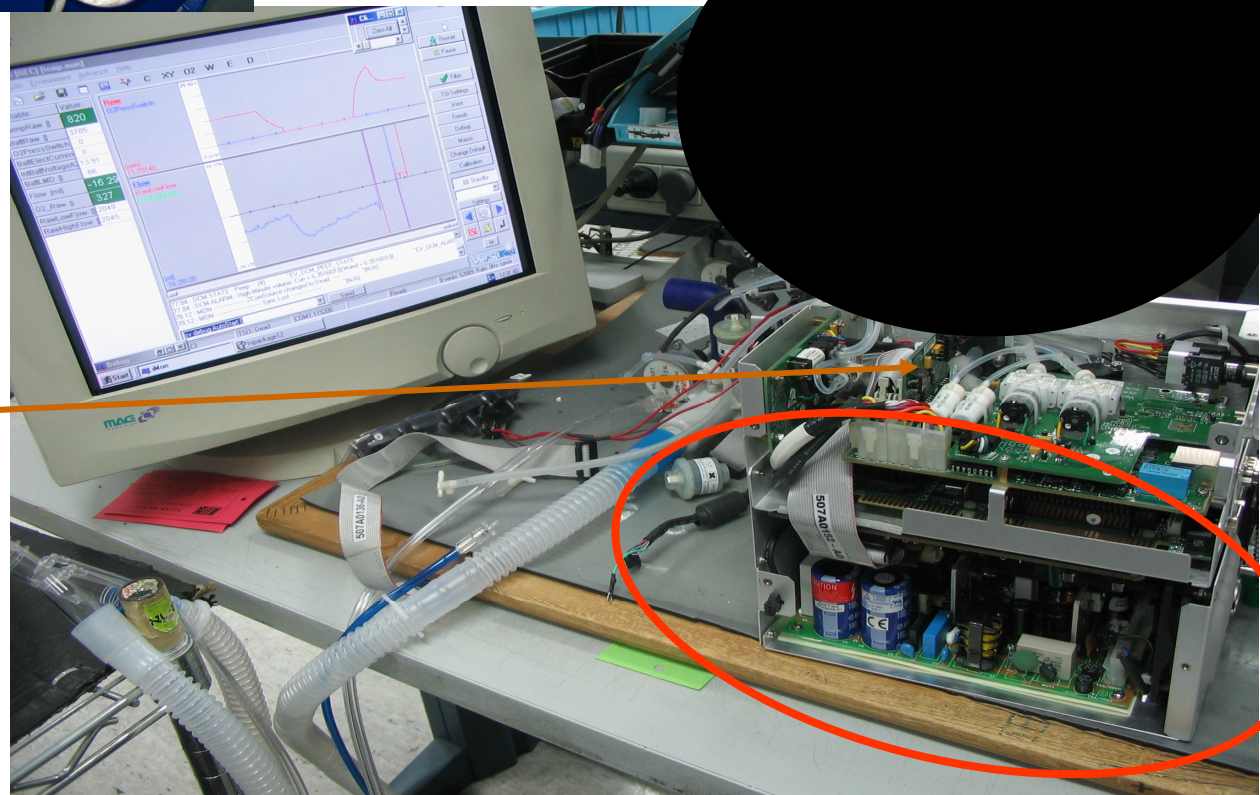
ELECTRICAL SAFETY IN ELECTRONICS WORKS

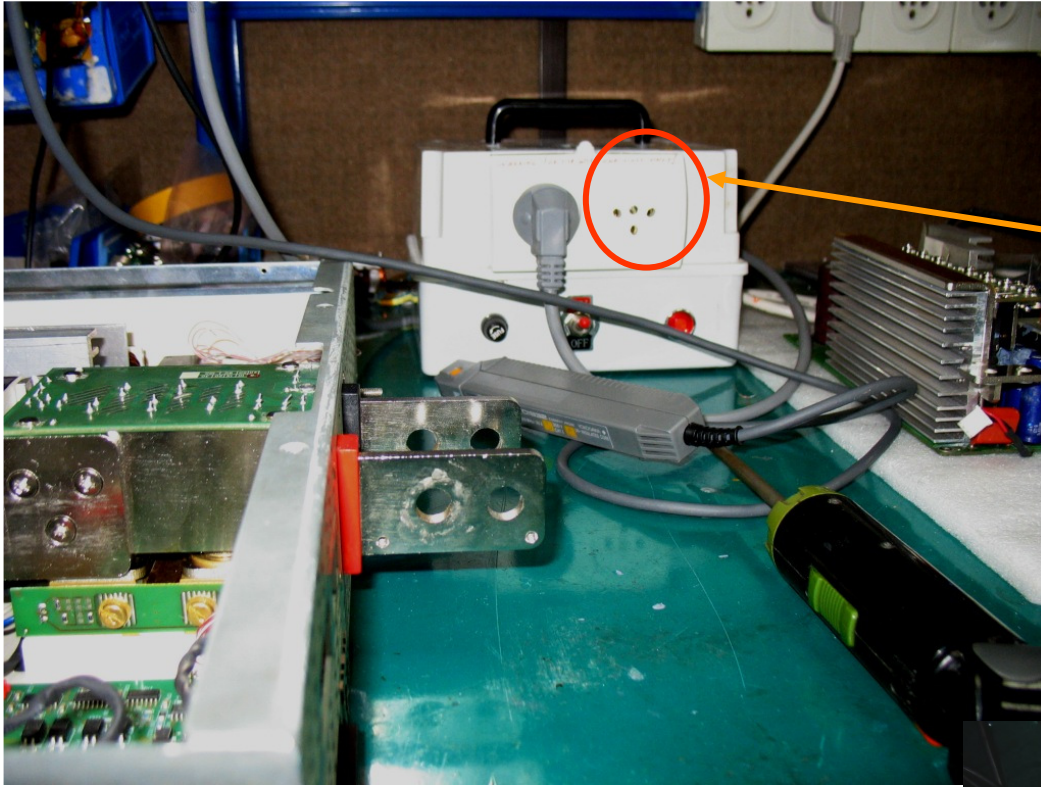
SAFETY IN THE DESIGN

Risks in electronic equipment



$U=2000V$

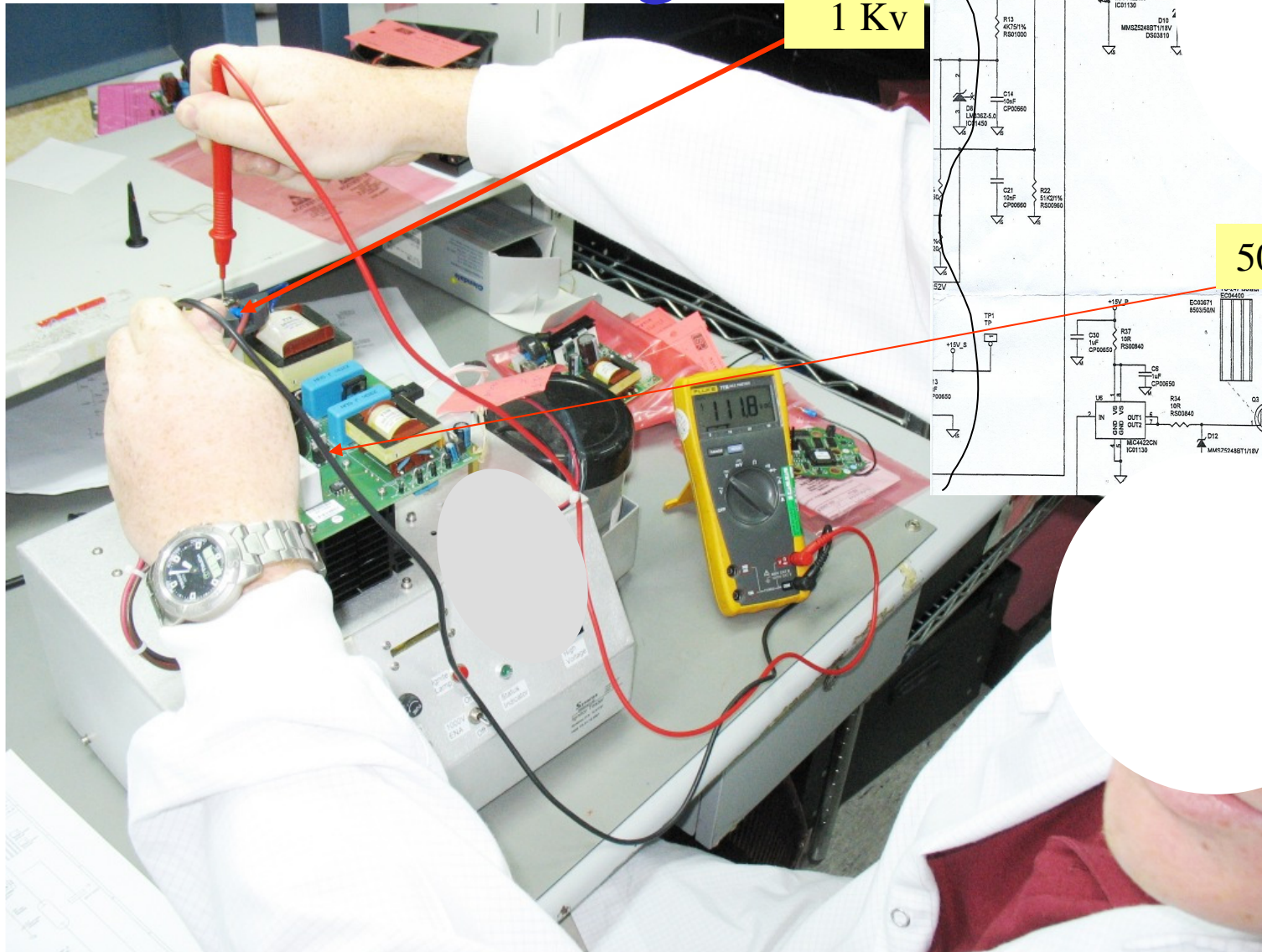




Electrical
transformers is not
safety

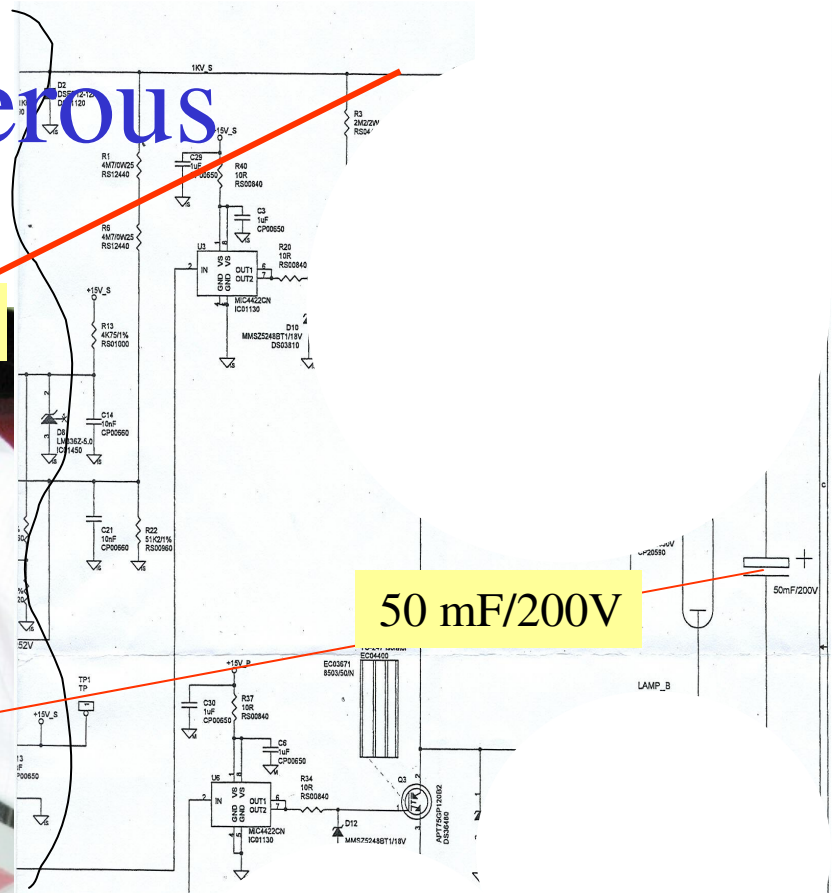


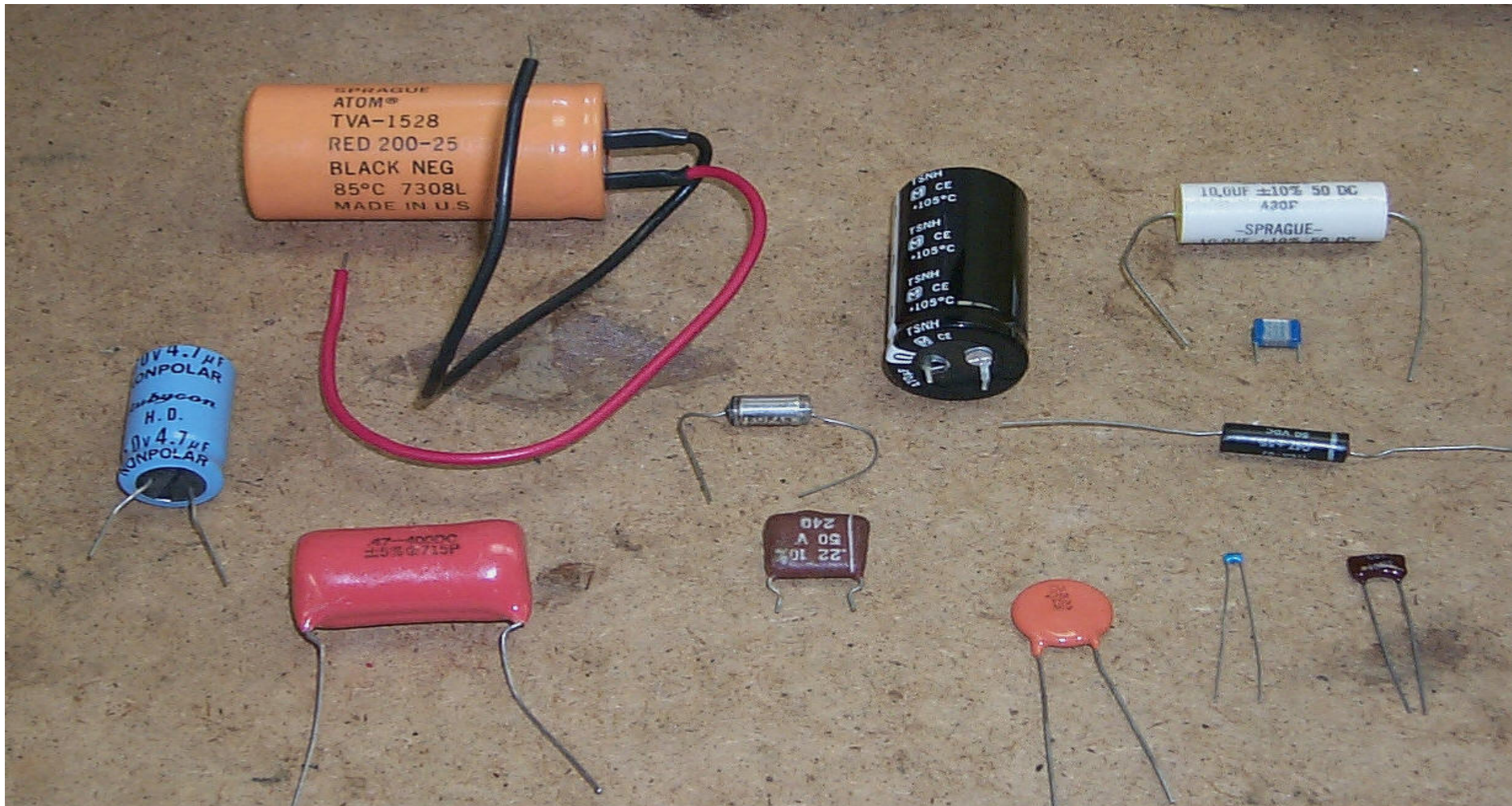
Definitions of dangerous working area



1 Kv

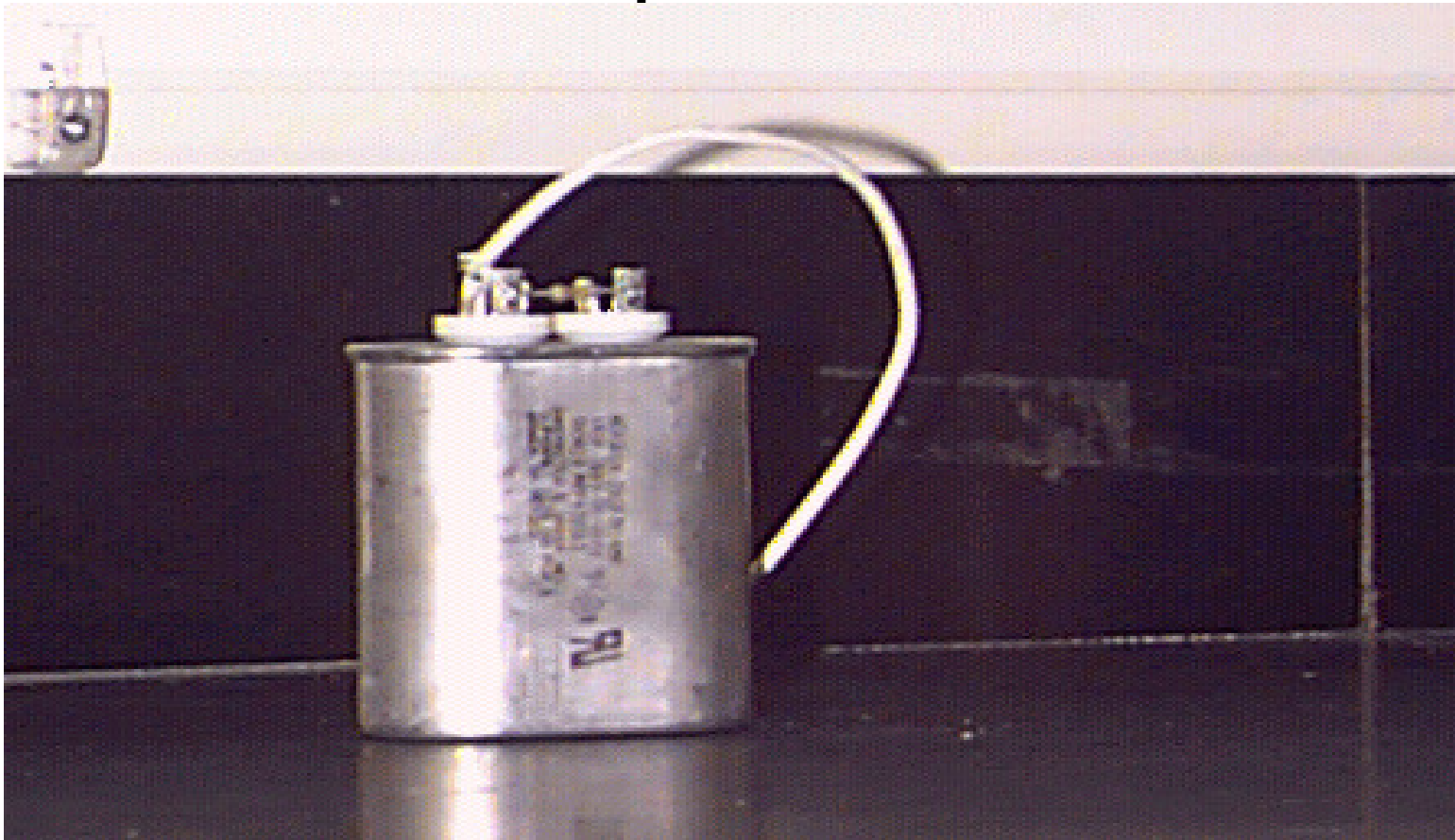
50 mF/200V





Capacitors are located inside of all laboratory equipment. They come in many different shapes and sizes. Capacitors can remain energized and produce harmful shocks long after a piece of equipment has been unplugged.

Capacitors



A discharge delivering 10 joules of energy can be lethal. •
Ten joules of energy can be delivered by the discharge of
even small highly energized capacitors (0.2 microfarads
charged to 10 KV etc.).

Ohm's Law of Electricity

$$V = I R$$

V = electrical potential (volts)

I = electrical current (amps)

R = resistance (ohms)

Voltage is almost always a constant so electrical current levels are determined by the resistance to flow. When there is a potential for electrical shock we can protect ourselves by maximizing our resistance to current flow.

**Time – is factor of
Electricity**

Effects of Electrical Shock on the Human Body

Current in mA	Direct Current		Alternating	
	Men	Women	Men	Women
Perception Threshold	5.2	3.5	1.1	0.7
Painful Shock 0.5%	62	41	9.0	6.0
Painful Shock 99.5%	90	60	23	15
Ventricular Fibrillation	500	500	675	675

All Units are in **milliamps** Reference: Introduction to Safety in the Chemical Laboratory, N. T. Freeman, J. Whitehead, Academic Press, New York, 1982, pg. 41.

Lower levels of AC than DC will produce painful shocks in humans while lower levels of DC than AC can lead to fibrillation of the heart muscle. Women are more sensitive to the effects of both AC and DC than are men.



Fig. 9. Determination of the maximum current a subject can tolerate and still let go of the energized conductor.

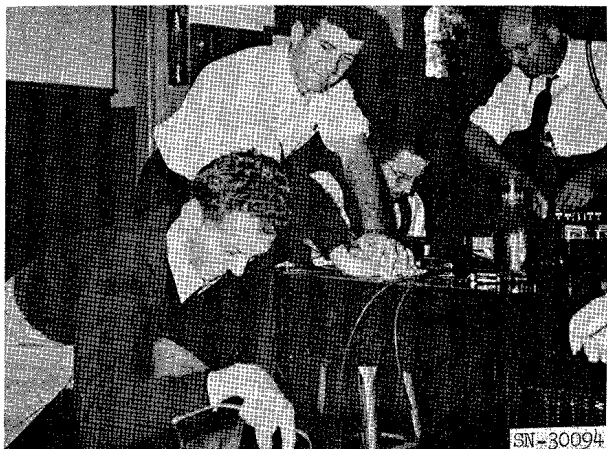


Fig. 10. Determination of let-go current. Current pathway between the hands.

**An example
lack of body control**

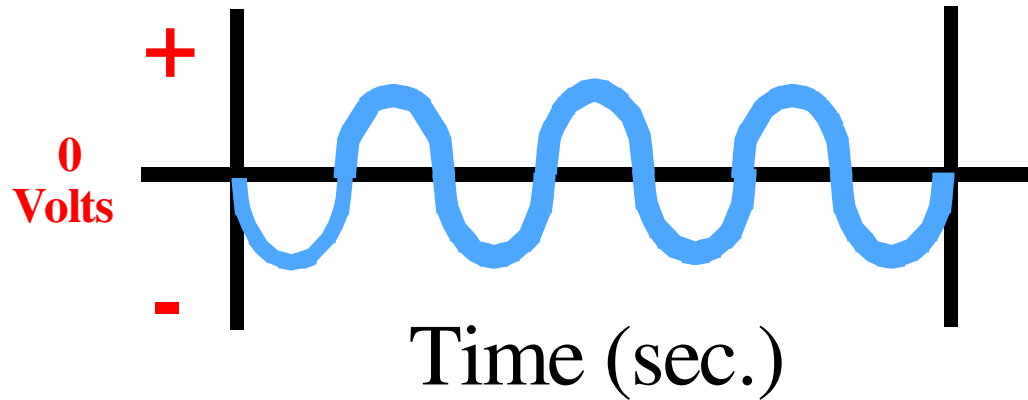
Threshold of sensation

DC – 76 mA

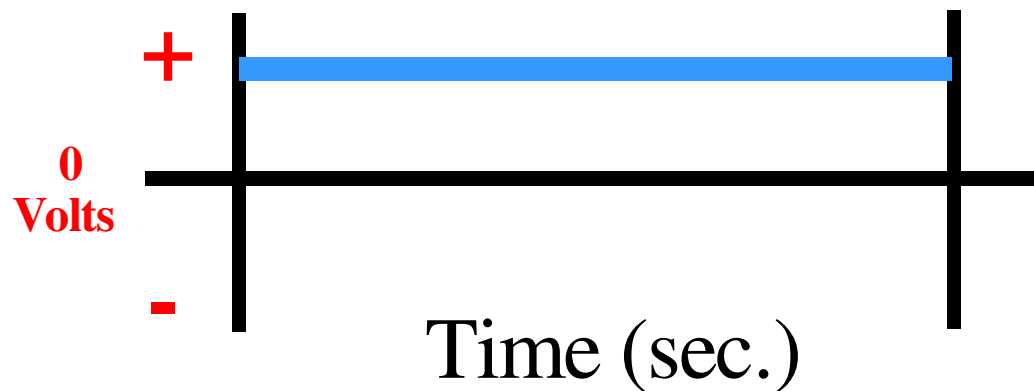
AC 50 Hz – 16 mA

AC 10,000 Hz - 75 mA

Alternating Current (AC)



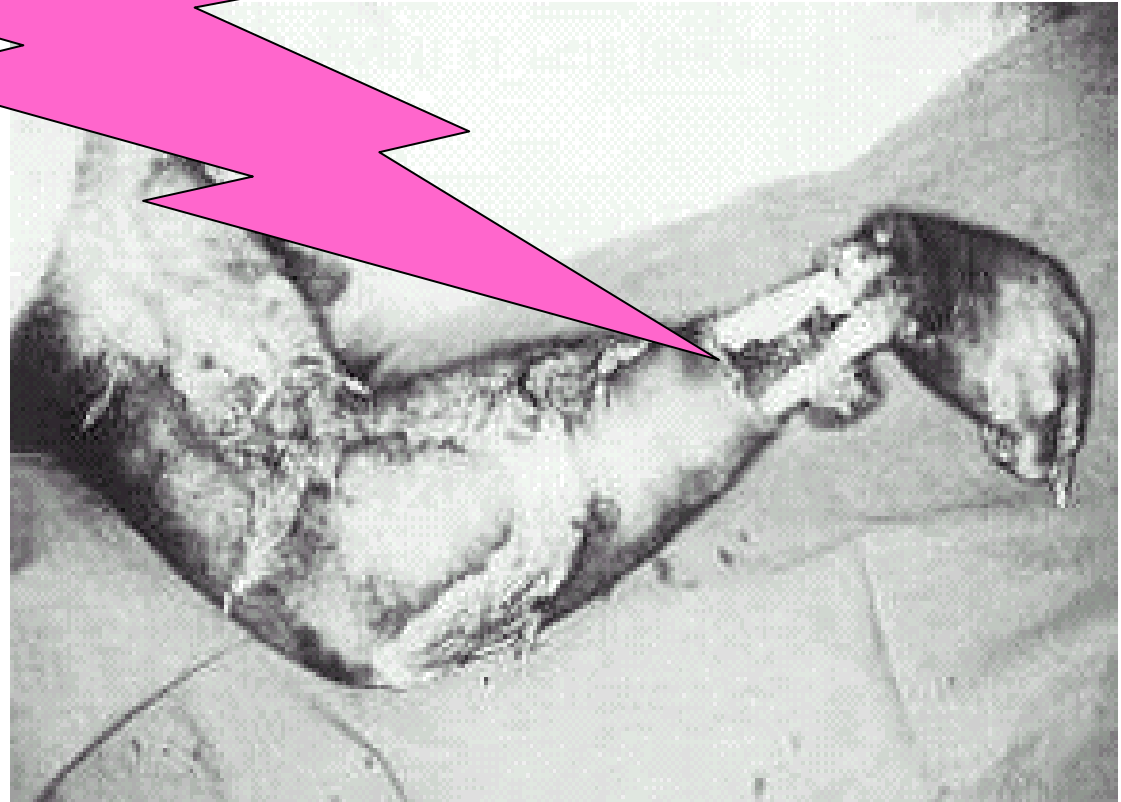
Direct Current (DC)



Arc Fault Hazards



electrical arc damage



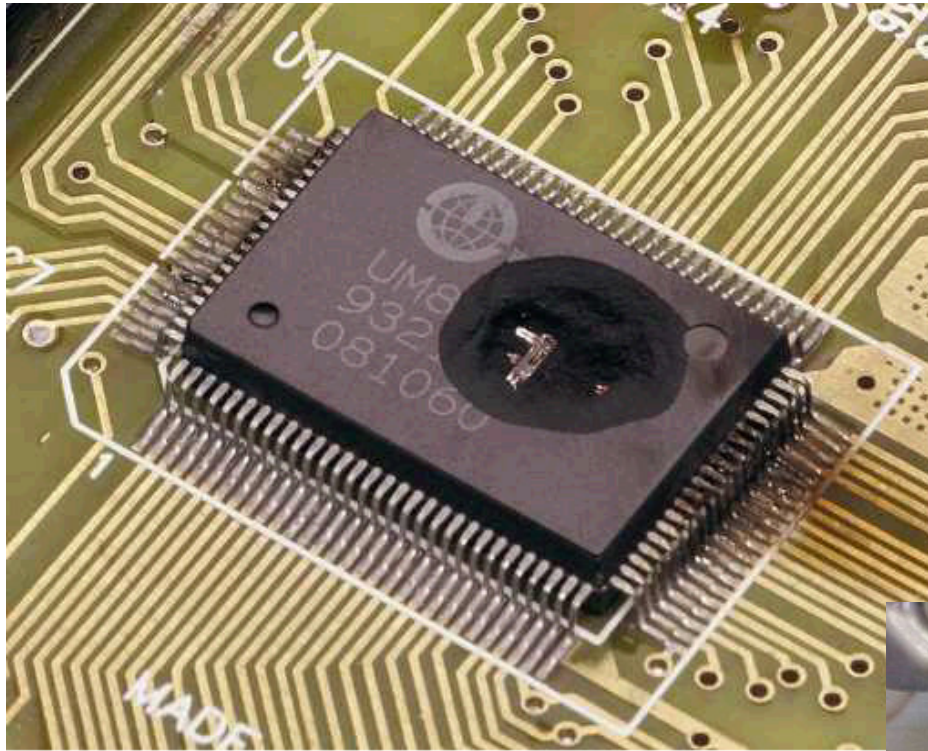


PHASE "S" OVERHEATING PROBLEM

Overheating main switch

Electrostatic protection





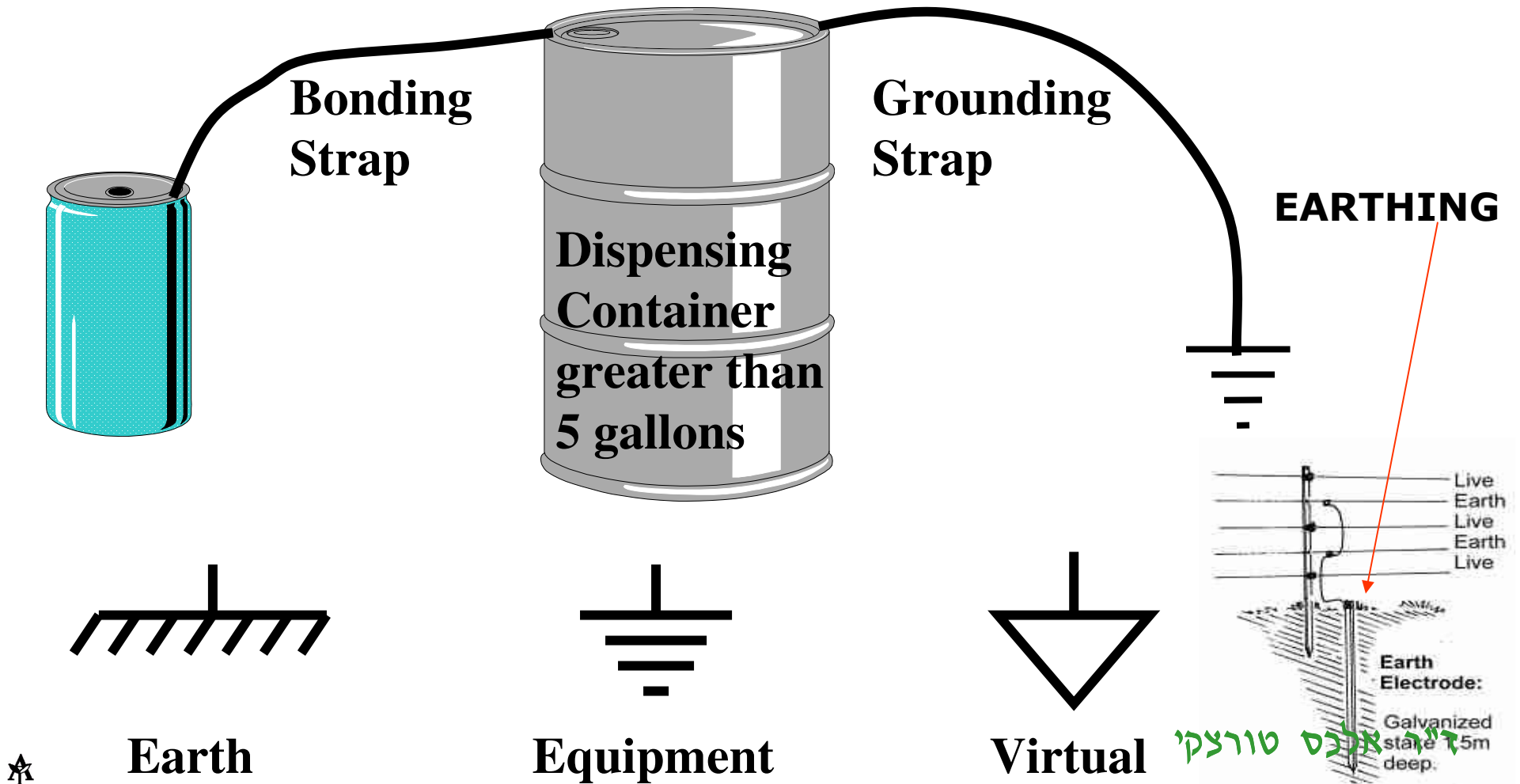
Power surges a big dangers to electronics components



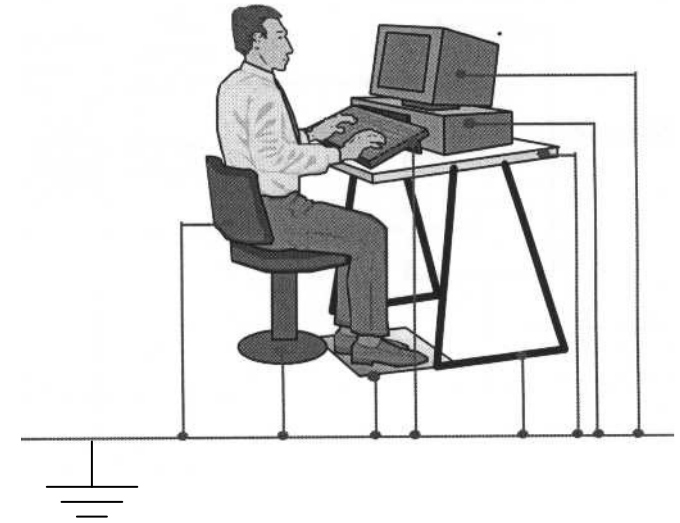
Safety solutions in electronic works including:

- Protection from dangerous contacts
- Lowering dangerous voltage, current & time
- Choosing safe working conditions
- Personal protective equipment
- Training
- SAFETY MANANGMENT

Earth protections



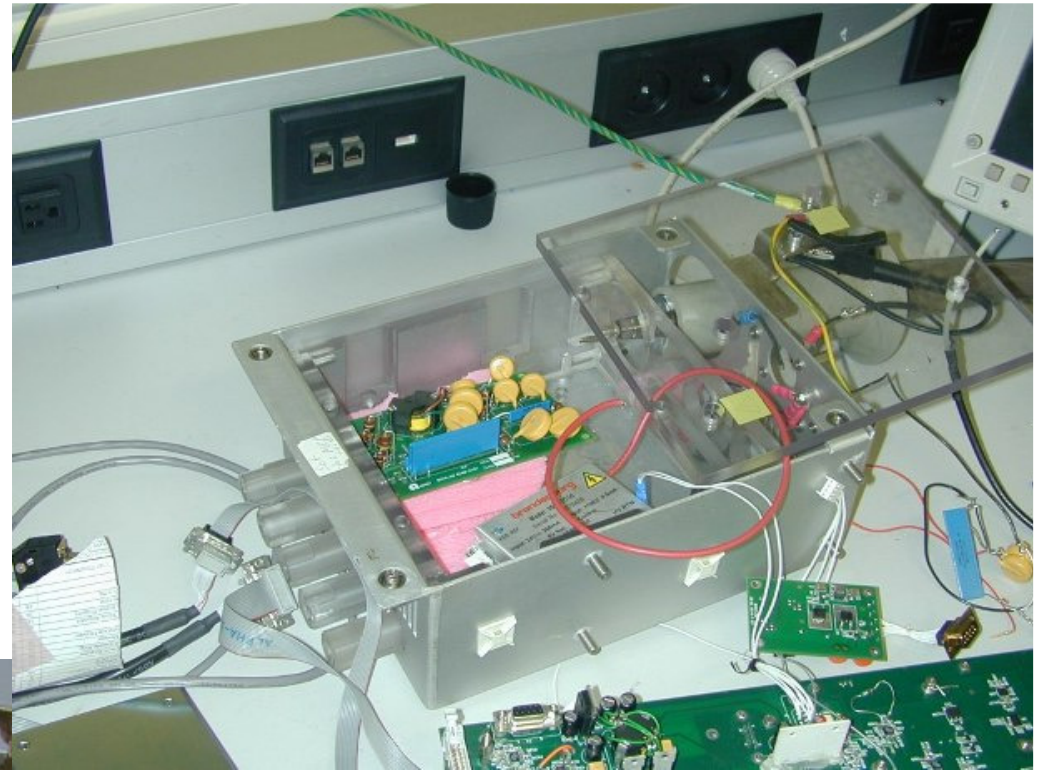
Earth protections



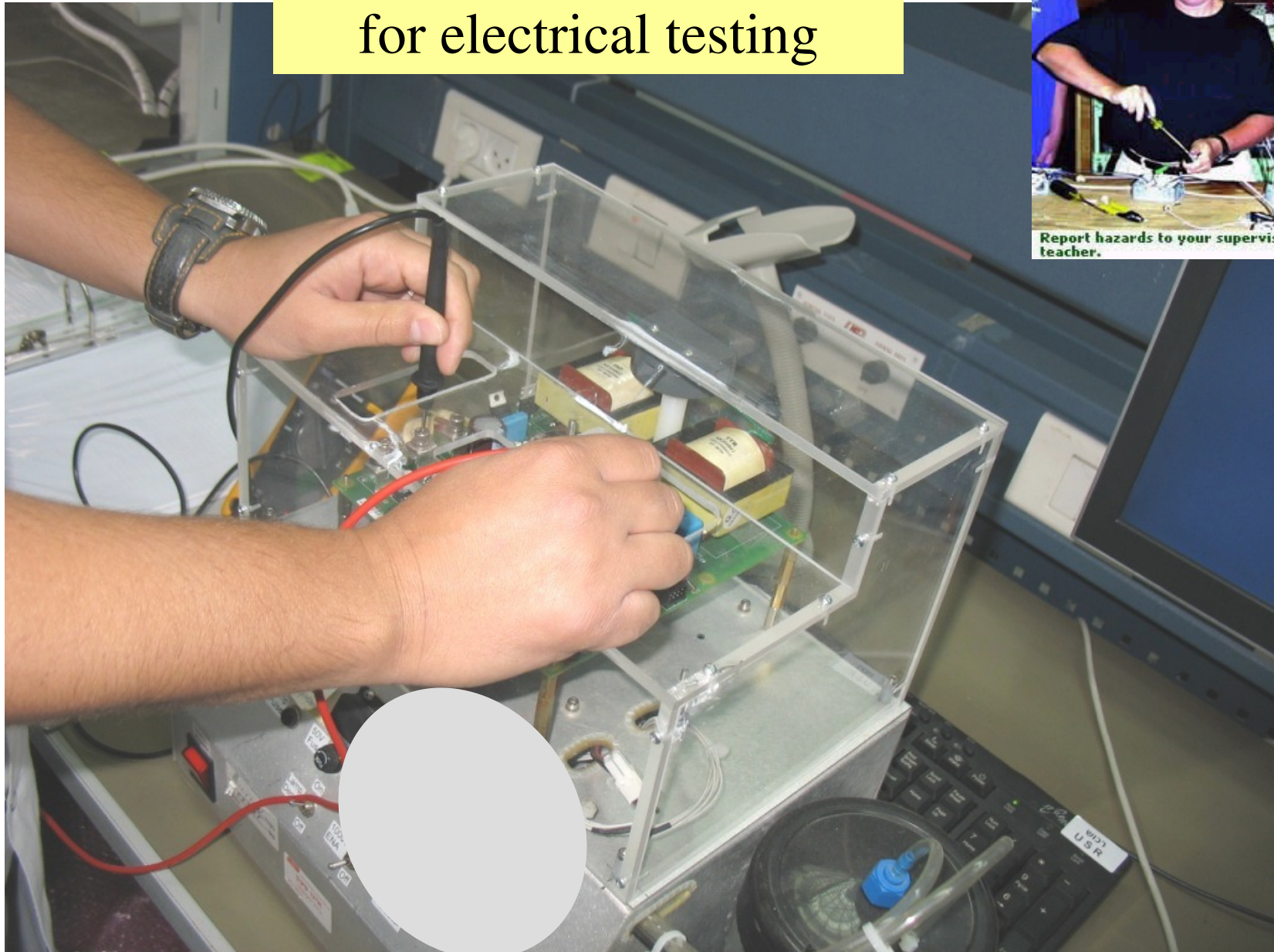
ESD



Insulated Electrical Box



Insulated Electrical Box for electrical testing



Report hazards to your supervisor or teacher.

Safety electrical system in the procedures for users



SAFETY procedures for electricians

SAFETY procedures for the safety engineer

SAFETY procedures for the safety officer

SAFETY procedures for the workers

SAFETY PROSEDURES

FOR ELECTRONICS WORKS

Based on:

ELECTRICAL LAW & REGULATIONS

Law on the work organization and supervision

ELECTRICAL STANDARDS



Electrical Safety Education and Training

Mobility Training in OSHI:

- for training on 6 languages: Hebrew, Arabic, Romanian, English, Chinese and Turkish.

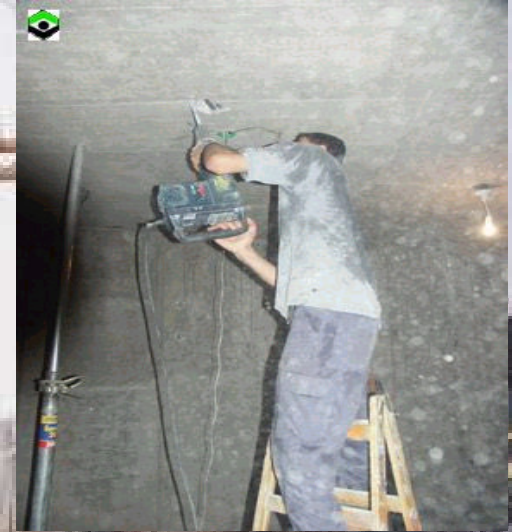
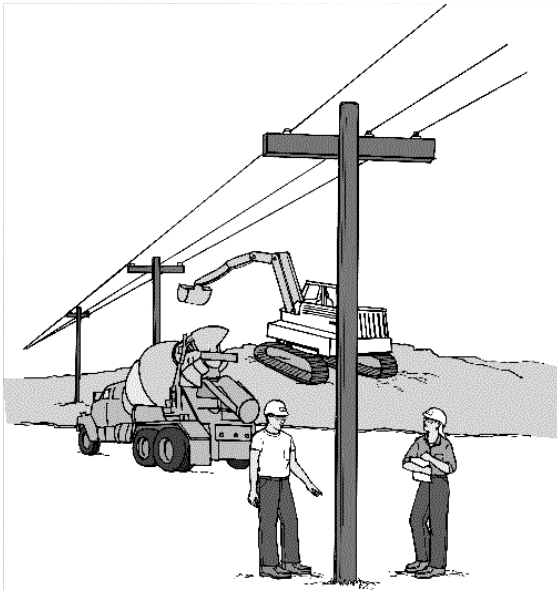


ELECTRICAL SAFETY

in buildings area

SAFETY in the electrical works

SAFETY in the electrical planning



building area



ELECTRICAL SAFETY

in the maintenance

SAFETY in the electrical works

SAFETY in the planning

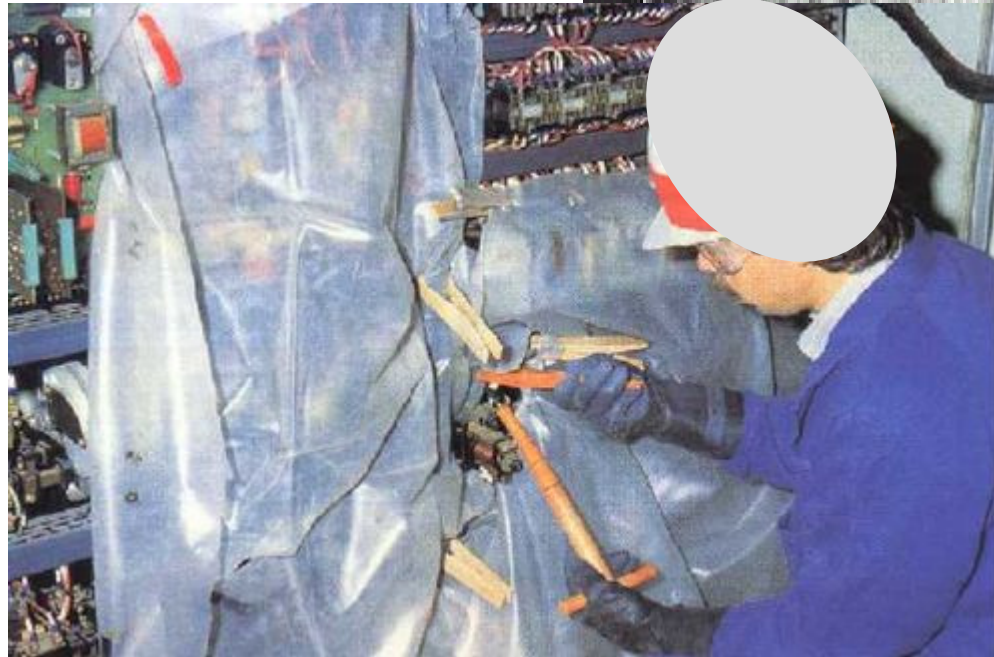
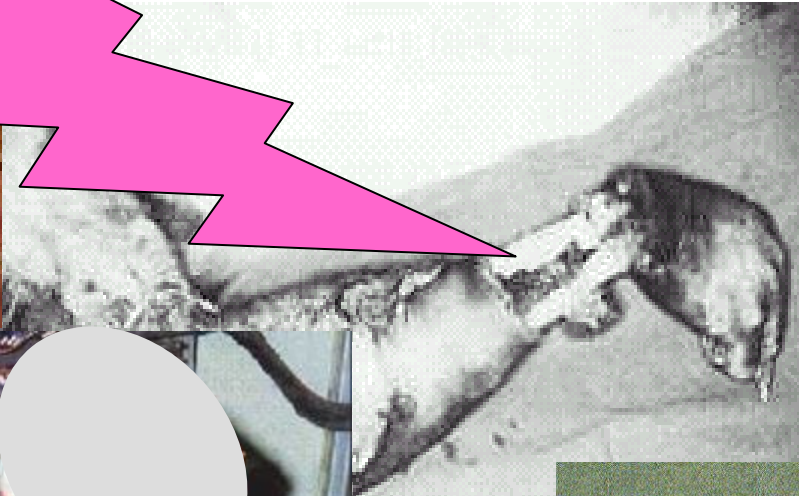
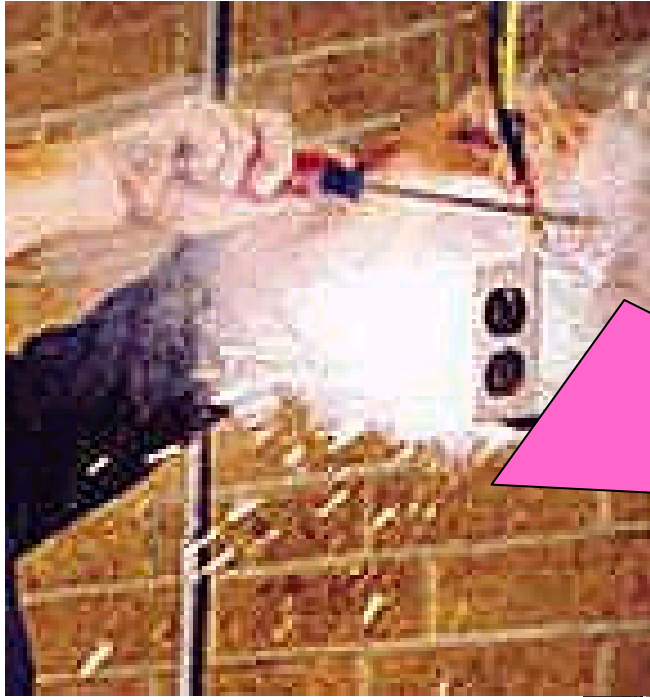
SAFETY in the tests

SAFETY in the Ex area

SAFETY in Electrical Emergencies



shock, skin burns,
electrocution
protections in the works



ELECTRICAL SAFETY **in the hygiene**



SAFETY in the electrical fields ELF

SAFETY in static electrical

Thank you for attention