WELCOME

The following material is being provided for informational purposes and in order to promote safety awareness. It does not constitute nor should it serve as a substitute for legal or other professional advice. Alcatel-Lucent makes no representations or warranties of any kind, express or implied, in providing this material.

EHS COMMITMENT FROM THE TOP

My ambition is for Alcatel-Lucent to be the recognized leader in sustainability and responsible business innovation for the technology industry.

Michel Combes

CEO Alcatel-Lucent

2013 Sustainability Report

Right First Time
SAFE EVERY TIME

ZERO TOLERANCE SAFETY PRINCIPLES

We always use the appropriate Personal Protective Equipment and Fall Arrest systems when working at heights.

We never work under the influence of alcohol or drugs.

We never work on energized equipment or in the vicinity of high voltage power transmission lines unless qualified.

We always have a lift plan when performing a critical lift.

We never exceed speed limits or travel at speeds which are dangerous for the type of road, vehicle, or conditions.

We always wear seat belts when travelling in, or operating vehicles.

We never use a hand held phone or text while driving.

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Basic Electrical Safety

Installation & Services Operations

LES091WG- January 2015

Alcatel·Lucent

AGENDA

1. Program Objectives
2. EHS Policy
3. Introduction and Definitions
4. How Electricity Works
5. Electricity Hazards
6. Preventing Hazards
7. Personal Protective Equipment
8. ALU Requirements
9. Working in Customer Equipment Rooms
10. Summary

PROGRAM OBJECTIVES

- Introduce basic electrical safety techniques
- Review how electricity works
- Review Alcatel-Lucent procedures
- Review shock and other types of injuries
- Provide procedures to prevent shock from occurring

ALCATEL-LUCENT EHS POLICY

The Alcatel-Lucent Environment, Health and Safety Policy provides the framework for EHS performance improvement in support of the business strategy.

ENVIRONMENT, HEALTH AND SAFETY POLICY

Alcatel-Lucent is committed to operating in a sustainable manner that protects the environment and the health and safety (EHS) of employees, contractors, customers, and the communities where we conduct business. Meeting this commitment is a primary management objective and the individual and collective responsibility of all employees and will be proactively communicated internally and externally through our Corporate Social Responsibility efforts. To that end, Alcatel-Lucent will:

- Comply with applicable EHS laws, regulations, directives, commitments with customers, company requirements, and with other requirements to which Alcatel-Lucent subscribes.
- Provide employees and those who visit or work at Alcatel-Lucent locations with safe working conditions.
- Design products that are safe, energy-efficient, can be installed/serviced/uninstalled safely, and can be recycled or disposed of in an environmentally responsible manner.
- Strive to efficiently and effectively prevent pollution, prevent occupational injury and ill health, optimize energy and resource consumption and minimize the EHS impacts from activities, services and products.
- Regularly assess and continually improve EHS performance in a responsible manner by implementing management systems, setting goals and meeting objectives.
- Appropriately train, inform, motivate and consult with employees to help them perform their activities in a safe and environmentally responsible manner.
- Work with suppliers and customers to promote responsible use of products throughout their life cycles.
- Promote the adoption of similar principles by contractors and suppliers.

This policy will be regularly reviewed, updated as necessary, applied and communicated to all employees and persons working for or on behalf of Alcatel-Lucent, and made available to interested parties and the public.

Michel Combes
CEO Alcatel-Lucent

Barbara Landmann
Chief EHS Officer Alcatel-Lucent

Alcatel·Lucent

EHS-1-1, Edition 3.2
April 2013

INTRODUCTION

Electricity is a recognized workplace hazard. A risk of electrical hazards (e.g., electrical shock, electrocution, source of ignition, explosion) exists whenever working with power tools or electrical circuits.

Some Alcatel-Lucent operations are considered high risk due to the potential contact with exposed energized components.

ELECTRICITY BASICS

ELECTRICAL CURRENT

Electricity is the flow of electrons, known as current, through conductors such as wires and switches.

Current flows in a closed or complete circuit, and is measured in amperes.

Voltage, measured in volts, is the force that pushes electrons through a circuit. Voltage and current are directly proportional: as voltage increases, current increases.

Current flow is also dependent on the resistance, measured in ohms, of the circuit. Current is inversely proportional to resistance: as resistance increases, current decreases. Hertz is the measure of how rapidly alternating current alternates. The **primary factor in injury is A**mperage/Current Density which flows through the body.

I = V / R

- **I**; Electrical Current (amperes)
- **V**; Voltage (volts)
- **R**; Resistance (ohms)

DEFINITIONS

Alternating Current (AC) – electricity that alternately reverses direction of motion in a circuit

Arc-blasts - occur when powerful, high-amperage current arc through the air. Arcing is the luminous electrical discharge that occurs when high voltages exist across a gap between conductors and current travels through the air. Temperatures as high as 35,000°F have been reached in arc-blasts

Bonding - Electrically connecting containers or a person to a container to prevent a build-up of static electricity while working with flammable or explosive liquids

Breakdown - A condition that occurs when insulation fails and allows current to flow rather than preventing it

Conductor - A material capable of carrying an electric current. This includes any material that will allow current to pass through it

Direct Current (DC) - electricity that moves in a continuous direction in a circuit

DEFINITIONS

Double Insulation - User is insulated from the internal electrical circuits by tool housing. Ground Fault Circuit Interrupter (GFCI) still required during use

Generator - An electrical-mechanical device used to create the electrical pressure (Voltage)

Ground - A low resistance path to earth ground. A common or neutral conductor that physically connects to earth ground

Ground Fault Circuit Interrupter (GFCI) - An electrical/mechanical device which automatically disconnects when a difference in current is detected

Hot - term used to describe a conductor that has an electrical current passing through it

Insulator - A material having a high resistance to electrical current

Short Circuit - A condition that exists when a conductor carrying an electric current comes in contact with another conductor or ground.

Static Electricity - A build-up of an electrical charge between two surfaces

ELECTRICITY HAZARDS

TYPES OF ELECTRICAL HAZARDS

Electrical Shock

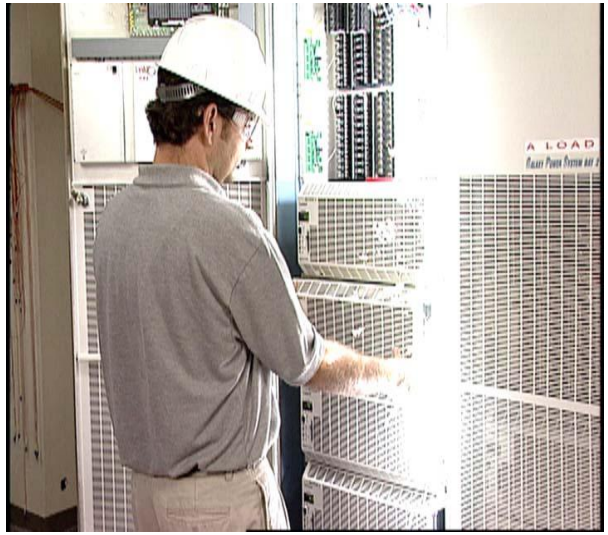
- The body becomes part of the electric circuit and current passes through a part of the body

Electric Arc

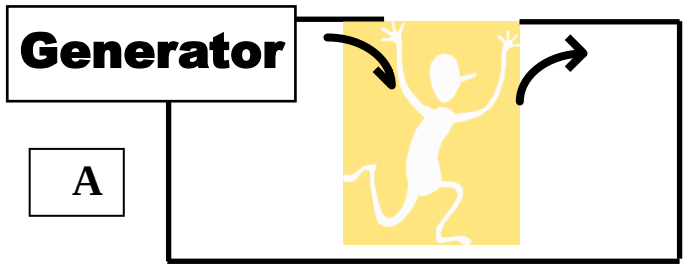
- Caused by large amounts of current passing vaporized material (usually metals)

Electric Blast

- Associated with an electric arc. Created from the instantaneous heating of air and the expansion of metal

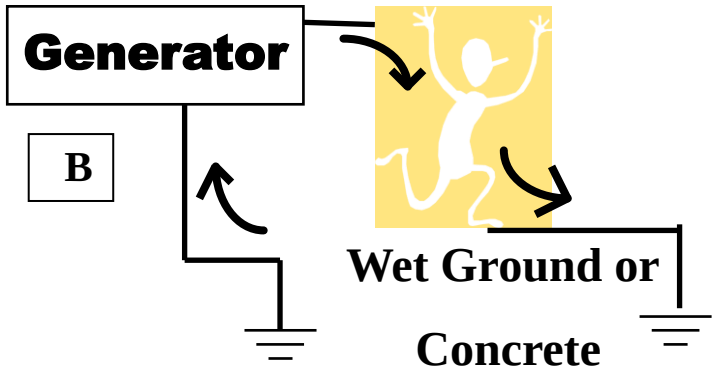


HOW SHOCK OCCURS



Contact with both conductors of an electrical circuit. The person becomes part of the circuit, and electrical current

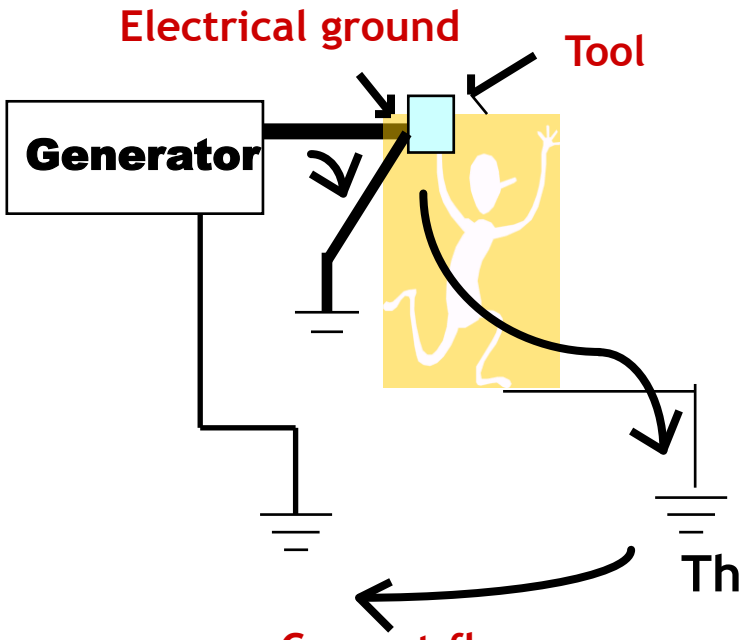
conducts through the person.



Contact with an energized conductor and ground. The

person becomes part of the electrical circuit and will conduct the electrical current.

SHORT-CIRCUITED TOOLS CAN CAUSE SHOCK



Electrically grounding a tool with a short between the cord and the tool will internally by-pass most of the current.

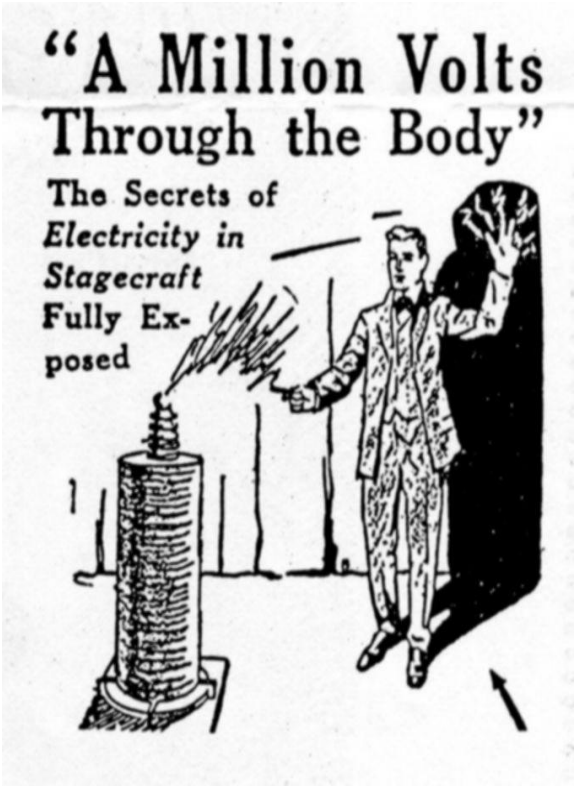
The low resistance path to ground will be taken.

Some current will pass through the person.

SEVERITY OF SHOCK

Dependent upon several factors

- Amount of current through the body
- Path of the current through the body
- Time the body is in the electrical path
- Frequency of the current
- The phase of the heart cycle
- General health of the person



EFFECTS OF ELECTRIC CURRENT IN THE BODY

Current	Reaction
0.3 – 1.7 mA	Slight sensation, no discomfort
1 – 5 mA	Slight shock, disturbing, injury possible
5 – 15 mA	Painful shock, release possible
15 – 20 mA	Painful shock, lose control, cannot release, possibly unconscious

EFFECTS OF ELECTRIC CURRENT IN THE BODY

Current	Reaction
20 – 50 mA	Painful, severe muscle contractions, breathing difficult
50 – 100 mA	Very painful, Ventricular fibrillation, heart may stop
100 – 200 mA	Ventricular fibrillation, Cardiac arrest, severe burns
Over 200 mA	Severe muscular contractions and burns

EFFECT OF MOISTURE ON ELECTRICAL CURRENT

- Dry skin has a fairly high resistance to electrical current
- Moisture dramatically lowers the skin's resistance to the passage of electrical current
- This allows for much easier entry of current into the body, where it can cause harm
- When current breaches skin barrier, the body offers little resistance to the flow

Arc burn underarm

location = high moisture

PREVENTING HAZARDS

PREVENTING ELECTRICAL HAZARDS

- Good grounding
- Proper bonding
- Insulation
- Well maintained tools / equipment
- Electrical protective devices
- Safe work practices
  - Safe approach distances

PROPER BONDING

While pouring or transporting containers with liquids, proper bonding:

- **Prevents** buildup of static electricity.
- **Allows** static charge between person and container to equalize.
- **Accomplished** by a static strap connecting the person and container.
- **Necessary** when working with electronic equipment OR moving, installing, or working with batteries.

STATIC ELECTRICITY

- May generate up to 35,000V, which can destroy integrated circuitry
- May ignite hydrogen gas from batteries.

WARNING DEVICES

- **Access to Work Area**
  - Access to area where work is to be performed shall be restricted by use of barrier tape, warning signs, tags, cones or other similar alerting methods.
  - Portable warning kit (NAR example: Tool Kit 83)
- **LOCKOUT/TAGOUT DEVICES**
- **Tags**
  - DANGER
  - CAUTION (e.g. testing circuits)
  - Special requirements for Tags
- **Locks**
  - LOTO procedure
  - Tag also required
  - One lock, one key rule

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WELL MAINTAINED TOOLS

- These can help protect you!
- Continually inspect for damage.
- Properly functioning.
- Properly grounded or double insulated.
  - Meet electrical standards
- Electrical cord in good condition.

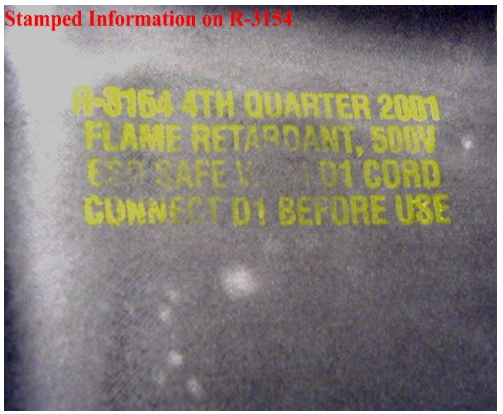
POWER INSULATED KIT (R-6081, TK605 for NAR example)

- **Insulated tools**
  - Pliers, wire cutter/stripper
  - Slotted screwdrivers
  - Phillips screwdrivers
  - Class 0 glove kit (size 9)
  - Class 0 shielding material

PROTECTIVE MATERIALS

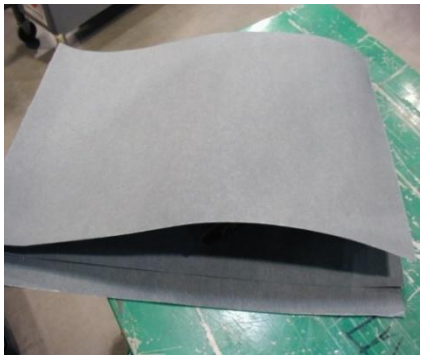
- **Canvas**
  - Provides bulk and padding.
  - DOES NOT insulate from electrical voltage!
  - Considered a support item for electrical protection.

- **Protective Sheeting**
  - Insulated, used for protection against electricity.
  - Thin, pliable, and easy to use.
  - Placed throughout the immediate surrounding cable connecting area.
  - Consider 2 layers for added protection.
  - Place sheeting first, canvas second for energized cabinets.
  - Must be inspected before every use.



PROTECTIVE MATERIALS

- **Fiber Sheeting**
  - Provides protection from electricity.
  - Available in sheeting or formed shapes.
  - Use formed first (easier to apply & secure).
  - Tougher than regular sheeting.
  - Used for larger areas, may require cutting to shape.
  - Use 2 layers for added protection.



- **Black Rubber Matting**
  - Provides protection from electricity.
  - 20 kV voltage rating.
  - Insulates you from the ground.
  - Not recommended for use up in the cabinets due to handling difficulties.

CIRCUIT PROTECTION DEVICES

- **Automatically shut off electricity flow if a short circuit or overload occurs.**
  - Circuit Breaker, Fuse
  - Ground Fault Circuit Interrupter

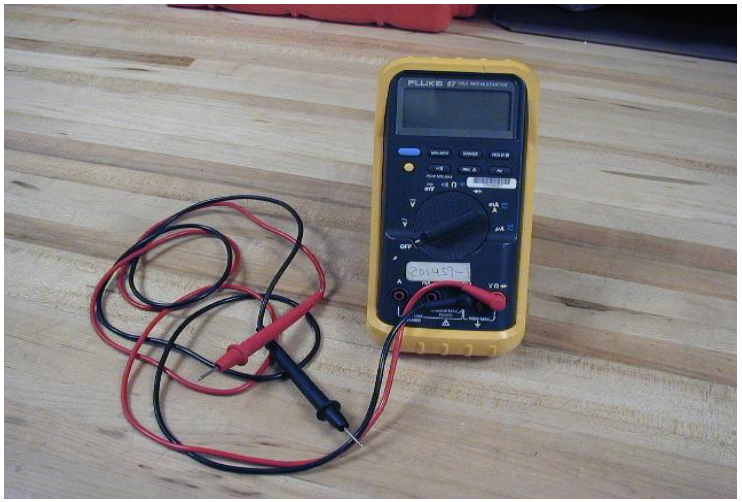
- **Circuit Breakers and Fuses**
  - Over current devices.
  - Open when current exceeds a certain value.
  - Protect components, conductors, and equipment.
  - Prevent conductor overheating.
  - Will not protect you if contact is made with a live conductor!

GFCI

- Terminates current in 1/40 sec required for ALL installation or maintenance work.
- Compares current to tool and current returning to GFCI.
- A difference of 6 milliamps interrupts circuit and prevents shock GFCIs will not protect you from a short between the power and neutral wire!

ENVIRONMENT TESTS

- **VOLTAGE:** The first and most important part of the testing.
  - Do not proceed with other tests until this one is performed.
- **CURRENT**
- **GROUND**
- **PHASE**



WORKING SAFELY WITH A MULTIMETER

- Ensure calibration sticker is current.
- Ensure maximum expected voltage does not exceed rating of meter and leads.
- Check insulation on test leads.
- Do not substitute leads that are rated for a lower voltage than the meter.
- Set meter to measure maximum expected voltage.
- Do not alter setting while meter is connected to circuit.
- Remove meter from circuit before changing switch positions.

WORKING SAFELY WITH A MULTIMETER (CONT.)

- Lessen risk of shock by using safety gear and reducing time near circuit.
- Use an alligator clip on one of the leads to allow you to take readings with one hand away from circuit, reducing risk of shock.
- Keep finger of active hand away from the metal end of test probe.
- Stand on an insulated mat.
- Use clips on both leads when taking extended readings to maintain distance from voltage source.
- Test a poly-phase system for the correct phase sequence using the R-3404 phase sequence indicator or equivalent.

RE-TEST FOR VOLTAGE

- Whenever returning to work area!
  - Breaks
  - Meals
  - Interruptions
  - Before starting work operations.
- TEST and RE-TEST FOR VOLTAGE!

MULTIMETER

- **Measuring Resistance**
- De-energize, Lock, and Tag circuit to be tested.
- Any voltage present is dangerous.
- Voltage may result in:
  - false readings
  - damage to meter
- **Low Values of Current**
- Connect meter in series with circuit.
- De-energize circuit before connecting leads. Securely attach meter before re-energizing circuit.
- Do not switch range settings while meter is connected. This may result in meter damage and circuit de-energization.

WORK AREA ENVIRONMENT

- **Part 1 = TEST**
- **Part 2 = CHECK** for possible safety issues;
  - Door opening into work area
  - Buzzers/Bells that may alarm
  - A busy walk-through area
  - A pathway for delivery carts
  - A break area

SAFE APPROACH DISTANCES

Approach distances:

- Increase with higher voltage.
- Do not exceed for work around exposed energized parts.
- Applicable to qualified personnel.
- Assumes an approved insulated tool is not utilized.

SAFE APPROACH DISTANCES

Voltage Range (Phase to Phase)	Minimum Approach Distance
300V and less	Avoid Contact
Over 300V, not over 750V	1 ft (30.5 cm)
Over 750V, not over 2kV	1 ft, 6 inches (45 cm)
Over 2kV, not over 15kV	2 ft (61 cm)
Over 15kV, not over 37kV	3 ft (91 cm)
Over 37kV, not over 87.5kV	3 ft, 6 inches (107 cm)
Over 87.5kV, not over 121 kV	4 ft (122 cm)
Over 121kV, not over 140kV	4 ft, 6 inches (137 cm)

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SAFE WORKING DISTANCES

It is not applicable in situations such as when ....

- A qualified employee is insulated from the energized part (e.g., low voltage gloves).
- Energized part is insulated from both the employee and all other conductive objects.
- Employee is insulated from all conductive objects.

ADDITIONAL PREVENTIVE MEASURES

- Use non-conductive ladders and scaffolds (e.g., wood or fiberglass).
- Do not expose metal tools near live components, circuits (e.g. tape measures, squares).
- Do not proceed when water or excessive moisture is noted in work area.
- Ensure portable lights, tools and appliances are equipped with a third wire grounding conductor.
- When double insulation incorporated into design, ensure equipment is marked.
- Ensure all AC outlets are mechanically grounded. Test periodically.

PERSONAL PROTECTIVE EQUIPMENT

PERSONAL PROTECTIVE EQUIPMENT

Protective clothing and equipment required to protect employees during electrical work operations will vary by job and shall be selected on the basis of the hazards involved.

Non-conductive hardhat

- Class B, E or ABC
- Protection from falling objects
- Protection from bumping
- Provides electrical protection
- Inspection and maintenance important

Non-conductive safety glasses with side-shields

- Required for all installation work
- Non-metallic frames
- Permanent side shields
- Keep them clean!

Low voltage rubber gloves

LOW VOLTAGE RUBBER GLOVES

- Provide protection when working with low voltage electric circuits.
- Check before each use.
  - leaks, holes, and cracks
  - trap air, squeeze, and listen

- In some countries must be tested every 6 months by the manufacturer after the initial year.
- **NOTE:** Gloves not factory tested must be discarded.
- Get used to glove bulkiness first.

ALCATEL-LUCENT REQUIREMENTS

ALCATEL-LUCENT ELECTRICAL SAFETY PROCEDURE

- Employees **SHALL NOT** work on or near energized AC equipment with exposed electrical parts unless the customer provides documentation that states de-energizing the equipment would introduce a greater hazard or would adversely affect communication services.
- Employees shall attend all required training applicable to assigned duties (e.g., Electrical Safety, Lockout/Tagout, First Aid-CPR and other locally required training).
- Supervisors must verify that an Electrical Safety Risk Assessment is being conducted so approved work practices are ensured. They are also responsible for enforcing electrical safety requirements and reviewing electrical work practices.

MINIMUM TRAINING FOR QUALIFIED PERSON

- Trained and certified/licensed in accordance with local laws
- Lockout/Tagout (LOTO) & Electrical Training
- Able to distinguish exposed live parts from other parts of electrical equipment
- Determining nominal voltage of exposed live parts
- Clearance distances and corresponding voltages

This course alone does not qualify you!

PROCEDURE FOR WORKING ON AC ENERGIZED CIRCUITS

- Outline specific safe work procedures
- Specify the approved tools and PPE required for the job
  - Electrically insulated tools
  - Electrically insulated rubber gloves
  - Non-conductive safety glasses
  - Non-conductive hard hat
  - Protective sheeting
  - Rubber matting
- Two qualified people must be present
- Be accurate and up-to-date

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RULES WHEN WORKING ON ENERGIZED CIRCUITS

At or below 50V, working alone

- Wear required PPE
- Follow work practices listed in Electrical Safety Procedure - Section.

Above 50V

- SHALL NEVER WORK ALONE! (Except for exempted low-risk DC power maintenance work approved by the Alcatel-Lucent Environment, Health & Safety Organization)
- Both employees must be additionally trained in PPE, electrical tools and insulating material.
- One other employee on site must be trained in First Aid/CPR.

FIRST AID / CPR AND WORKING ALONE

- On each job site, there must be at least one installer or maintenance technician who has a valid “Standard First Aid" certificate
- In addition, employees working on or near any exposed equipment or circuit parts that are or may be energized at 50 volts or greater shall never work alone and the other person must also have a valid “Standard First Aid certificate”

Exception: Exempted low-risk DC power maintenance work approved by the Alcatel-Lucent Environment, Health & Safety Organization

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WORKING IN CUSTOMER EQUIPMENT ROOMS

VOLTAGES – FROM MAINS TO THE CUSTOMER EQUIPMENT ROOM

- General Information and guidance on working adjacent to voltage systems.
- The next 4 slides has a schematic of voltages broken down by voltages
  - All Voltage Systems combined demonstrating voltages coming from the power lines down to the equipment room.
  - And then broken down by Zone....
  - High Voltage Systems (Red Zone in Schematic)
  - Low Voltage Systems (Orange Zone in Schematic)
  - Extra Low Voltage Systems (Green Zone in Schematic)

High voltage transmission allows efficient transport of electrical energy from the generation station

Transformer reduces high transmission voltages to "mains" voltages typically 220vac or 110Vac

IEC defined High Voltage > 1000v AC. >1500DC

High Voltage AC Transmission
Fatal currents can arc though the air leading to burns and death.

s/w

Diesel generator

Customer Equipment Room

Low voltage AC distribution board

Air Con

Lights

Sockets for test equipment, laptops , soldering irons etc

IEC Defined Low Voltage 50V to 1000V AC, 120Vto 1500V DC.

Low Voltage AC distribution.
Note Low Voltage does not mean low risk. Highest number of electrical fatalities occur at low or "mains" voltages.
Low AC voltages are those we have typically in our **homes:** 220vac or 110Vac. **Risk of Shock, fibrillation, death.**

AC to DC convertor

Customer equipment

Customer equipment

Customer equipment

Battery

AC to DC convertor changes the low voltage alternating current to a lower risk extra low voltage DC current.
Note low risk does not mean no risk.

IEC defined Extra Low Voltage <50V AC, < 150V DC

High voltage transmission allows efficient

transport of electrical energy from the

generation station

Transformer reduces high transmission

voltages to “mains” voltages typically 220vac or 110Vac

HIGH VOLTAGE SYSTEMS

- IEC defined High Voltage > 1000V AC or > 1500V DC
- **Alcatel-Lucent does not work on High Voltage Distribution Networks.** Only Utility Companies and Specialized Electricians are allowed to perform work in this set up.
- Fatal currents can arc through the air leading to burns and death.

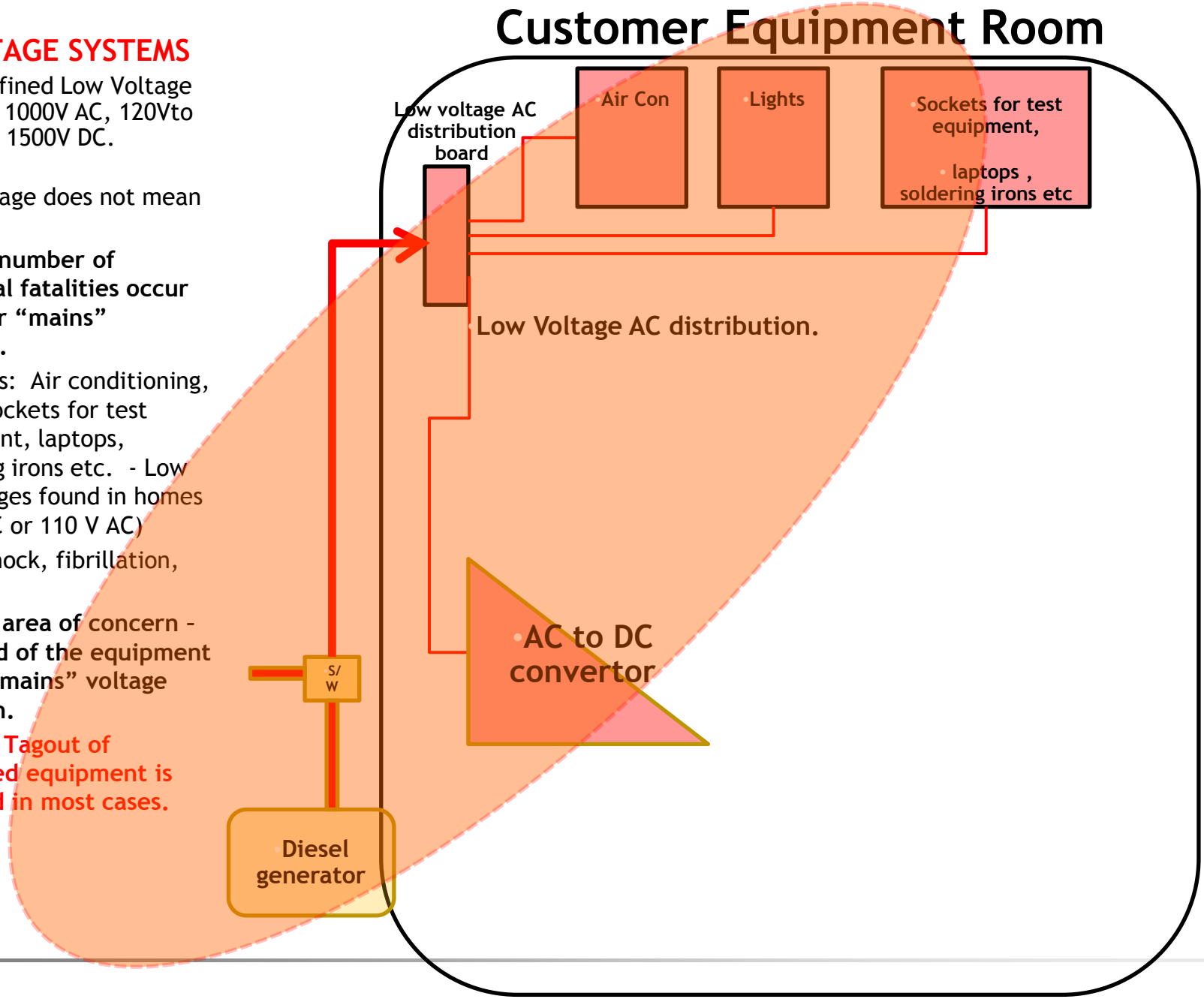
ADJACENT TO HIGH VOLTAGE SYSTEMS

- **We can work adjacent to High Voltage Systems.** For example, we can have a radio or antenna on a High Voltage Pylon. In this case however, our technicians are trained by the utility company on the risks associated with high voltage, and in particular **maintain safe working distance from the High Voltage conductors.**
- **Discuss any Lockout Tagout procedures with the Utility Company and follow their direction.**
- ALU High and Low Risk Approved Subcontractors (approved for electrical work) may work adjacent to such systems, so long as they inform the Utility company and meet the Utility company’s requirements (training, certification etc).
- ALU Employees and Subcontractors working in these areas should conduct a detailed Risk Assessment and all employees working in these situations shall be made aware of the risks associated with working in these conditions.

LOW VOLTAGE SYSTEMS

IEC Defined Low Voltage 50V to 1000V AC, 120Vto 1500V DC.

- Low voltage does not mean low risk.
- **Highest number of electrical fatalities occur at low or "mains" voltages.**
- Examples: Air conditioning, lights, sockets for test equipment, laptops, soldering irons etc. - Low AC voltages found in homes (220V AC or 110 V AC)
- Risk – shock, fibrillation, death.
- **General area of concern – back end of the equipment where "mains" voltage comes in.**
- **Lockout Tagout of energized equipment is required in most cases.**

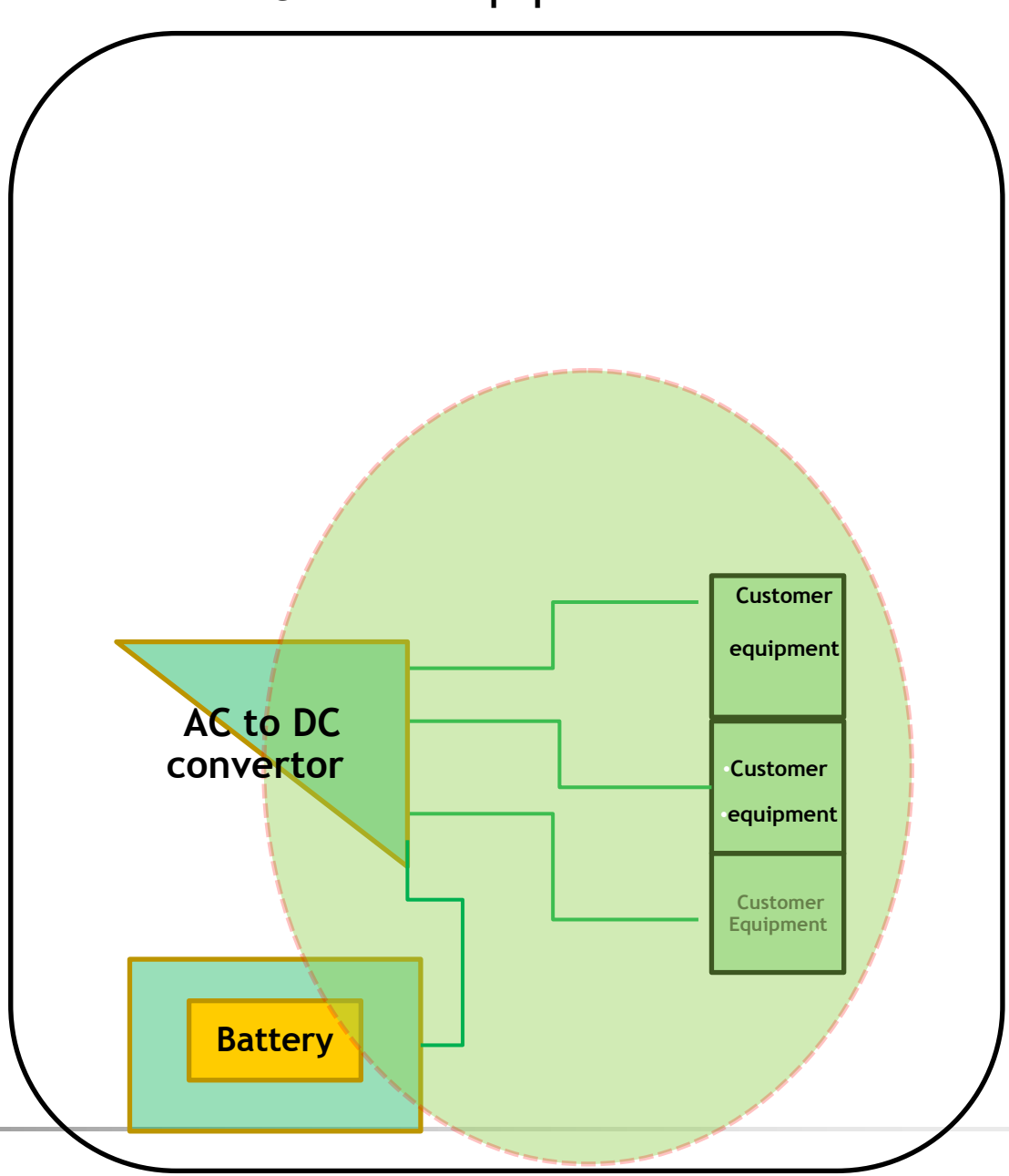


EXTRA LOW VOLTAGE SYSTEMS

IEC Defined Extra Low Voltage as < 50V AC and < 150V DC.

- AC to DC convertor changes the **low voltage alternating current to a lower risk extra low voltage DC current.**
- Low risk does not mean no risk.
- **Only telecommunications engineers and technicians trained to work on extra low voltage equipment and competent on the equipment concerned may do so.**
- **Examples: Changing circuit pack, boards at the front end etc.**

In the event that work is required on the extra low voltage distribution circuits a risk assessment should be undertaken and appropriate controls put in place to mitigate the risk of arc flash , burns or fire.



ELECTRICAL STANDARDS – WHO CAN DO WHAT

The International Electrotechnical Committee (IEC) established Electrical standards which are applied by the individual country Electrotechnical councils.

Standard IEC 60038: 2002, 2009, establishes the classifications for voltages used for generation, distribution and utilization systems.

IEC voltage range	AC	DC	defining risk	SUBCONTRACTOR PERMITTED
High voltage (supply system)	> 1000 V_{rms}	> 1500 V	electrical arcing	ONLY ADJACENT TO THE SYSTEM WITH APPROPRIATE TRAINING
Low voltage (supply system)	50–1000 V_{rms}	120–1500 V	electrical shock	HIGH RISK SUBCONTRACTORS ONLY
Extra-low voltage (supply system)	< 50 V_{rms}	< 120 V	low risk	HIGH OR LOW RISK SUBCONTRACTORS

ELECTRICAL SAFETY - FAQs

1. **Can I work on the low voltage (220V/110V) electrical distribution circuits in equipment rooms?**

Only if you are competent and qualified to do so . In most countries because of the high risk to persons working on electrical distribution systems and the risk to life of if those distribution networks are not installed correctly only qualified electricians are allowed to undertake such work. Alcatel-Lucent will only use competent electricians to work on the low voltage ac distribution networks of our customers. Any service supplier or contractor must be approved by PDC before they are permitted to do such work which includes proving that their staff consist of competent and qualified electricians.

2. **Can I work on equipment connected to the DC side of the AC/DC convertor?**

If you have been trained to work on the equipment yes. You do not have to be a qualified electrician to work on the DC circuits.

3. **Why can I work on the DC circuits but not the low voltage AC circuits , it's all electricity right?.**

No, alternating current is particularly suited to power distribution networks as the voltages can be easily changed to aid the efficient transmission over the great distances from generation stations to where we use the energy to power devices. However at local distribution levels such as the voltages found in our homes, AC voltages can kill at very low currents. Low AC voltages and the resultant currents that can pass through a person can cause the heart to stop and can be affected by how healthy the person is, the condition of the skin, sweat, and where on the body contact is made. The typical DC direct current extra low voltages of 48V (actually because we often have battery back up the DC voltages are around 53 V) has a lower risk that low voltage AC but do not be fooled as whereas the risk is low there is still risk. Extra low DC voltages can still produce arcs in short circuit conditions which can damage our sight , DC short circuits can also result in serious burns.

ELECTRICAL SAFETY - FAQs

4. Can I remove a circuit pack from a DC powered equipment rack?.

From the electrical perspective the risk of electrical shock or arcing is low but the rack may have to be powered down before doing so . It is essential that you follow the instructions for such intervention from the equipment manual . If not sure ask your supervisor.

5. **My laptop has a power supply unit that needs a low voltage AC supply . Do I need an electrician to plug the laptop's PSU into the mains outlet socket?.**

No, Anyone can plug a laptop PSU, a piece of test equipment, or other electrical apparatus into a power outlet once it is intended to be powered from the mains and an appropriate plug top in good condition is used. Common sense should prevail as most people are quite used to safely connecting and disconnecting electrical devices in our homes from mains sockets.

LOCKOUT TAGOUT- FAQs

1. Where are the ”lock out” tools available?

Lockout tagout is a fundamental control that accords with the highest level of the hierarchy of controls “Elimination”. The tools typically used in electrical lockout situations are freely available from suppliers of electrical apparatus or from specialist safety equipment vendors. The apparatus selected must be compatible with the characteristics of the electrical installation. Similarly lock out tag out tools or equipment for energy control such as mechanical energy, pressure systems, are available from suppliers of equipment and installation materials or from specialist safety equipment suppliers. A competent tradesperson trained in safe systems of work can help in the selection of the appropriate LOTO tools. Safe systems of work training including the control of energy release is a fundamental element of any trade training. A competent trades person is expected to be familiar with LOTO tool, procedures and methodology.

ALU field organizations should provide these tools, in the same way that they provide the other tools our employees need to do their jobs. Remember, Lockout/Tagout is already ALU policy, this is not new – therefore theoretically our workforce should already be equipped. But now, we are providing a re-emphasis and hopefully more clear training.

LOCKOUT TAGOUT- FAQs

2. Is this communicated to all our customers? And do they agree to implement this in their network?

No, we have not issued any special communication to our customers on this. We believe there is universal agreement: Lockout/tagout is a globally-accepted, minimum standard safety practice. I am not aware of any customer who would object, as they most likely all have the same policies themselves. If, however, you think there might be a customer concern, definitely raise it to your management, who will in turn get with EHS organization.

3. How does this affect our normal installation of equipment, when we will install a circuit pack or board while the frame is still operating?

This will not affect you if installing or removing additional boards or circuit packs in a frame that is designed to accept hot change outs or additional boards whilst still powered up. The equipment manual will have that information. If the equipment manual requires that the rack, shelf, etc must be powered down for change outs then that requirement must be followed.

In the event that work is required on the extra low voltage distribution circuits (48v DC) to accommodate new racks, shelves etc. a risk assessment should be undertaken and appropriate controls put in place to mitigate the risk of arc flash , burns or fire. A risk assessment looks at the factors other than the equipment, such as capacity of DC PSU, cable cross sectional areas , switching and breaker arrangements, cable runs etc.

INJURIES

TYPES OF INJURIES

- **Electric Shock**
- **Burns**
  - Electrical burns. Caused by current flowing through tissue or bone.
  - Thermal contact burns. Caused by touching an item made hot by the current flow through it.
  - **Arc burns**
    - Caused by the high intensity heat and flash of an electric arc.
    - Arcs can reach 35,000 degrees F (19,427 °C)
    - This may affect the eyes
- **Indirect Injuries**
  - Caused by falling as a result of shock. (bruises, strain/sprains etc.)

Shocked by tool

INDIRECT INJURIES

- **Falls, collisions, fractures, or death**
  - involuntary reaction to shock
- **Contact with fragmented metal**
  - high energy arcs can cause metal to fly in all directions
- **Severe eye damage**
  - high intensity light generated from arc
- **Explosion**
  - can result with a low energy arc (spark) in atmospheres with flammable gases, vapors, or combustible dust

SUBCONTRACTOR REQUIREMENTS FOR ELECTRICAL WORK

PM Role

- Overall, ensure all safety rules are being followed on the project.
- Ensure Subcontractor has knowledge and training of Electrical Safety Procedures
- ALU Electrical Safety Risk Assessment Form can be shared with the subcontractor
- Periodically review the Subcontractor's Procedures when onsite

Subcontractor Role

- Conduct a Risk Assessment to identify hazards and energy sources.
- Adherence to LOTO procedures required each time energy source is identified as part of the work to be performed and the employee is going to be exposed to it.
- Document LOTO procedure and make available to ALU upon request.
- Use ALU LOTO procedure Form if none available.

SUMMARY

- Be trained and qualified.
- Be aware of hazards.
- De-energize prior to work if possible and utilize LOTO procedures.
- Employees working on or near any exposed equipment or circuit parts that are or may be energized at 50 volts or greater shall never work alone and the other person must also have a valid "Standard First Aid certificate" (**Exception**: Exempted low-risk DC power maintenance work approved by the Alcatel-Lucent Environment, Health and Safety Organization).
- If work must be performed on AC energized circuits
  - Conduct a Risk Assessment
  - Receive appropriate approval

SUMMARY

- Verify presence or absence of electrical power before beginning work (Voltage first)!
- Utilize approved insulated tools.
- Maintain tools in good conditions.
- Maintain proper clearances when working around energized circuits.
- Remove all metallic jewelry.
- Utilize PPE and protective sheeting/matting.
- Follow all safety work practices.
- Maintain good housekeeping.

Questions or Comments?

Contact:

- Your local EHS Coordinator for Personal Protective Equipment specifics and a demonstration on use.

Regional EHS Leaders

APAC - Ong Wee Liang

CALA - Martha Montes

EMEA - Robert Nolan

NAR - Rich Quick