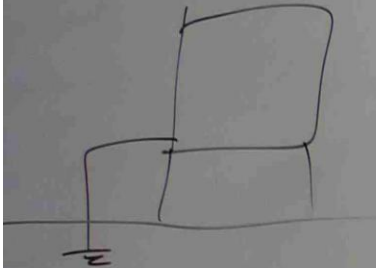


## LOW VOLTAGE SAFETY ( RISK IN LOW VOLTAGE SYSTEM )



### THE VOLTAGE HAZARDS DUE TO SYSTEM GROUNDING

- STEP VOLTAGE
- TOUCH VOLTAGE
- MESH VOLTAGE
- TRANSFER VOLTAGE

### HAZARDS FROM ELECTRONIC CIRCUITS

- FREQUENCIES
- CAPACITIVE DISCHARGE

DC & AC CURRENT UP TO 100 Hz AFFECT THE BODY.

FREQUENCIES BETWEEN 10 TO 100 kHz CAN INCREASES  
THE CURRENT FROM 10 TO 100 mA.

CURRENT CAUSED BY DISCHARGE, IF  $1 \mu\text{F}$  CAPACITOR, MAY  
CAUSE VENTRICULAR FIBRILLATION. 10KV

### SAFETY HAZARDS OF STATIONARY BATTERIES

ELECTRICAL, CHEMICAL, EXPLOSION

BREAK DOWN OF ELECTRICAL INSULATION  $\longrightarrow$  ENERGIZING CONDUCTOR.

BATTERIES  $\longrightarrow$  SUFFICIENT STORED ENERGY  $\longrightarrow$  SHOCK & ARCING HAZARDS

HIGH CURRENT OF BATTERY  $\longrightarrow$  EXTREME DANGEROUS HEAT

ELECTROLYTE OF BATTERY  $\longrightarrow$  DAMAGE HUMAN'S TISSUES

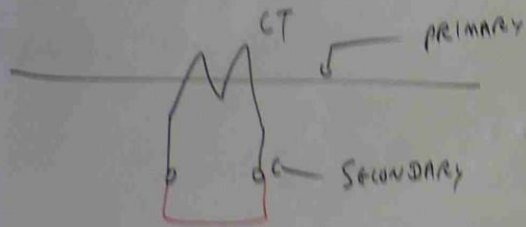
SULPHURIC ACID / POTASSIUM HYDROXIDE  $\longrightarrow$  SERIOUS BURN  
DESTROY EYE TISSUE

EXCESSIVE CHARGING / DISCHARGING  $\longrightarrow$  HEAT  $\longrightarrow$  EXPLOSION

IF BATTERIES DISCHARGE TOO QUICKLY, NOT ALL HYDROGEN FIND SULPHATE TO COMBINE. CONCENTRATION OF MORE THAN 4  $\rightarrow$  5% OF HYDROGEN IN AIR CAUSES EXPLOSION.

UN-MAINTAINED PROTECTIVE DEVICES  $\longrightarrow$  FAIL TO INTERRUPT OVER CURRENT  $\longrightarrow$  ELECTRIC ARC BLAST.

## MEDIUM & HV RISK



$$X_L = X_C$$

$$\frac{1}{2\pi fL} = \frac{1}{2\pi fC}$$

## THE RISKS & DANGERS IN POWER STATION

- OPEN CIRCUITED SECONDARY SIDE OF CT CAUSING EXTREMELY HIGH VOLTAGE
- SYSTEM GROUNDING CONDUCTOR AND ELECTRODE
- TRANSIENT OVER VOLTAGE / SPARK CAUSED BY ELECTRICAL SWITCHING DEVICES
- RESONANT IN ELECTRIC CIRCUITS CAUSING INSULATION FAILURES.

## RECOMMENDED SAFETY EQUIPMENTS & PROCEDURES IN POWER STATION

- A WORK PARTNER (NEVER WORK ALONE)
- UNDERSTANDING OF SAFETY PRACTICES, EQUIPMENT AND EMERGENCY PROCEDURES
- SAFETY CHECK LIST
- SAFETY HELMET
- EYE PROTECTION
- DRY LEATHER GLOVES AND RUBBER GLOVES
- SAFETY BELT (IF WORKING ON ROOF AND ELEVATED SITES)
- MEASURING AND TESTING EQUIPMENTS

## SAFETY PROCEDURES

— UNQUALIFIED WORKERS NOT ALLOWED TO CROSS LIMITED APPROACH BOUNDARY

ALLOWED IF THE FOLLOWING REQUIREMENTS ARE MET.

\* MUST HAVE SPECIFIC TRAINING TO WORK ON ENERGIZED CONDUCTORS

\* RISK ANALYSIS MUST BE PERFORMED

\* PLAN THE WORK PROCEDURE AND APPROVED BY SUPERVISOR

\* PERSONAL PROTECTION EQUIPMENTS (PPE) FOR HAZARDS OF EXPOSED ENERGIZED CONDUCTORS

— LOCK OUT AND TAG-OUTS IS APPLIED TO VOLTAGES OF ALL LEVELS

— PROTECTIVE DEVICES SHOULD NEVER BE RE-CLOSED AFTER IT HAS OPERATED UNTIL IT IS DETERMINED THAT IT IS SAFE TO DO SO.

## MAIN TENANCE WORK IN SUB STATION

- ① PRE WORK DISCUSSION
- ② HAZARD CHECK LIST
- ③ CONTROL HAZARDS
- ④ CONTINUALLY MONITOR
- ⑤ PERSONAL PROTECTION EQUIPMENTS.

