

**Session -1**

**• Introduction & Fundamentals  
of Electrical Safety.**

**• High or Extra High Voltage  
Installations.**

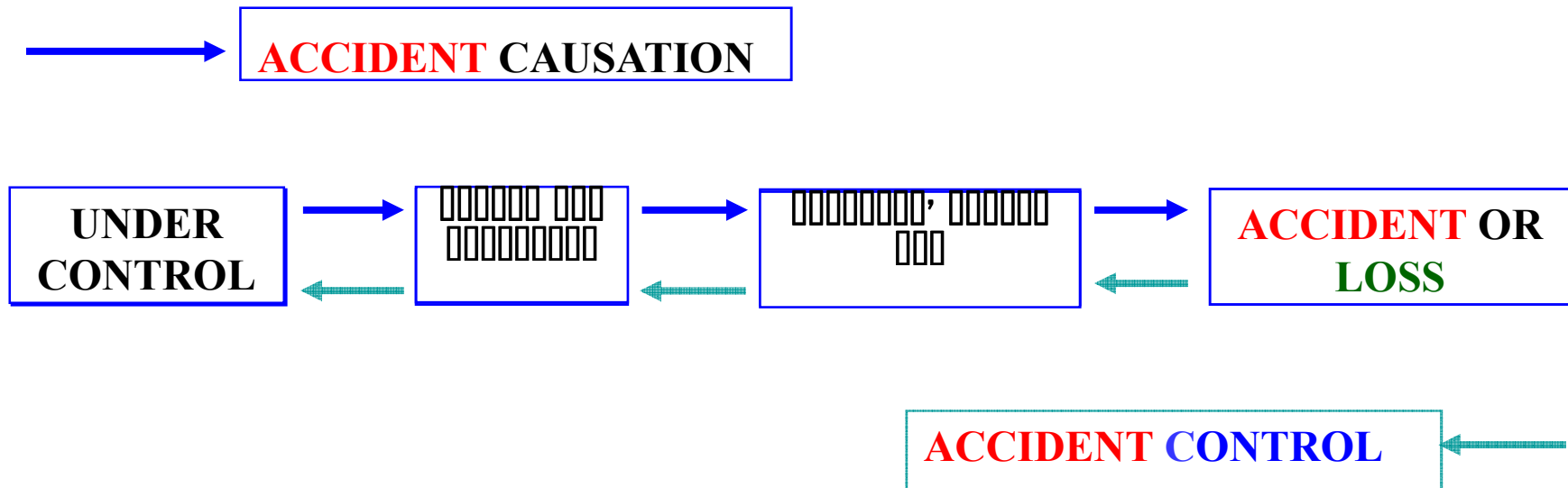
**By**

**Mr Swapan Mukherjee**



**SAFETY IS ABOUT MANAGING RISKS.**

**SAFETY IS ABOUT CONTROLLING ACCIDENT.**



**Let us consider an example –  
How a Technician working on  
ladder became victim of an  
accident.**

**At some point of time, he was  
standing with both his feet on  
one rung of the ladder, when the  
rung broke Down.**

**The technician sustained serious  
head injury.**



The question before us is – Why did this happen?

**UNSAFE WORK CONDITION ?-** FAILURE OF EQUIPMENT OR FAILURE IN SAFETY PROCEDURES.

QUESTIONS RELATED TO EQUIPMENT-

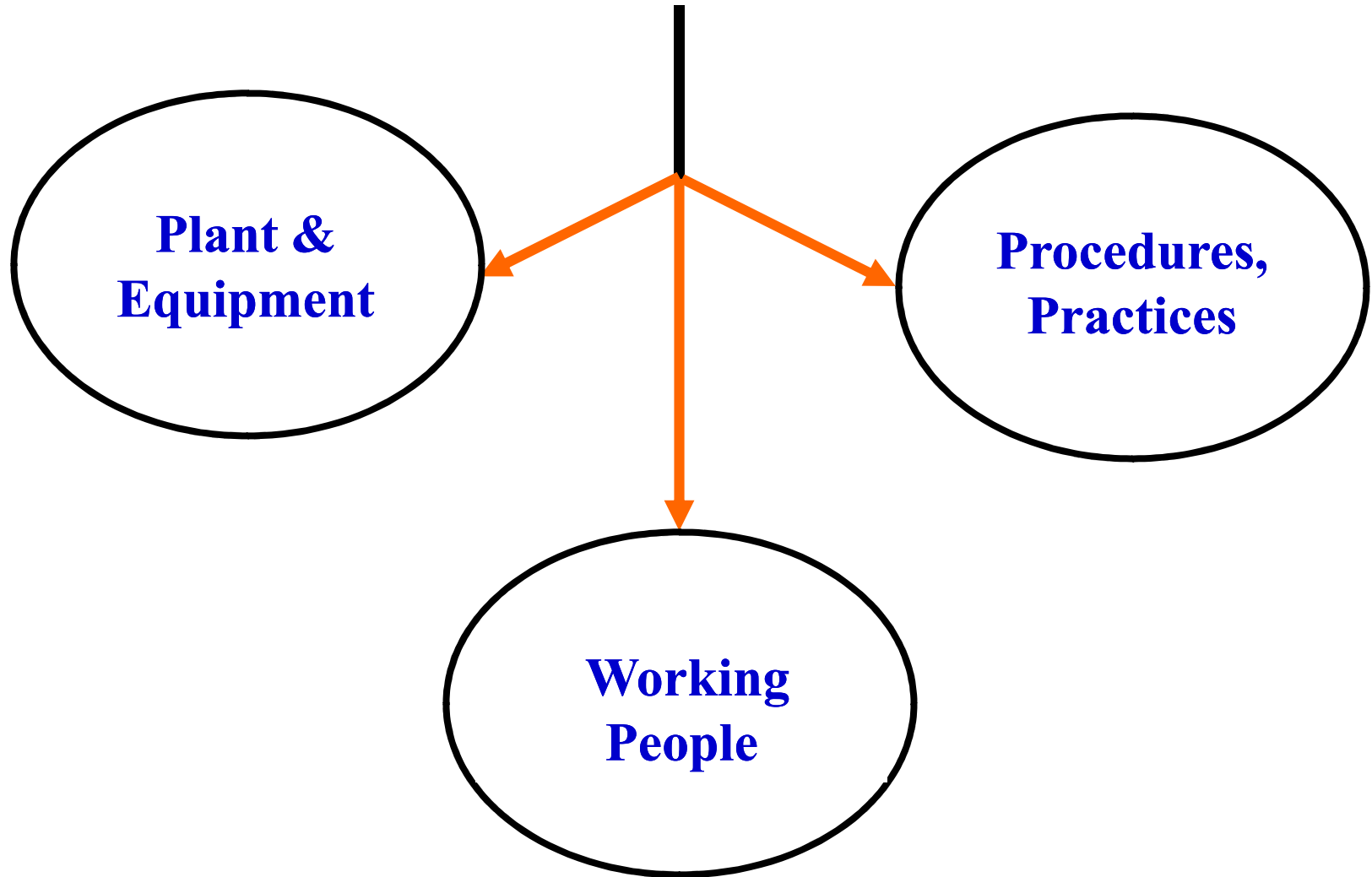
- **Design** of the equipment?
- **Purchase** policy? The cheapest?
- **Inspection** during delivery?
- How **stored**?
- How **maintained**?

## Questions related to safety procedure

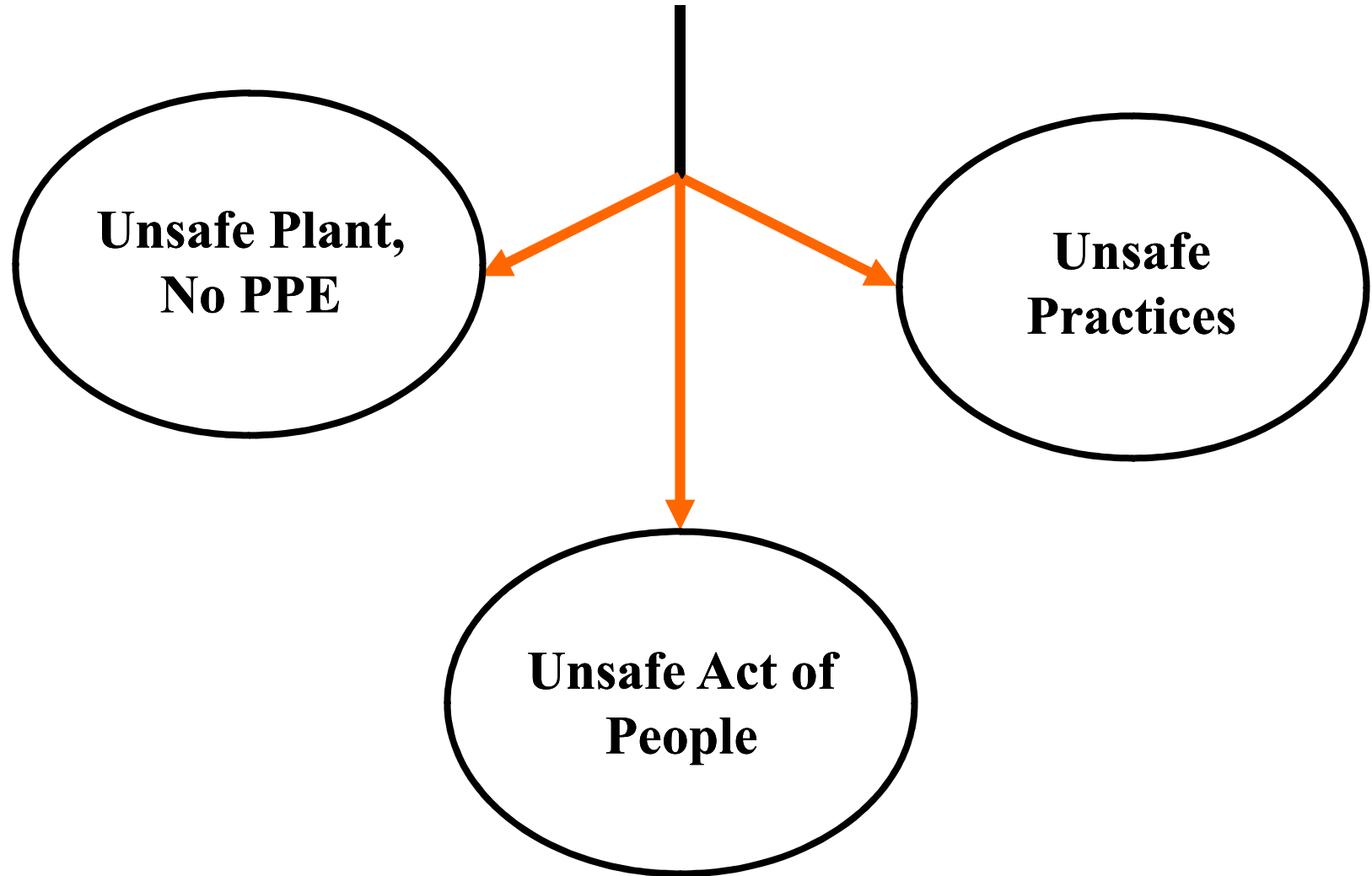
- Any safety norms for using ladders and working at heights?
- Are people trained in those safety norms?
- Are people supervised when performing risky tasks?



# 3 PILLARS OF SAFETY

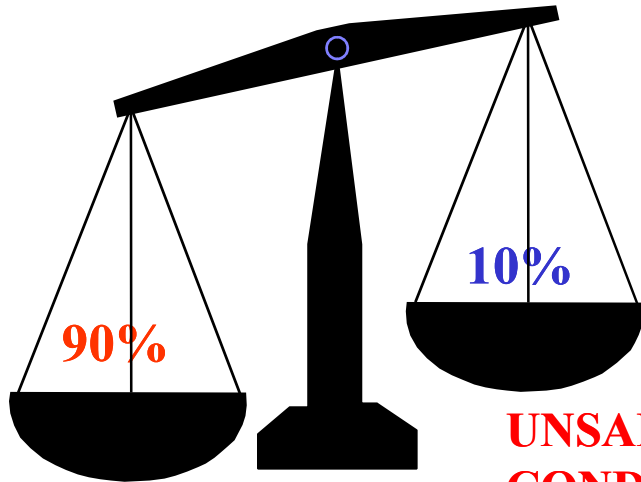


# CAUSES OF ACCIDENT



# CAUSE OF ACCIDENT

Experts' Saying (NSC REPORT)



UNSAFE ACT

UNSAFE WORK  
CONDITION



**ACCIDENTS DO NOT SIMPLY HAPPEN –  
THOSE ARE CAUSED AND CAN BE PREVENTED.**



## CAUSES OF FAILURE

**Absence of Job standards - Installation, Commissioning.**

**Inadequate / Improper Maintenance**

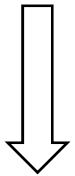
**PLANT**

**Improper design / manufacturing defect.**

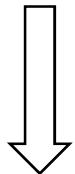


## CAUSES OF FAILURE

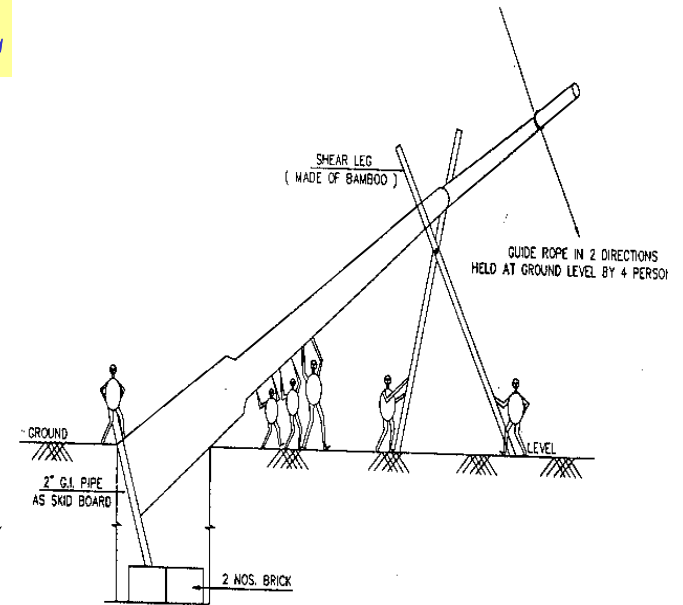
**Absence of  
Safe work  
Instructions**



**Traditional  
Unsafe Job  
Procedure**

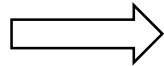


**Unsafe Job  
Management  
System**



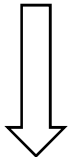
## CAUSES OF FAILURE

**Gradual deterioration of requisite skills**

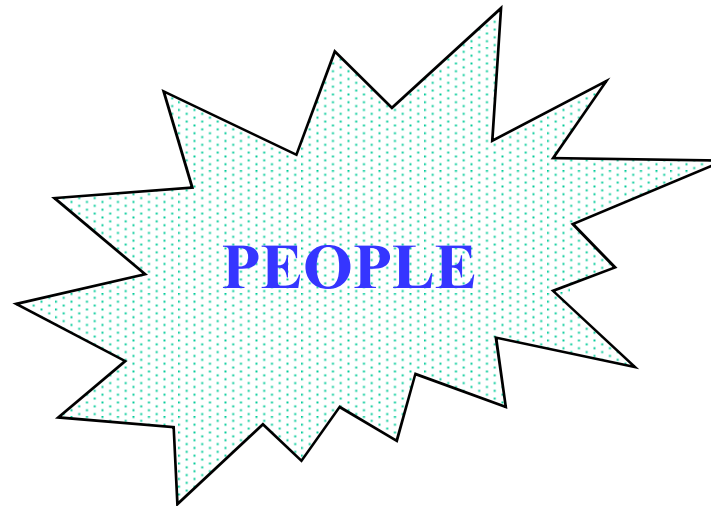


**Dilution of safety habits**

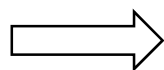
**Inadequate Training**



**Lack of knowledge**

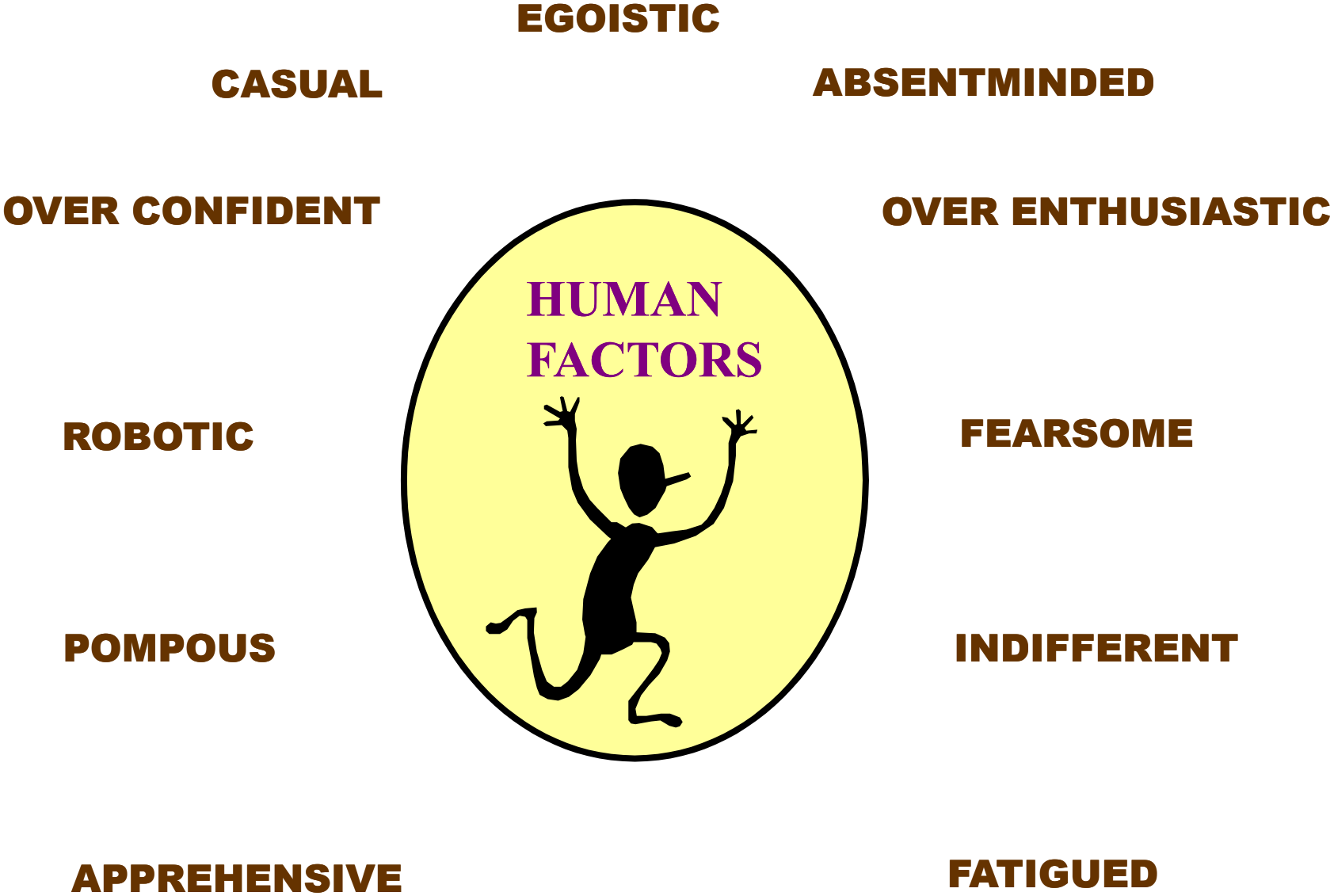


**Improper experience**



**Lack of understanding**

# Psychological Traits That Characterize Working People



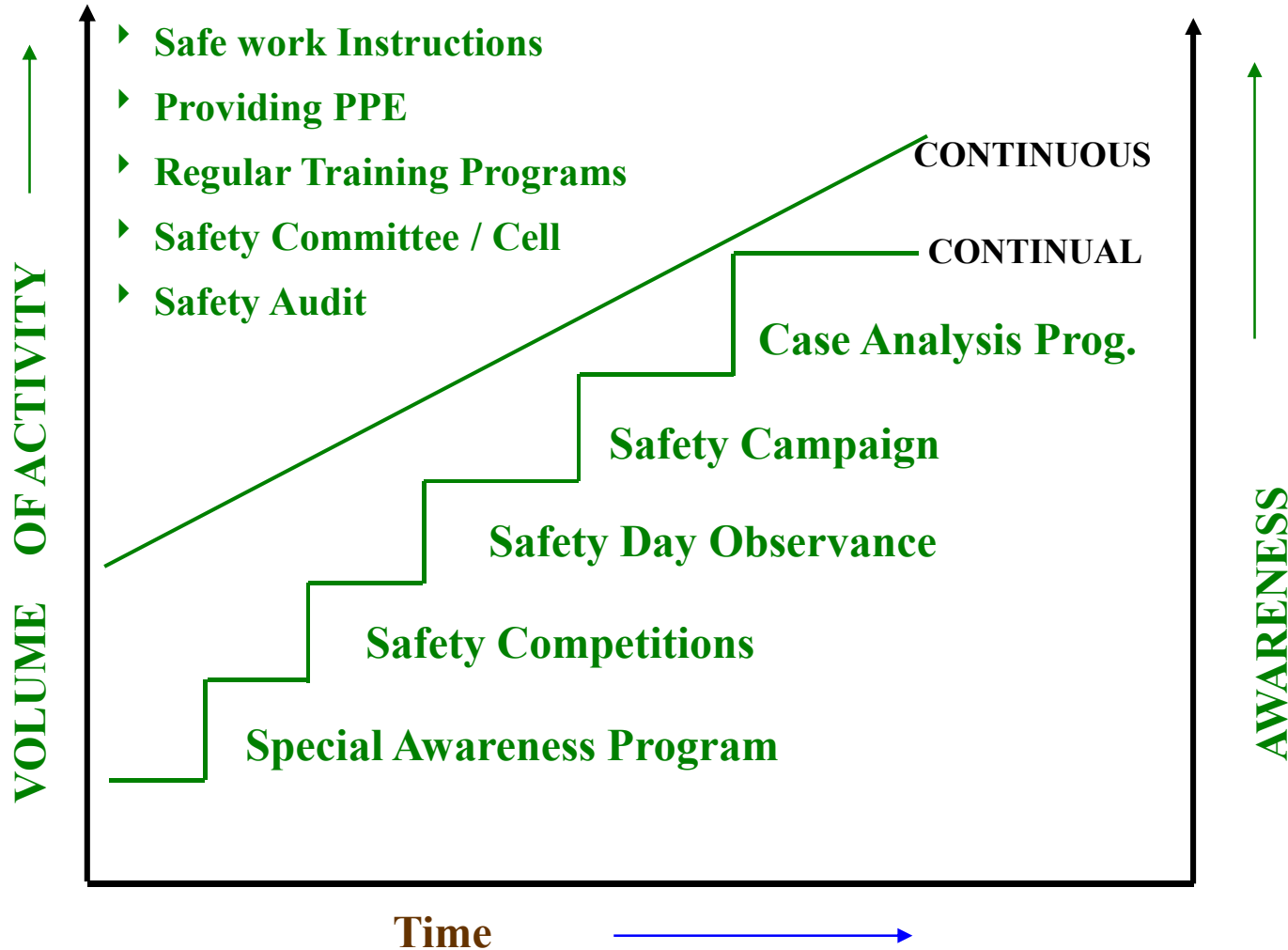
# ACCIDENT CONTROL PROCESSES

## CONTINUOUS

Continuing Uninterrupted  
LINEAR

## CONTINUAL

Frequently Recurring  
STEP BY STEP



# HV / EHV INSTALLATIONS

By HV / EHV installations we mean-

**DISTRIBUTION TRANSFORMER,**

**OH / UG NETWORK,**

**HV SWITCH / ISOLATOR,**

**OUTDOOR SW. YARD,**

**POWER TRANSFORMER,**

**HV MOTORS, HV CAPACITORS etc.**

**In Public places (Road side)**

**May endanger Public & Operator safety.**

**In Protected places (Sub-Stn.)**

**May endanger Operator safety.**

**(Chapter VI- Safety Provisions, CEA Regulations. 43-50)**

# **HV / EHV INSTALLATIONS**

For **Public safety-**

Considerations will be on - **EQUIPMENT DESIGN,**  
**COMMISSIONING STANDARD &**  
**PREVENTIVE MAINTENANCE.**

For **Operator safety-** besides above,

Considerations will be on - **USE OF PPE.**  
**AUTHORIZED / DESIGNATE**  
**TRAINING & SKILL TEST**  
**WORK INSTRUCTIONS.**

## **DISTRIBUTION TRANSFORMER –**

- **Quite often installed in densely populated public place when it demands full proof protection through Breakers or HRC fuses (Reg. 35-3).**
- **Always it would be better to use DRY type transformers (Reg.44).**
- **Metallic fence need to be earthed separately besides earthing of Transformer body (Reg. 49).**

## **HV SWITCH / ISOLATOR-**

- **In recent times are also being installed on road sides in conjunction with DTR.**
- **Mostly oil less (SF<sub>6</sub> gas filled) switches are used, subjected to less fire hazards.**
- **Operators need to be adequately knowledgeable for local operation.**
- **Use of PPE & Safety gazettes are must.**



### **HV / EHV OH LINES-**

- **In urban areas, OH lines not to be erected unless technically constrained.**
- **OH lines to be erected maintaining relevant standards (Reg. 58, 61, 72, 73, 69).**
- **Properly earthed guard wires to be maintained at all strategic locations and also to be provided with standard protection system (Reg. 73).**
- **Working personnel need to use PPE & Safety gazettes & must keep lines shorted & earthed by metallic chain while working.**

### **HV / EHV UG NETWORK –**

- **Safe as far as Public safety is concerned provided standard depth of laying is followed (Reg. 76).**
- **Digital Route map (Reg.11) to be maintained & to be made accessible by other utilities on demand.**
- **Use of properly demarcated cable protection tiles is a must.**
- **Coordination amongst all other utilities need to be maintained.**
- **Identification of an UG cable is a crucial task. Requires use of special cable detection tools by experienced hands.**

**OUTDOOR SW. YARD, POWER TRANSFORMER, HV MOTORS, HV CAPACITORS etc.**

- **Are installed in prohibited places and maintained under periodical or regular surveillance.**
- **Adequately trained personnel (Reg. 3) are usually deployed for operations.**
- **PLANT SAFETY – demands best Commissioning Standard (Reg.45), Preventive maintenance policy, State of the art Fire protection system and Electrical protection systems.**

**To set up specific Plant &  
Equipment maintenance schedule.**

**To follow safe work /  
operational procedure.**



**WHAT TO DO ?**

**To Maintain safe  
installation practices  
following Job standards.**

**To set up safety code of  
Practices/ Commandments.**

**To build up Safety awareness amongst all concerned**

**To arrange various safety competitions amongst field staff**

## **WHAT TO DO ?**

**To impart on the job training / on real life simulation**



**To carry out thread - bare analysis of reasons behind wrong Acts. (both Technical & Behavioral factors)**

# **Safety Code of Practices**

**In electrical jobs no conductor should be considered as dead unless it is visibly earthed since both live and dead conductors look alike.**

**A conductor may remain alive even when the controlling switch is selected to 'earthed' position. As such strict adherence to safety code of practices or measures is a must.**

**It has been experienced that certain measures which appear to be of little importance, need to be followed for ensuring safety.**

# **MINOR STEPS MAJOR RESULTS**

**Work on any electrical installation should be carried out in presence of minimum two operators, but one of them should take charge of the job.**

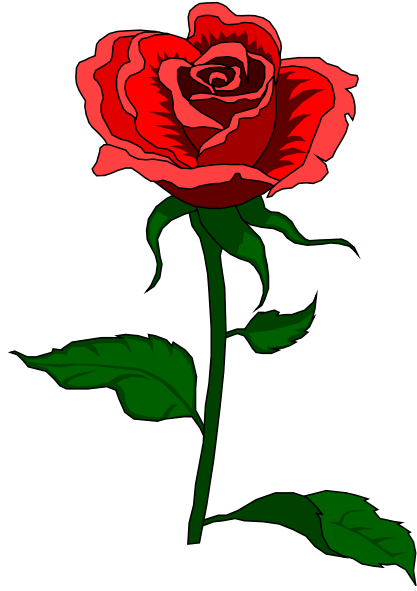
**Danger/caution notices need to be displayed in Positions where those catch the eye and be written in Hindi, English and other regional languages.**

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# **MINOR STEPS MAJOR RESULTS**

**If any new technique or machine is introduced, it is to be ensured that those are properly understood by the operating persons so that they take adequate protection against possible lapses arising out of old habits.**

**Those who are supervising the work of others have to be sure that people, specially the new recruits under their control, know exactly what to do in case of fire and other emergencies.**



**Thank You All**