INTRODUCTION

• There are many dangers and hazards which have to be taken into account when entering live substations and enclosures and many accidents can be avoided if the correct action is taken.
SUBSTATION

• Any building, room or fenced enclosure containing electrical apparatus used for control, distribution and supply of electrical energy.
MUST BE AWARE OF HAZARDS
LIVE ENCLOSURE

• Any room, chamber, yard or enclosed area in which it is possible for a person from ground floor level, to make inadvertent contact with, or infringe on, safety clearance to live conductors or apparatus.
SAFETY CLEARANCE
CLOSE PROXIMITY

• The minimum distance any part of a person’s body or work tool, may come close to any bare, unearthed Low Voltage (LV) conductor or unscreened, unearthed Medium or High Voltage (MV/HV) conductor.
UNSCREENED/UNEARTHED
LIVE ENCLOSURE

• Or an enclosed area fitted with an automatic fire suppression system.
LIVE CHAMBER

- Any chamber, enclosure or any situation in which inadvertent contact with conductors or live parts of electrical apparatus working at High Voltage is possible from ground floor level.
DANGER

LIVE CHAMBER
KEEP CLEAR
PROHIBITED AREA

• An enclosed area in which live conductors or live parts of electrical apparatus working at High Voltage are accessible, but situated in such a position that inadvertent contact is not possible from ground floor level.
DANGER
33 kV OVERHEAD EQUIPMENT LOW
DO NOT RAISE HANDS ABOVE SHOULDERS
RESTRICTED AREA

• An enclosed area that is neither a live chamber nor a prohibited area as defined,
• that is enclosed for the purpose of power system security and the safety of personnel.
In both live chambers and prohibited areas, live High Voltage conductors are present. But in a live chamber these live conductors can be touched from ground floor level, whilst in a prohibited area they cannot.
Before entering into a substation there are certain pre-requisites that should be carried out:

• Check and disable any fire suppression system.

• This is imperative as a person’s life can be endangered if the fire suppression system is triggered.
ISOLATE FIRE SUPPRESSION
• Check there is at least one fire extinguisher present, its condition and when it was last tested.
CHECK SUBSTATION SIGNS
CHECK YOU HAVE CORRECT PPE

RIGHT

WRONG
• Before allowing staff to enter the substation, check for any hazardous conditions, give safety talk, explaining dangers, hazards and emergency assembly point.
• After entry certain things must be checked before any work is carried out.
Sign substation Log Book and look for any abnormal conditions that could compromise your safety during the task.
• Call Control and inform them that you are at the substation and the reason that you are there.
• Conduct a Take 5 risk assessment and assess any dangerous and hazardous conditions, discuss with staff and obtain their signatures.
Hierarchy of Control

- Elimination.
- Replace (Method or Process).
- Redesign (Engineering).
- Separation (Isolation or Guard).
- Administration (Training Process).
- PPE.

- You will note that PPE is the last resort and NOT the first line of defence, as many people think.
# Examples of Dangers and Hazards

<table>
<thead>
<tr>
<th>MECHANICAL</th>
<th>MATERIALS</th>
<th>ELECTRICAL</th>
<th>HEALTH</th>
<th>ENVIRONMENT</th>
<th>OTHER</th>
</tr>
</thead>
<tbody>
<tr>
<td>Slipping</td>
<td>C02 Gas</td>
<td>Shock</td>
<td>Gas</td>
<td>Air Pollution</td>
<td>No Supervision</td>
</tr>
<tr>
<td>Tripping</td>
<td>Argonite</td>
<td>Burns</td>
<td>Dust</td>
<td>Water Pollution</td>
<td>Not Trained</td>
</tr>
<tr>
<td>Moving Machinery</td>
<td>Fire</td>
<td>Explosion</td>
<td>Noise</td>
<td>Ground Pollution</td>
<td>Remote Control Operation</td>
</tr>
<tr>
<td>Unsupported Loads</td>
<td>Solvents</td>
<td>Switching</td>
<td>Lighting</td>
<td>Noise Pollution</td>
<td>Not Complying With Rules</td>
</tr>
<tr>
<td>Tools</td>
<td>Asbestos</td>
<td>Lock Out</td>
<td>Ergonomic</td>
<td>Spillage</td>
<td>Complacency</td>
</tr>
<tr>
<td>Flying Objects</td>
<td>Acid</td>
<td>Isolating Wrong Circuit</td>
<td>Fumes</td>
<td>Waste Disposal</td>
<td>Safety Clearance</td>
</tr>
<tr>
<td>Hot Work</td>
<td>Hot Metal</td>
<td>Electrocution</td>
<td>Heat</td>
<td></td>
<td>Sharp Edges</td>
</tr>
</tbody>
</table>
MITIGATE HAZARD

• Mitigate any hazard identified e.g. barricade any live parts.
• Ensure that no unauthorised person can gain access to the area whilst work is being carried out.
• Check condition of all the circuit breakers against the drawings.
• Check for any alarms and discrepancies.
• Check first aid kit available.
• Check all equipment and operating tools are available before starting task.
• Check battery tripping unit (BTU).
• Perform load test.
TRIPPING - UNEVEN PLATES
ALL METALWORK EARTHED
WHICH ONE IS LIVE?
EFFECTIVELY LOCKED OUT?
LOCK OFF VT SHUTTER
Persons allowed to enter live substations and enclosures

• Competent Person.
• Authorised Person.
• Specifically Trained Person.
• Non/Pre-Competent Persons under direct supervision of a Competent Person.
Duties of the above persons

• Accept responsibility for all persons assisting him and for Non-Competent Persons personally supervised by him.
• At all times exercise proper control over these persons and issue explicit and proper instructions.
• Obtain confirmation that the instructions are understood.
Duties of the above persons

• Ensure that only necessary persons enter a live substation, yard or enclosure.
• Ensure that all persons under his control are warned of the danger of inadvertent contact with live conductors and apparatus.
• Be responsible, after entering, that no unauthorised person can get access.
Duties of the above persons

• On leaving the substation or enclosure be responsible for ensuring that the door or gate is locked and that the key is removed.

• When it is impracticable to provide adequate barriers, arrangements shall be made for a Competent Person to watch continuously the men at work to ensure that they incur no risk.
No switching whilst work is in progress in a live chamber or enclosure
USE REMOTE SWITCHING
USE REMOTE SWITCHING
Incident 1

• Two competent electricians were working in a live 11 kV substation containing Oil Circuit Breakers (OCBs) when a fault occurred.
• Both the circuit breaker feeding the fault and the Incoming circuit breaker failed to trip.
• The upstream protection was slow in operating and the circuit breaker feeding the fault exploded, killing both of the electricians in the substation.
Incident 1

• In the ensuing accident investigation it was found that the DC supply at the substation had failed.

• It is, therefore, recommended that when working in a substation the batteries and charger are checked and a load test carried out, if facilities exist.
Incident 2

• A fault developed in an outdoor Voltage Transformer (VT) in a live yard. The VT exploded, causing a fire and extensive damage to equipment. Shrapnel was hurled over 20 metres away embedding itself in a wall.

• The investigation revealed that the VT developed an internal fault and exploded.
Incident 3

• A fault occurred on a circuit breaker panel in a 33kV substation.
• The force of the explosion blew the breaker out of the panel over 10 metres away.
• Anyone working in the substation at the time would have been injured had they been near the breaker at the time.
After closing the door there was a flash and a loud explosion, followed by the door being blown open. The door struck one person in the head and another sustained minor burns to the neck.
Conclusion

• From the above, one can see that it is not only a legal requirement for all staff entering a substation to be trained (or under the direct and personal supervision of a Competent Person), it is necessary to prevent injury or even death, therefore, training is essential.
Conclusion

• So often at the workplace we hear ‘production before safety’, it should be SAFETY BEFORE PRODUCTION.

• No operation or urgency of service can ever justify endangering the life of anyone.
Conclusion

• Before doing any job, ask yourself these questions:
• Would I let my 16 year old son or daughter do this job?
• If not, why should I be doing it?
• Or expect anyone else to do it!
THERE IS NO SUBSTITUTE FOR SAFETY
THANK YOU

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