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Great Noligwa Mine Electrical Flash Accident

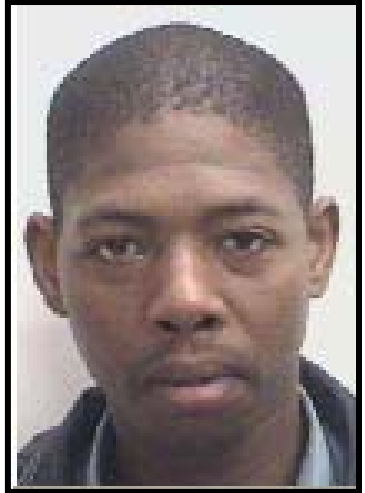


Content

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- **Mini Substation details**
- **Incident summary**
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The Injured

Date:	24th October 2004	
Time:	08H15	
Location:	68Level EE₂ 60A^{x/c}	
Now Injured:	Ferdinand Mothoane	
Age:	30 years old	
Profession:	Electrician (10 years service)	
Injuries:	1st and 2nd degree burns to the face, front lower neck, both hands and right thigh	
Equipment:	Mini Substation	
Refresher:	2nd June 2004 (93%)	



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Mini Substation Details

Equipment N°:	M258
Switchgear:	Lucy (OCB)
Last overhaul:	1995
Manufacturer:	Steelcor
Installation date:	1996
Last serviced:	08-09-2004
Load:	Two mini-substation in parallel
Status:	Temporary installation, was due to be removed

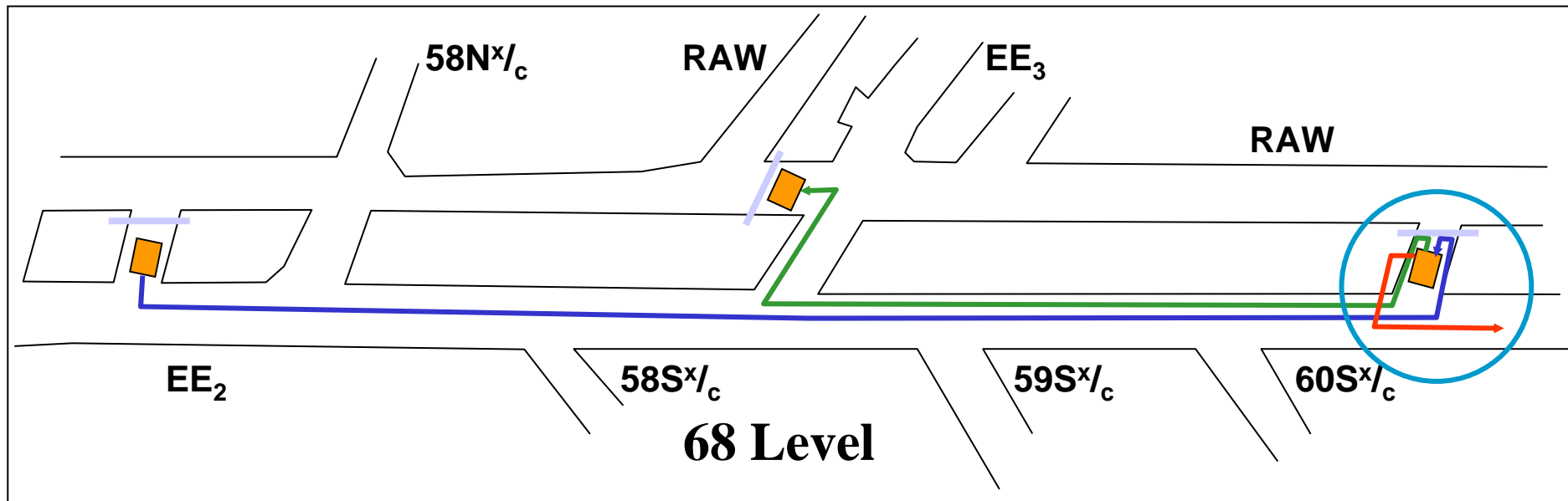


Incident Summary

To be able to disconnect the mini substation which was feeding the raise bore machine, the electrician had to switch off the out going power on the unit in question.

In the processes of switching off the out going power, a flash occurred in the switchgear.

The electrician sustained 1st and 2nd degree burns to his face, lower neck, hands, both forearms and right thigh.

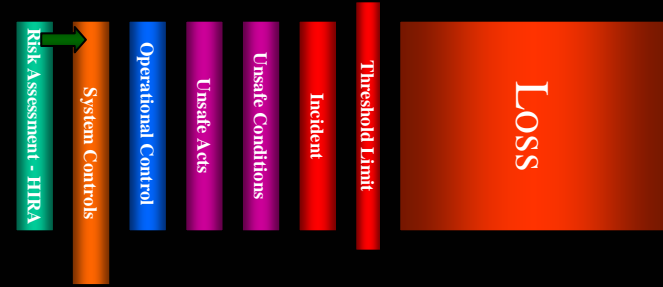




Risk Assessment

The baseline risk assessment and issue based risk assessments was done.

The resulting procedures dealt with both the 6.6kV shaft sub-station and the 550V mini-substations jointly.



System Control

High voltage substation Procedure	GNM/ES/001	10/2000
STP – Maintaining a mini substation	GNM/E/046	04/1999 07/2002

Extracts of points covered in the procedures of concern

6.2 PROTECTIVE CLOTHING

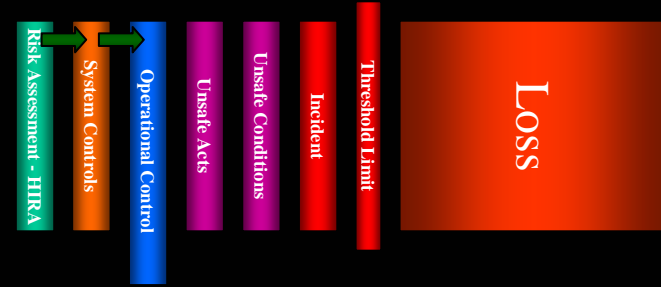
- (a) When any switching or testing of high voltage takes place, the person shall wear at least a **fully buttoned-up one or two-piece long sleeved cotton boiler suit** and/or an **approved flash suit, switching balaclava, safety glasses, racing gloves, face shield** which does not allow ultra violet rays to penetrate and leather or gum boots.

6.4 PREPARATION

- (a) Consult the latest revision drawing and verify the switching operations prior to disengaging any breakers.
- (b) Ensure that equipment feeding from the sub-station is stopped and that feeders, where possible are carrying **minimum load**.

6.5 EXAMINATION

- (j) Check the **oil level** of the oil filled transformers and examine the transformer for oil leaks. Check and test all protection devices on the transformer.



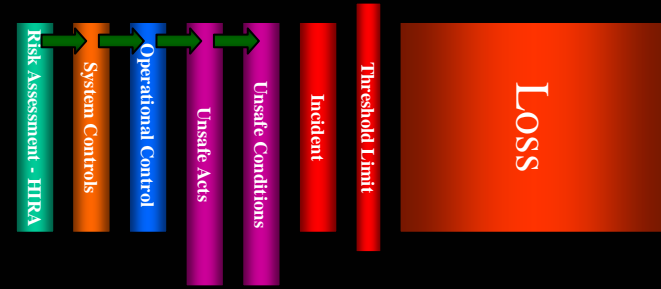
Operational Control

Personal Factors

- **The artisan did not deem it necessary to use the recommended PPE underground because of its cumbersome nature.**
- **Complacency with the set task.**

Job Factors

- **This was not the artisan's allocated section. This fact still did not exempt the artisan from his responsibility towards safety and set procedures.**
- **Artisan and Foreman did not complete the HT work permission form. (Control mechanism)**
- **Artisan and Foreman did not do a mini risk assessment concerning the work to be done, which could have identified the hazards.**
- **Artisan and Foreman did not review the work related procedure.**



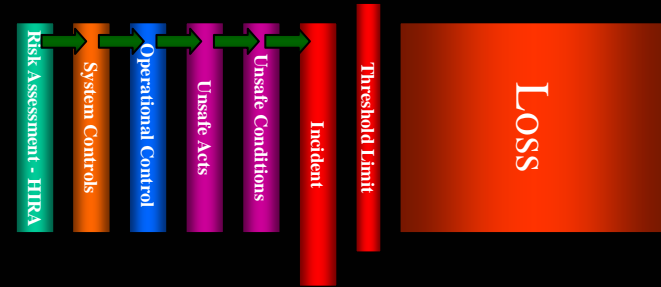
Unsafe Acts & Conditions

Unsafe Acts

- **Doing switching without donning the recommended PPE.**
- **Not making sure the mini-substation was not under load.**
- **Switching the mini-substation while still on load.**
- **The min-substations sides doors was closed.**

Unsafe Conditions

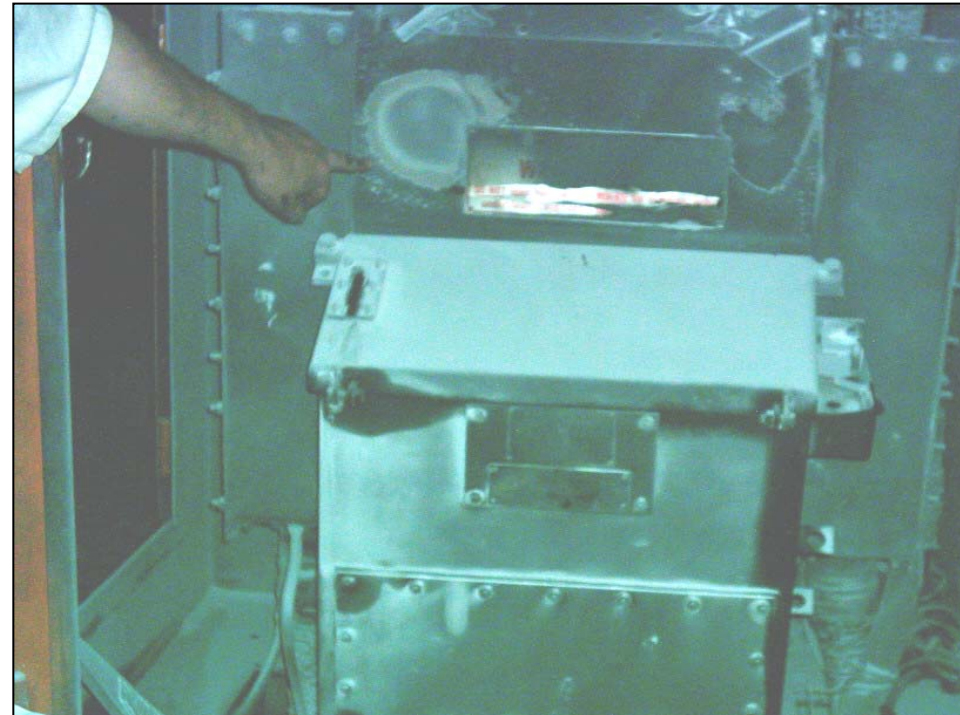
- **No visible indication of the oil level inside the mini-substations switchgear chamber.**



Incident

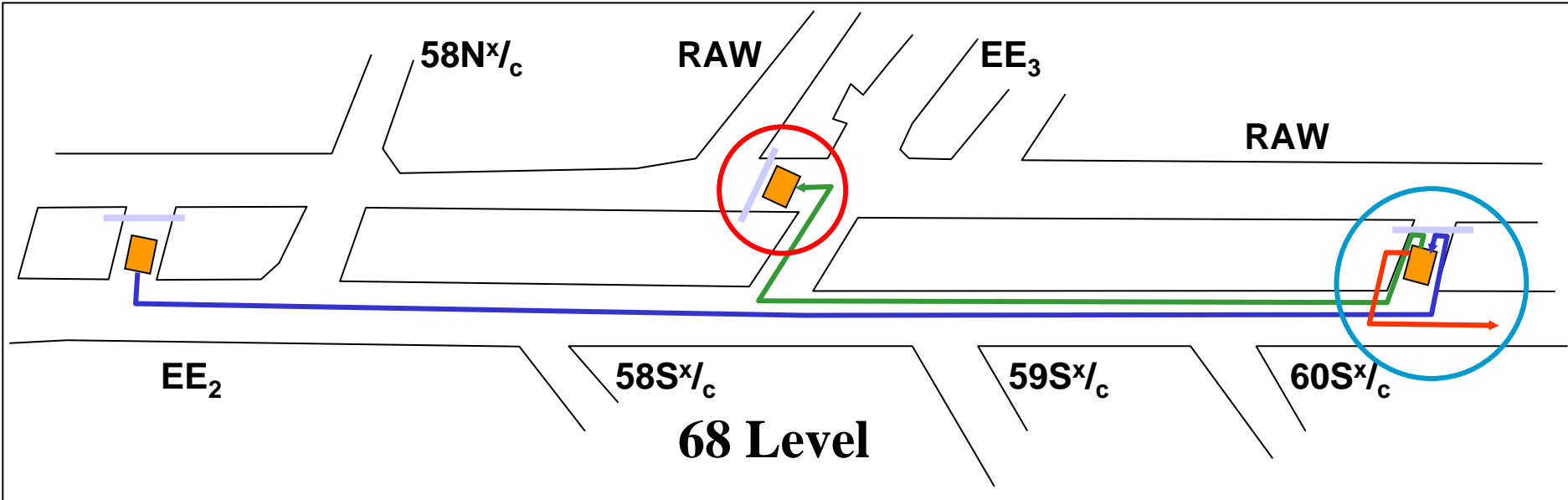
For the flash to take place the following conditions had to prevail:

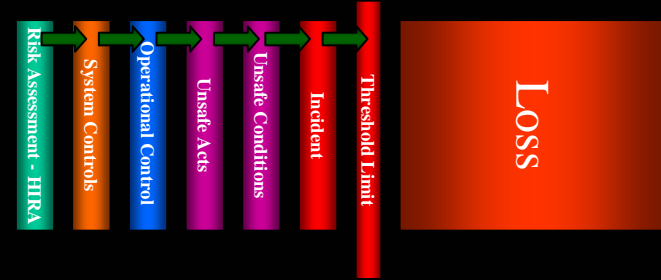
- **There was not enough oil in the switchgear to quench the arc.**
- **The switching was done while the mini-substation was still on load. The mini-substation feeding the raise bore machine had no load, but the mini-substation feeding the SV3 area was still under load, as it was not switched off.**





Incident





Threshold Limit

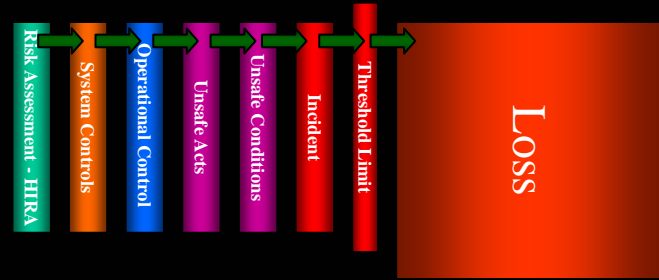
The artisan could not move out of the way of the flash fast enough, because he had to stand right up against the mini-substation to be able to do the switching. Due to the short switching handle.

This resulted in the heat of the flash being concentrated on his hands, fore arms, face and lower neck.

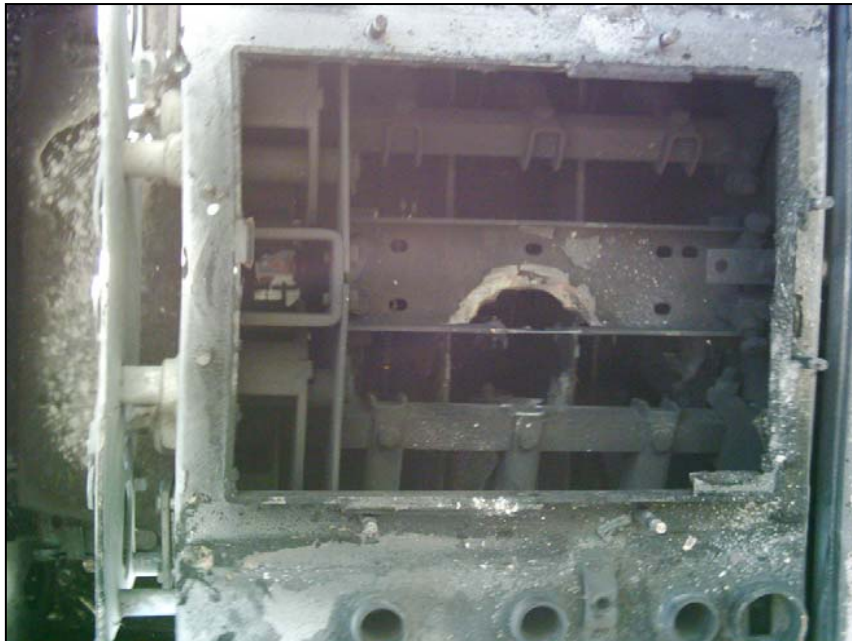




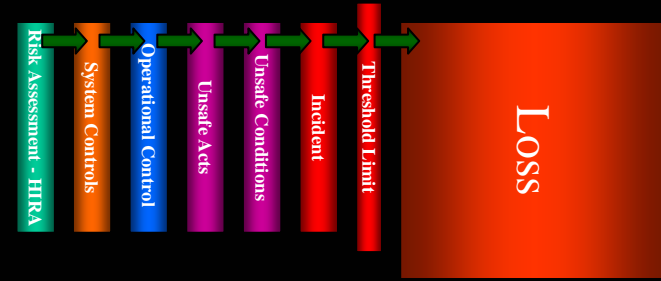
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Loss

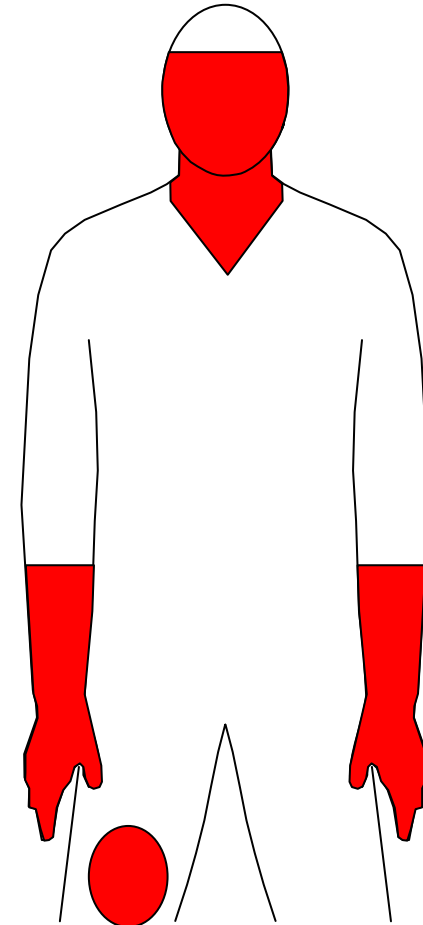


Damaged mini-substation (R168 000)



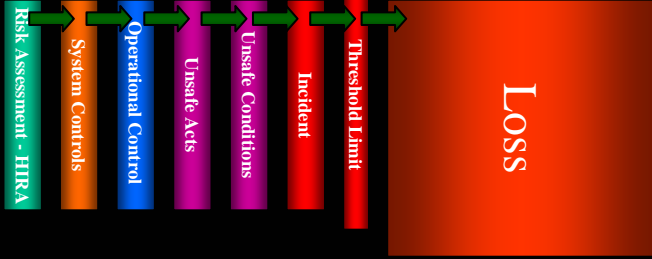
Loss

The electrician sustained 1st and 2nd degree burns to his face, lower neck, hands, forearms and right thigh and was off from work for an estimated four and a half months.

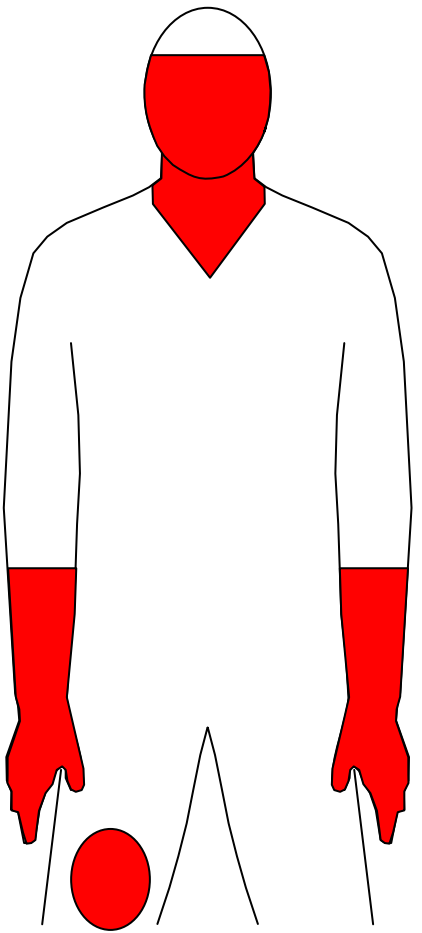




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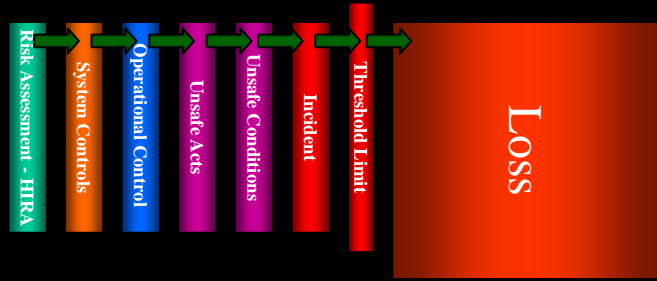


Loss



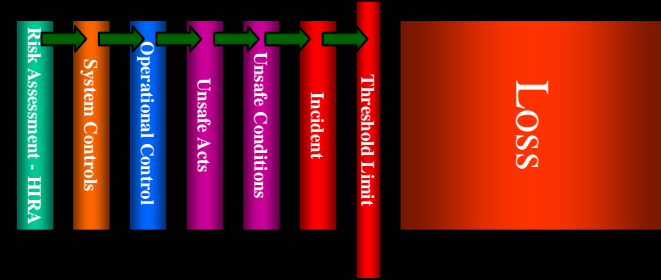


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Loss

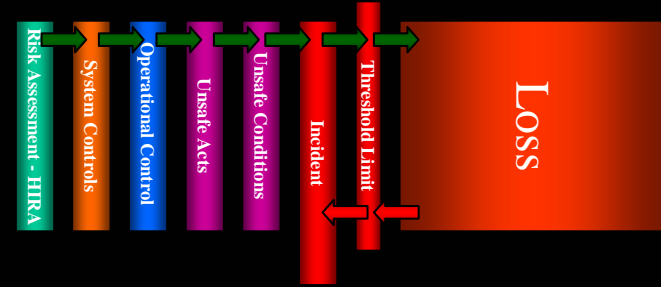




Threshold Limit

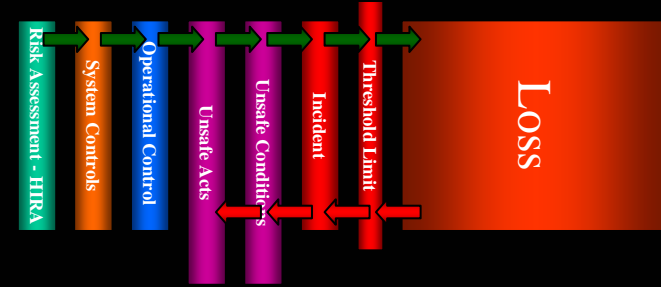
- Increased the length of the switching handle, so as to take the person at least 500mm away from the mini-substation.
- Cut holes into the doors of the mini-substation to facilitate switching with the doors closed.
- Increased the holding points and hinge strength of the door, so as to strengthen the door itself.
- OEM have been instructed to install an oil level site glass on all the OCB switchgear which will be repaired in the future.





Incident

- **Had all mini substation audited, to determine the amount and location of mini substation with similar oil circuit breakers. (19 identified)**
- **A schedule was setup to inspect these mini substation, and bring them up to standard over the Christmas period. Seven had been inspected over the Christmas break the other 12 was done on the Sundays of January 2005.**
- **A total of two mini-substation required its oil to be refilled to the recommended level, and one of the mini-substation needed to be replaced because it failed its load test.**



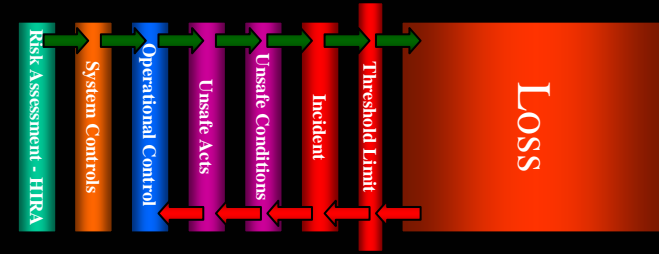
Unsafe Acts & Conditions

Unsafe Acts

- **Switching will be done by an artisan with special HT switching training.**
- **The minimum PPE being a balaclava and leather gloves, in addition to the overalls.**
- **All artisans had been reassessed with the assistance of the Deelkraal training center to determine who needs to go for a full refresher training on HT.**

Unsafe Conditions

- **The switching PPE was reviewed, hence other suites have been purchased and is currently being used when doing switching.**
- **No switching will be done on a mini-substation with the Lucy OCB, instead the mini-substation feeding that particular substation will be switched.**



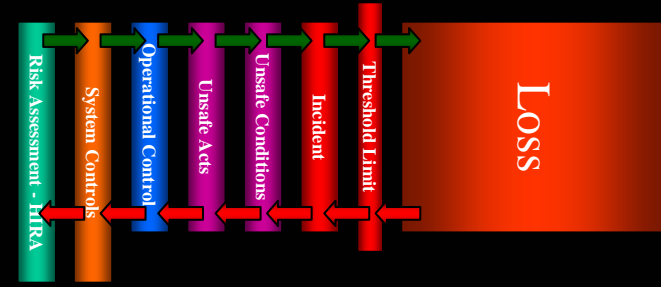
Operational Control

Personal Factors

- All employees in the Production Engineering department was put through the SMAT training, so that they can identify the potential hazards pertaining to day to day tasks.
- The refresher training for the artisans was reviewed, because it is giving the artisans a false sense of security, which leads to complacency.

Job Factors

- A special instruction was given to the foreman to do a mini risk assessment with their artisans, for any work relating to HT. Taking all procedures relating to the work into consideration.



System Control & Risk Assessment

High voltage substation Procedure	GNM/ES/001	10/2000
STP – Maintaining a mini substation	GNM/E/046	04/1999 07/2002

- **The risk assessments and the procedures pertaining to High Voltage had been reviewed and updated, to make sure they cater for the production section needs.**
- **An issue based risk assessment based on the Lucy switchgear has been completed. This was deemed necessary because of the amount of Lucy switchgear still in service.**



System Control & Risk Assessment

- **Yearly services (Labour)**
- **Training and skills needed to do the HT switching**
- **Short handles on switchgear**
- **Switching on load**
- **Continuous risk assessment**
- **Thorough investigation and communication**



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QUESTIONS COMMENTS