TOPIC 8: ELECTRICAL ACCIDENT INVESTIGATIONS – CASE STUDIES

Case Study 1

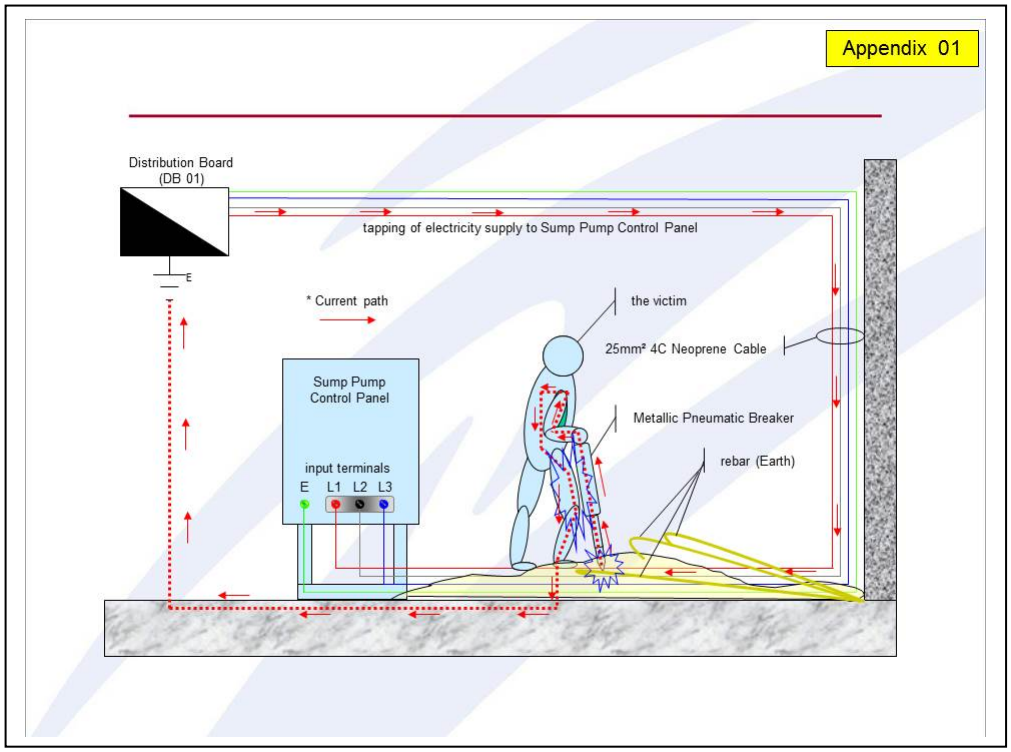
1.1 Background

Two construction workers were assigned to carry out works using a pneumatic breaker to hack & remove construction cement debris in an underground work area within the construction worksite.

During the course of work, one of the construction workers received an electric shock. The paramedic pronounced him dead on the same day after the incident.

1.2 Investigation and findings

The underground work area was wet and damp, a 25mm² neoprene cable was found dangling from the wall and part of the cable was covered under the construction cement debris. The cable end was connected to the sump pump control panel (see Appendix 01). A metallic pneumatic breaker was found lying on the floor.

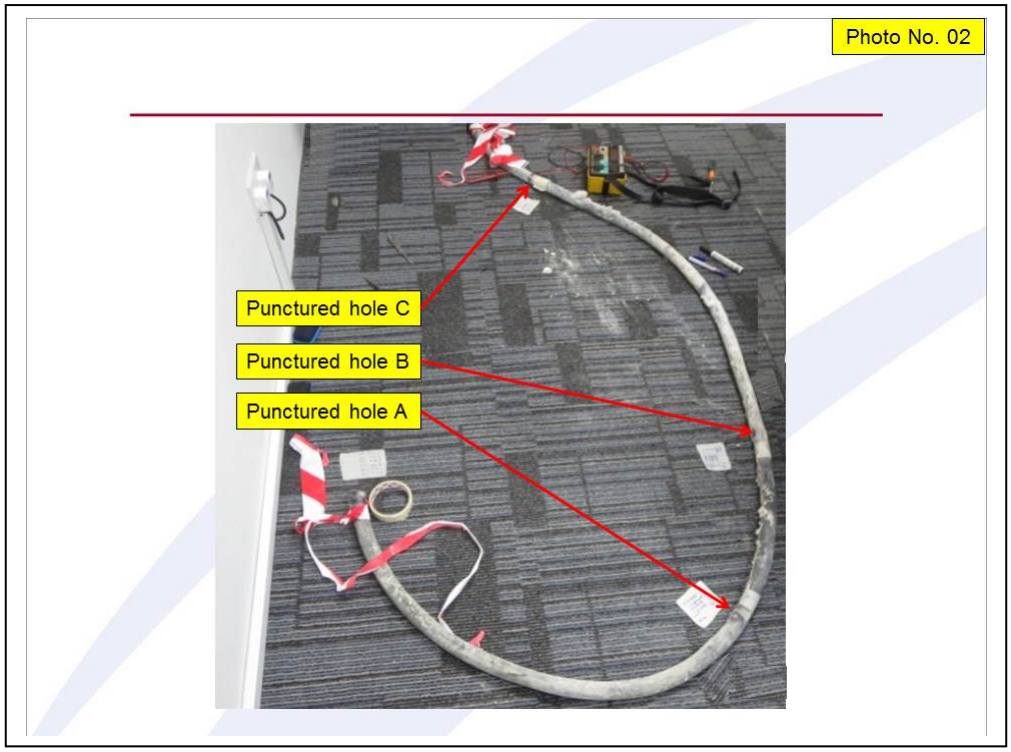


The electricity supply of the sump pump control panel was taken from a Distribution Board (DB-01) through the 25mm² neoprene cable. The incoming DB-01 was equipped with an incoming 3-pole 100A MCCB rated at 415V, and a RCCB rated at 100A with 100mA tripping sensitivity. Both the MCCB and RCCB were found in the "tripped" position**.**

Close examination was conducted on the 25mm² neoprene cable after it was carefully removed from the construction debris. It was found that:

a. There was three nos. of punctured holes on the neoprene cable and exposed metallic conductors could be seen as shown on Photos No. 02 & 03, labeled as punctured holes A, B and C;

b. There was a dented mark on the surface of a rebar found nearby, it could be caused by the chisel of the pneumatic breaker when the victim was carrying out the work (see Photo No. 04).



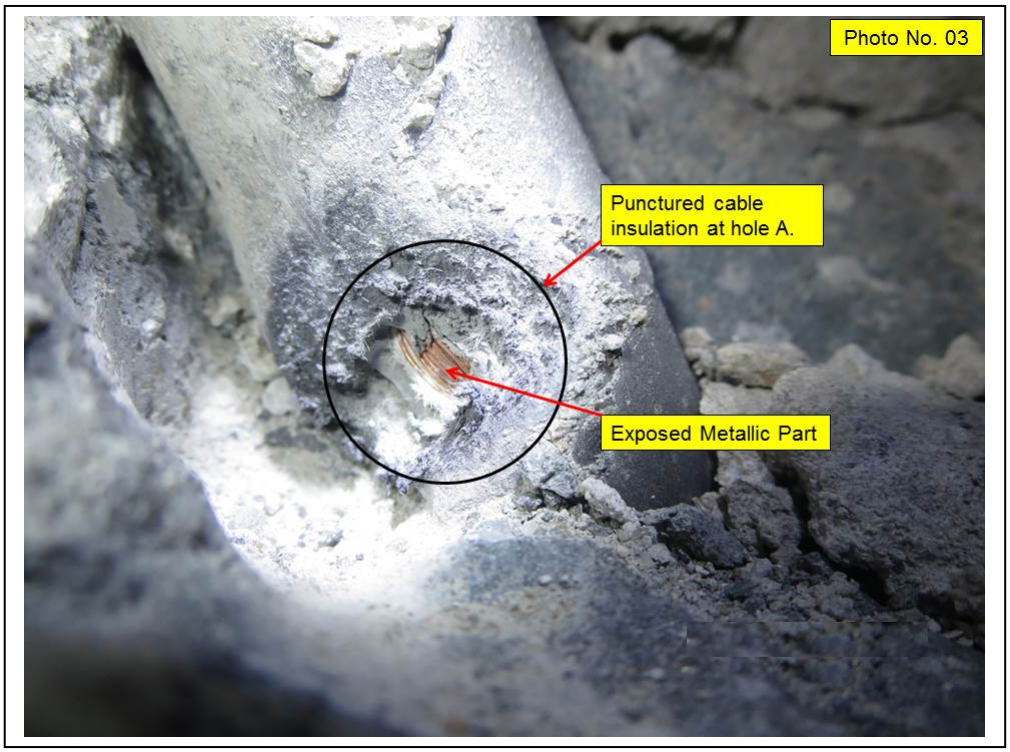


Photo No. 03
Punctured cable insulation at hole A.
Exposed Metallic Part

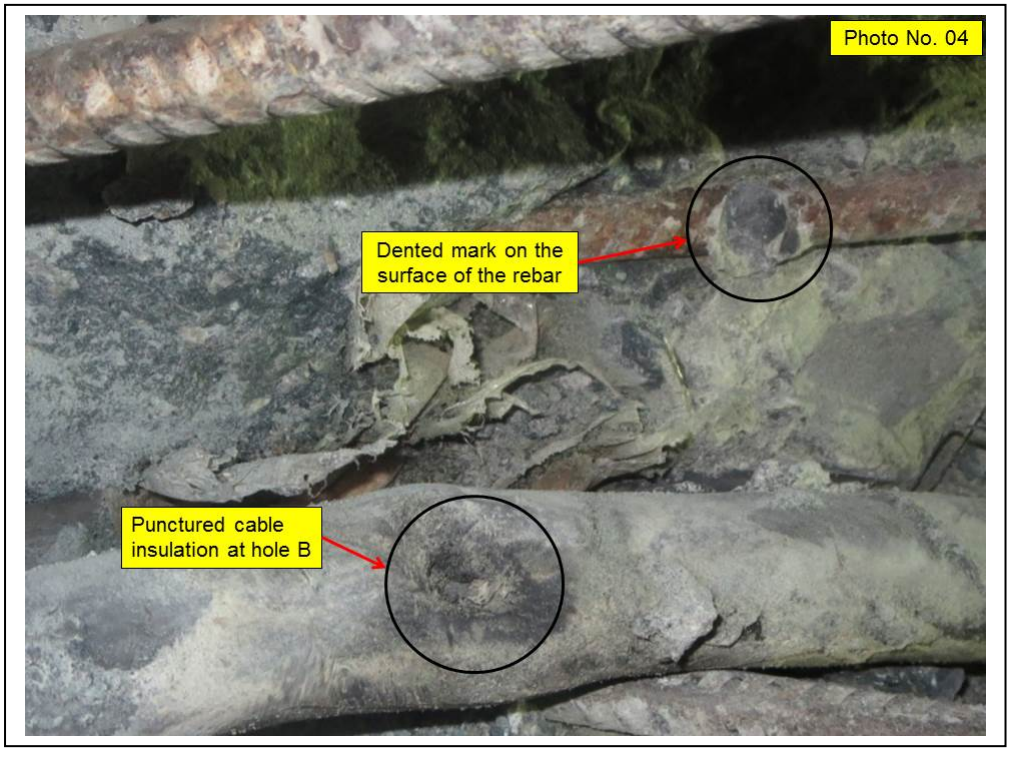


Photo No. 04
Dented mark on the surface of the rebar
Punctured cable insulation at hole B

Insulation resistance and continuity test was conducted on the metallic pneumatic breaker and the results showed that the pneumatic breaker was conductive. Tests conducted on hand groves and safety shoe shows that it does not have adequate insulation resistance to break the flow of current.

1.3 Conclusion

The victim's hands were gripping the metallic handles of the pneumatic breaker and his hand groves & safety shoes were wet during the course of work.

It was possible that when the victim was using the pneumatic breaker for breaking the cement debris where the 'live' neoprene insulated cable was buried, the metallic chisel of the pneumatic breaker damaged the cable insulation and came into contact with one of the 'live' conductors of the neoprene cable. This would cause a current to flow from the exposed live cable cores through the metallic pneumatic breaker and the victim's body resulting in electrocution.

The current had caused the tripping of the 100A MCCB at DB-01 and the 250A MCCB at the upstream Sub-Board (SB-01), and the activation of the earth fault relay (set at 25A at 0.3 sec) at MSB No. 1 caused the tripping of the 250A MCCB.

1.4 What should be done to avoid danger ?

The accident could have been prevented if the 'live' cable and the control panel for the sump pump were decommissioned and removed before the commencement of construction work. Also, prior to the commencement of work, the cable should be checked using a voltage detector to confirm that it was not 'live' to ensure safety.

Case Study 2

2.1 Background

A worker was tasked to cut and remove the copper piping of an air-conditioning system above the false ceiling space of a vacant unit in a multi-tenanted commercial premises. He was informed that the electricity supply to the unit had been switched off.

The worker received an electric shock while cutting a 'live' electrical cable which he mistaken as an insulated air-conditioning pipe.

2.2 Investigation and findings

The tenant has vacated the premises and a contractor was appointed to carry out the dismantling and reinstatement work.

The victim and his co-worker were tasked to cut and remove the copper pipes of the air-conditioning system. At the time of the incident, the victim was standing on a metallic ladder to gain access to the false ceiling. He used a metallic cutter with a rubber insulated handle to cut away the copper pipes in the false ceiling while his co-worker was pulling out the copper pipes from a distance away. Moments later, the co-worker saw the victim lying motionless on the floor.

The cutter used by the victim was found with the metallic blades resting on a PVC insulated electrical cable. There was a few polyethylene insulated copper pipes and a green-yellow earth cable that had been cut in the vicinity of the cutter within the false ceiling. Voltage measurement between the metallic handle of the cutter in its original position and Earth was about 238V (see Photo No. 01 & Photo No. 02).

2.3 Conclusion

As the ceiling area was dark, the victim might have mistaken the 'live' sub-main cable as an insulated air-conditioning pipe that need to be removed.

The victim could have received an electric shock when the metallic cutter he was holding came into contact with the 'live' cable conductor at 238V (with respect to Earth), while part of his body was in contact with the earthed metallic pipes and other earthed metallic objects.

2.4 What should be done to avoid danger ?

The accident could have been prevented if the victim or his supervisor had used a voltage detector to verify that all the cables and metallic objects in

the false ceiling were “dead” before proceeding to cut the air-conditioning pipes. Workers shall be advised that they should treat any cable ‘live’ unless they had checked and confirmed that the cable is <u>not</u> ‘live’ before commencement of work.