
Guidance Notes for

The Safe Isolation of Electricity Source at Work

Occupational Safety and Health Branch Labour Department

Occupational Safety & Health Council

The Guidance Notes is prepared by the
Occupational Safety and Health Branch
Labour Department

This Edition October 2010

This Guidance Notes is issued free of charge and can be obtained from offices of the Occupational Safety and Health Branch, Labour Department. It can also be downloaded from <http://www.labour.gov.hk/eng/public/os/C/isolation.pdf>. For enquiries about addresses and telephone numbers of the offices, please call 2559 2297.

This Guidance Notes may be freely reproduced except for advertising, endorsement or commercial purposes. Please acknowledge the source as "Guidance Notes for The Safe Isolation of Electricity Source at Work" published by the Labour Department.

Table of Contents

1. Introduction	1
2. Electrical Hazards	3
3. Reasons for Failing to Isolate Electricity Source at Work	4
4. Basic Safety Principles	5
5. Typical Safety Steps	6
6. Particular Hazardous Situations	7
7. Live Work in Extreme Situations	8
8. Other Safety Issues	9
9. Special Attentions for Supervisors	10
10. Summary	11
Enquiry	
Complaint	

1. Introduction

Let us look at a few past electrical accidents that claimed lives or caused serious body injury to workers.

- (i) An electrician who was wiring up a lighting fitting got electrocuted when someone mistakenly switched on the lighting switch at the far end. There was no indication made on the switch or barrier of any kind to prevent the switch from being accidentally turned on.
- (ii) Whilst removing dust from busbars of a main electrical switchboard, an electrician got serious burn on his face and the upper body in a flashover. Although all switches and circuit breakers on the switchboard had been switched off, the mains supply connected from the power company to the switchboard was still energized.
- (iii) The portable electric drill that connected from a power extension unit suddenly stopped. A worker removed the socket's cover of the extension unit to check but got electrocuted. The source side of the extension unit was still connected with a wall socket.
- (iv) A technician got electrocuted whilst wiring up the control panel of an air-conditioning unit. The sub-main switch that connected power supply to and mounted in the adjacent of the control panel had not been turned off.

What was common to the cause of the above accidents?

In the accidents, the power supply source for the electrical installation had not been safely isolated before the electrical wiring/ maintenance work started or be maintained so during the course of work.

This guidebook aims at the frontline electricians, technicians and other workers that carry out electrical wiring or electrical maintenance work for ¹¹low voltage¹¹ electrical installations, and their supervisors. It gives guidance on what should be done and what ought not to be done in respect of the isolation of electricity source at work to prevent electrical accidents.

Remarks:

¹Low voltage¹¹ means any voltage normally exceeding 50 V a.c. (or 120 V d.c.) but not exceeding 1000 V a.c. (or 1500 V d.c.) between conductors or 600 V a.c. (or 900 V d.c.) between conductors and earth.

2. Electrical Hazards

- ❖ Failing to isolate electricity source at work is a common but fundamental cause of electrical accidents for electrical wiring and maintenance work for electrical installations, switchboards and other equipment.
- ❖ Even if one has isolated the electricity source before, failing to ensure that it would remain so would still make him or others vulnerable as someone may switch on the power supply inadvertently or by mistakes.
- ❖ Without isolating the electricity source, one would work on a live circuit. He would be vulnerable to electrical hazards including electric shock, electrical flashover and short circuit.
- ❖ The consequence of an electrical accident could be very serious. It may cause electrocutions, serious burns on human bodies, man-fall from height, fire and explosions, etc.

3. Reasons for Failing to Isolate Power Supply Source at Work

There are lots of reasons why the electricity source is not isolated at work. Some are on the worker behaviour aspect, e.g. ignorance and negligence, and some on the system of work aspect, e.g. inadequate management control, lack of supervisions, and etc.

- **Deliberately not isolating power supply source**
 - Under-estimate the hazards and the consequence of accidents.
 - Over-estimate one's competency and carefulness at work.
 - Cut corners to save time and for convenience.

- **Wrongly believe that supply source has been isolated**
 - Turned off the wrong switch or working on the wrong circuit.
 - Defects in the switch such that the circuit is still live after turning off the switch.

- **Failing to maintain the supply source isolated during work**
 - The isolated power source has not been locked out so that it could be connected back accidentally.
 - No warning notice, signs or tags posted at the isolated power source to alert others not to disturb it.

- **Deficiency in the working system**
 - Inadequate house rules and working system to govern the isolation of power supply for electrical work.
 - Lack of supervision such that workers committed danger acts instead of following safety procedures.
 - Lack of management control on the access of power supply source / electrical switch room.

4. Basic Safety Principles

- To minimize the risk at electrical work, it would be essential to devise a safe work plan. Proper and effective safe working procedures should be closely followed and adequate safety precautions should be taken so as to ensure that the electricity source for an electrical installation be safely isolated before and during the course of work.
- The appropriate engineering and administrative controls should be taken to safely isolate any electricity sources of, and to safely discharge any electrical energy stored in an electric circuit, before the work commences. It should also ensure that the electricity source would be securely maintained in the isolated condition during the course of work.
- Effective control measures should also be taken during the course of work to ensure that all the electricity sources would remain in an isolated condition without possible accidental or inadvertent re-connection of electricity sources.
- Always remember that when a switch is turned off, only the load side is dead. The source side of switch would still be live unless the power supply to the switch is also isolated.
- Workers at electrical work should have received proper training and have the relevant knowledge and experience to be aware of the necessary procedures and precautions for the isolation of electricity source before and during the course of work.

5. Typical Safety Steps

- Correctly identify the power supply source for the involved circuit by referring to information such as wiring diagrams, layout drawings, circuit labels, records, etc.
- Isolate the supply source for the circuit by switching off the respective switch or circuit breaker, removing the power cord of equipment, etc.
- If practicable, lock off the power source by using the integral lock of the switch or switchboard, or by using separate padlock. The key of lock should be securely kept and controlled.
- If the switch cannot be locked off physically, control of accidental access to the switch should be exercised by locking off the switch room, fencing off the switch, etc.
- Warning notice, signs and tags should be put on the lock/ switch to prevent interference of the switch. They may also describe what the work is, who applies the lock, target date/ time of completion, etc. as appropriate.
- Labels of switches and circuits should be correct, clear and durable to avoid any wrong identification and switching of circuits.
- Before actually work on the electrical installation, use a voltage indicator, meter or other suitable equipment to verify that the installation is dead.
- Communicate with the fellow workers, supervisor and other workers in the workplace, in particular those who may need to get access to the other electric switches in the vicinity of the concerned switch for switching. It is to ensure that they would not disturb the concerned switch by mistakes.

6. Particular Hazardous Situations

There are some particularly hazardous work situations or working environment where safely isolate the power supply source is of paramount importance. One should consider adopting a permit-to-work system in carrying out electrical wiring/ maintenance work under such circumstances.

- **Modification work**

Modification work that involved manipulation of cables and conductors on electrical installation already put in service should be done with great care. Apart from isolating the circuit and locking it out, it should consider to temporarily disconnect the supply cables from the power source. It is to avoid any misunderstanding or making mistakes that results in having the uncompleted installation made live prematurely.

- **Working at height**

It would be particularly hazardous when one work on the electrical installation fixed at high level. Even a mild electric shock may cause loss of balance of the worker resulting in fall from height.

- **Conductive /Restrictive workplace**

It would be particularly hazardous for carrying out electrical work in a conductive or restrictive workplace, e.g. inside an earthed steel tank. The conductive workplace would provide a good return path for earth leakage/ fault current. On the other hand, it would be more difficult to set oneself free when making contact with live part incidentally in a restrictive workplace.

7. Live Work in Extreme Situations

- Only in extreme situations should the electricity supply be on and work be carried out on a live circuit.
- Only workers who are by virtue of knowledge and experience competent be allowed to carry out live work.
- Prior risk assessment should be carried out and appropriate safety precautions, including the use of personal protective equipment, should be taken for the proposed live work. Where danger cannot be avoided for work on the live circuit, the circuit should be isolated and the live work should be prohibited.
- Due to the intrinsically hazardous nature of a live work, the worker should take great care of himself and other workers when the live work is in progress.
- It should minimize the duration and the extension of the live work. Once the unavoidable live work has been finished, the circuit shall be isolated and with the power supply locked out before proceeding with the remaining work where live work is not required.

8. Other Safety Issues

- Stored energy in circuit

In case there is other stored energy source, e.g. standby battery banks or capacitor etc., fixed in the electrical installation, or the capacitance of the circuit is large, any stored energy should be safely isolated or discharged first before carrying out work.

- Emergency stop switch

When carrying out maintenance work on electrical equipment, apart from switching off the main supply switch, do remember to actuate the emergency stop button, if there is any, fixed on the control panel or the equipment.

If the emergency stop switch is of the key-reset type, after its actuation remember to remove and properly keep the key to avoid any inadvertent reset of the switch during the course of work.

- Isolation of both power and control circuits

When carrying out maintenance work on switchboards or control panels, remember that both the power and the control circuits should be isolated for complete isolation of power supply. The control circuit is usually supplied via separate fuse/ MCB.

- Active work site

At active work site having workers of different trades who would need to have power supply for work or testing, there should be stringent control on the use of electricity supply to avoid chaos. A close supervision would also be required to ensure that the appropriate power supply sources are isolated and to avoid the premature energisation or inadvertent re-energisation of the involved electrical installation.

- Tight working schedule

Even if one is facing a tight working schedule, the standard of safety should not be sacrificed. Do not compromise too much to allow live work without isolating power supply for work. The cost of cutting corner could be live.

9. Special Attentions for Supervisors

- Ensure that only workers, who are by virtue of their training and experience competent for the work, are allowed to carry out electrical wiring and maintenance work.
- Supervisors should give clear instructions to the workers the requirements in respect of the isolation of power source before and during the work. They should give to the workers sufficient information about the work and the safety provisions.
- Close supervision is required for complicated or urgent work tasks. It has to implement more stringent engineering and administrative controls, e.g. a permit-to-work system, on the work should the situation warrant.
- The supervisors should observe any act of failing to isolate power source for electrical installation at work. They should identify whether the breach is situational or widespread, and the reasons for non-compliance, e.g. design problems, difficult-to-reach of switches, operational restrictions, etc. and to rectify accordingly.

10. Summary

- ✓ Remember to isolate power supply source at work to avoid carrying out live work. Failing to do so may result in electrocution, serious burns, fire and explosion.
- ✓ Do not under-estimate the hazards of "small" jobs or over-estimate one's competency. It does not pay for cutting corners for convenience and save of time.
- ✓ Plan the work carefully and set out safety precautions and procedures for oneself, subordinates and other workers to observe and follow.
- ✓ Turn off and lock out the power supply source, and post up the appropriate warning notice, signs or tags before working on the electrical installation.
- ✓ Exercise adequate management control and supervision at the workplace to ensure that the isolated power supply source of the electrical installation would not be disturbed.

Enquiry

If you wish to enquire about this guidance notes or require advice on occupational safety and health, please contact the Occupational Safety and Health Branch of the Labour Department through:

Telephone : 2559 2297 (auto-recording after office hours)

Fax : 2915 1410

E-mail : enquiry@labour.gov.hk

Information on the services offered by the Labour Department and on major labour legislation can also be found by visiting our Homepage on the Internet. Address of our Homepage is <http://www.labour.gov.hk>.

Information on the services offered by the Occupational Safety and Health Council can be obtained through hotline 2739 9000.

Complaint

If you have any complaint about unsafe workplaces and practices, please call the Labour Department's Occupational Safety and Health complaint hotline on 2542 2172. All complaints will be treated in the strictest confidence.

