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IS 5216-1 (1982): Recommendations on Safety Procedures and Practices in Electrical Work, Part I: General [ETD 20: Electrical Installation]



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“Knowledge is such a treasure which cannot be stolen”

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Indian Standard

RECOMMENDATIONS ON SAFETY
PROCEDURES AND PRACTICES IN
ELECTRICAL WORK

PART I GENERAL

(*First Revision*)

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*Indian Standard*RECOMMENDATIONS ON SAFETY
PROCEDURES AND PRACTICES IN
ELECTRICAL WORK

PART I GENERAL

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Indian Standard

RECOMMENDATIONS ON SAFETY PROCEDURES AND PRACTICES IN ELECTRICAL WORK

PART I GENERAL

(First Revision)

0. FOREWORD

0.1 This Indian Standard (Part I) (First Revision) was adopted by the Indian Standards Institution on 29 September 1982, after the draft finalized by the Code of Practice for Power Installation and Maintenance Sectional Committee had been approved by the Electrotechnical Division Council.

0.2 It is essential that safety should be preached and practised at all times by all concerned in installation, operation and maintenance of electric lines and apparatus. The real benefit to be derived from a guide of this nature will be realized only when the safety instructions it contains are regarded as normal routine duty and not as involving extra and laborious operations.

0.3 This guide gives general instructions regarding safety procedures and practices to be followed in all major electrical installations. Special precautions are to be taken in mines and other hazardous areas where explosive or flammable gases are present. Guidelines for the same are provided in a subsequent part of the standard (under preparation). For precautions to be observed while installing, operating or maintaining any particular electrical equipment, reference shall also be made to the relevant Codes of Practice.

0.4 This Indian Standard was originally published in 1969. The present revision is being brought out to introduce new concepts in the safety practices in electrical work and also to make the guide comprehensive in all respects as far as safety in electrical installations are concerned. This revision is being brought out in several parts as follows :

Part I General

Part II Life saving techniques

Part III Safety posters

Part IV Special guidance for safety in electrical work in hazardous areas.

All parts shall be read in conjunction with one another.

1. SCOPE

1.1 This standard (Part I) gives recommendations regarding safety procedures and practices which should be followed to the extent applicable in all major electrical installations, such as generating stations, sub-stations, industrial establishments, transmission and distribution lines, and cable networks.

1.2 For special precautions to be taken in mines and other hazardous areas, see Part IV of this standard.

2. STATUTORY REGULATIONS

2.1 It is the duty of all persons who may be concerned with the installation, operation and maintenance of electric lines and apparatus to make themselves thoroughly conversant with the regulations and safety rules governing the work they may have to undertake on these lines and apparatus.

2.2 Generation, transmission, distribution and utilization of electrical energy in our country is governed by Indian Electricity Supply Act, 1948, Indian Electricity Act, 1910 and the Rules made thereunder, that is, Indian Electricity Rules, 1956.

2.3 The electricity supply undertakings are required to comply with other statutory acts besides those given in 2.2, and these shall be taken into account.

2.4 In addition to the statutory regulations mentioned in 2.2 and 2.3, electric supply undertakings usually lay down safety instructions in the form of safety rules or standing orders for the guidance of the staff employed in connection with the execution of work on or near the electric lines and apparatus and for their operation and maintenance which should be strictly complied with at all times.

2.5 It shall be the responsibility of the person-in-charge to interpret and explain correctly the rules and regulations to all staff concerned and to ensure that the staff thoroughly understands the same.

2.6 For the purpose of this standard, a competent person is one who had been certified so by the State Government, for the specific category of electrical work, as laid down in Rule 45 of the IE Rules 1956.

3. PERMIT-TO-WORK SYSTEM

3.1 All work on major electrical installations shall be carried out under permit-to-work system which is now well established, unless standing

instructions are issued by the competent authority to follow other procedures. In extenuating circumstances, such as for the purpose of saving life or time in the event of an emergency, it may become necessary to start the work without being able to obtain the necessary permit-to-work; in such cases, the action taken shall be reported to the person-in-charge as soon as possible. The permit-to-work certificate from the person-in-charge of operation to the person-in-charge of the men selected to carry out any particular work ensures that the portion of the installation where the work is to be carried out is rendered dead and safe for working. All work shall be carried out under the personal supervision of a competent person. If more than one department is working on the same apparatus, a permit-to-work should be issued to the person-in-charge of each department.

NOTE — The words ' permit-to-work ' and ' permit ' are synonymous for the purpose of this guide.

3.2 No work shall be commenced on live mains unless it is specifically intended to be so done by specially trained staff. In such cases all possible precautions shall be taken to ensure the safety of the staff engaged for such work, and also of others who may be directly or indirectly connected with the work. Such work shall only be carried out with proper equipment provided for the purpose and, after taking necessary precautions, by specially trained and experienced persons who are aware of the danger that exists when working on or near live mains or apparatus.

3.3 On completion of the work for which the permit-to-work is issued, the person-in-charge of the maintenance staff should return the permit duly discharged to the issuing authority.

3.4 In all cases, the issue and return of permits shall be recorded in a special register provided for that purpose.

3.5 The permits shall be issued not only to the staff of the supply undertakings, but also to the staff of other departments, contractors, engineers, etc, who might be required to work adjacent to live electrical mains or apparatus.

3.6 A model form of permit-to-work certificate is given in Appendix A.

NOTE 1 — The permit is to be prepared in duplicate by the person-in-charge of operation on the basis of message, duly logged, from the person-in-charge of the work.

NOTE 2 — The original permit will be issued to the person-in-charge of work and the duplicate will be retained in the permit book. For further allocation of work by the permit receiving officer, tokens may be issued to the workers authorizing them individually to carry out the prescribed work.

NOTE 3 — On completion of the work, the original shall be returned to the issuing officer duly discharged for cancellation.

3.7 Permit books should be treated as important records. All sheets in the permit books and the books themselves should be serially numbered. No page should be detached or used for any other except bonafide work. If any sheet is inadvertently detached, a dated and initialled statement shall then and there be recorded in the book by the person responsible for it.

3.8 Permit books shall be kept only by the person-in-charge of operation who shall maintain a record of the receipts and issues made by him.

3.9 It is important that the special instructions given in Appendix B are strictly complied with at all times by the person-in-charge and his staff working on any job with a permit-to-work.

4. REGISTER OF MESSAGES

4.1 All messages and instructions relating to the operation of switches and other important communications concerning the work shall be recorded in the register of messages, preferably by an independent person not directly connected with the work.

4.2 The issue (or return) of permit shall be entered in the log book or log sheet either in red ink or should be underlined. When change of shift occurs during the pendency of a permit, the outgoing permit issuing officer shall inform his relief by entering in the log book or log sheet, before handing over, the existence of all permits. The incoming permit issuing officer shall also sign the log book or log sheet in taking over and indicate that he has noted the pendency of the permits.

4.3 All the permit issuing officers and persons-in-charge concerned with the permit shall adopt similar logging procedure.

5. SAFETY INSTRUCTIONS FOR WORKING ON LOW AND MEDIUM VOLTAGE MAINS AND APPARATUS

5.1 Work on Dead Low and Medium Voltage Mains and Apparatus
— Unless a person is authorised to work on live low and medium voltage mains and apparatus, all mains and apparatus to be worked upon shall be isolated from all sources of supply before starting the work, proved dead, earthed and short-circuited. For earthing and short-circuiting, only recognized methods should be used. Measures shall be taken against the inadvertent energizing of the mains and apparatus.

5.2 Work on Live Low and Medium Voltage Mains and Apparatus
— Only competent, experienced and authorized persons shall work on live mains and apparatus, and such persons should take all safety measures as may be required under the Indian Electricity Rules, 1956.

5.2.1 Warning boards shall be attached on or adjacent to the live apparatus and at the limits of the zone in which work may be carried out.

5.2.2 Immediately before starting work, rubber gauntlets, if used, shall be thoroughly examined to see whether they are in sound condition. Under no circumstances shall a person work with unsound gauntlets, mats, stools, platforms or other accessories and safety devices.

5.2.3 It shall be ensured that no other live parts come within safe distance of a person working on low and medium voltage mains so that he does not come in accidental contact with it unless he is properly protected.

5.3 Testing of Mains and Apparatus with Low Voltage — No person shall apply test voltage to any mains unless he has received a permit-to-work and has warned all persons working on the mains of the proposed application of test voltage. If any part which will thus become alive is exposed, the person-in-charge of the test shall take due precautions to ensure that the exposed live portion does not constitute danger to any person. It should also be ensured before the application of test voltage, that no other permit-to-work has been issued for working on this mains.

5.4 Connecting Dead Mains to Live Mains — When dead mains are connected to live mains, all connections to the live parts shall be made last, and in all cases the phase sequence should be checked to ensure that only like phases are connected together. Before inserting fuses or links in a feeder or distribution pillar controlling the cable on which a fault has been cleared, each phase shall first be connected through a test switch fuse.

6. SAFETY INSTRUCTIONS FOR WORKING ON HIGH VOLTAGE MAINS AND APPARATUS

6.1 General — All high voltage mains and apparatus shall be regarded as alive and a source of danger and treated accordingly unless it is positively known to be dead and earthed.

6.1.1 No person shall work on test or earth high voltage mains or apparatus unless covered by a permit-to-work and after proving the mains dead except for the purpose of connecting the testing apparatus, etc,

6.1.2 The operations of proving dead, earthing and short-circuiting of any mains shall be carried out only by an authorized person under the instructions of the person-in-charge of maintenance.

6.1.3 While working on high voltage mains, the following precautions shall be taken:

- a) No person, after receiving a permit-to-work, shall work on, or in any way interfere with any high voltage mains or conduits or trough containing a high voltage mains except under the personal instructions and supervision, on the site of work, of a competent person;
- b) When any high voltage mains is to be earthed, the procedure prescribed in **6.4.6** shall be scrupulously followed; and
- c) The earths and short-circuits specified on the permit-to-work shall not be removed or interfered with except by authority from the person-in-charge of the work.

6.2 Minimum Working Distance — No person shall work within the minimum working distance (as specified in the relevant standard) from the exposed live high voltage mains and apparatus. The minimum working distance depend upon the actual voltage. It does not apply to operations carried out on mains and apparatus which are so constructed as to permit safe operation within these distances.

6.3 Isolation of High Voltage Mains — Isolation of high voltage mains shall be effected by the following methods:

- a) The electrical circuits shall be broken only by authorized persons by disconnecting switches, isolating links, unbolting connections or switches which are racked out. Where possible, the isolation should be visibly checked; and
- b) Where the means of isolation are provided with a device to prevent their reclosure by unauthorized persons, such a device shall be used. The isolation shall be maintained until necessary by suitable interlocking arrangements to prevent inadvertant energizing of the circuit.

6.4 Devices for Proving High Voltage Mains and Apparatus Dead

6.4.1 High voltage neon lamp contact indicator rods are often used for proving exposed high voltage mains and apparatus dead. Each rod is fitted with an indicating neon tube or other means which glows when the contact end of the rod comes in contact with exposed live high voltage parts. Each rod is clearly marked for the maximum voltage on which it may be safely used and shall not, under any circumstances, be used on higher voltages.

6.4.2 High voltage contact indicator and phasing rods are provided for phasing and proving exposed high voltage mains and apparatus dead. A set consists of two rods connected in series by a length of insulated cables. Both rods are fitted with contact tips and indicating tubes. When the contact tip of one rod is applied to exposed live high voltage parts and that of the other to earth or other exposed live high voltage parts provided there is sufficient voltage difference between the two, the indicating tubes should glow. Each set of rods is normally marked for the maximum voltage on which it may be used and shall not, under any circumstances, be used on higher voltages.

6.4.3 Use of High Voltage Contact Indicator and Phasing Rods — While using the high voltage contact indicator and phasing rods for proving the high voltage mains or apparatus dead, following precautions should be taken:

- a) Ensure that the rod is clean and dry;
- b) Check the rod by applying it to known live parts of the correct voltage, the indicating tube shall glow;
- c) Apply the rod to each phase required to be proved dead, the indicating tube shall not glow. Be very careful to be in a position to see the glow, if any, appearing in the indicating tube; and
- d) Again check the rod by applying it to live parts as in (b) above, again the indicating tubes shall glow.

NOTE 1 — All the above operations shall be carried out at the same place and at the same time if no live high voltage parts are available on the site; rods up to 11 kV may be tested by applying them to the top of the spark plug in a running motor car engine. If the rod is in order, the indicating tube will glow each time the plug sparks. Therefore, the glow will be intermittent, but the indicating tube should glow on this test or the rod is useless as a means of proving the mains or apparatus dead.

NOTE 2 — The rod should be tested both before and after the use.

6.4.4 Testing and Marking of Devices for Proving High Voltage Mains and Apparatus Dead — It shall be ensured that all devices for proving high voltage mains and apparatus dead are marked clearly with the maximum voltage for which they are intended and should be tested periodically as recommended in 6.4.3.

6.4.5 Identification of Cables to be Worked Upon — A high voltage cable shall be identified as that having been proved dead prior to cutting or carrying out any operation which may involve work on or movement of the cable. A non-contact indicating rod, induction testing set or spiking device may be used for proving the cable dead.

6.4.6 Earthing and Short-Circuiting High Voltage Mains

6.4.6.1 High voltage mains shall not be worked upon unless they are discharged to earth after making them dead and are earthed and short-circuited with earthing and short-circuiting equipment adequate to carry possible short-circuit currents and which are specially meant for the purpose. All earthing switches wherever installed should be locked up.

6.4.6.2 If a high voltage cable is required to be cut, a steel wedge shall be carefully driven through it at the point where it is to be cut or preferably by means of a spiking gun of approved design.

6.4.6.3 After testing the high voltage cable with dc voltage, the cable shall be discharged through a 2 megohms resistance and not directly, owing to dielectric absorption which is particularly prominent in the dc voltage testing of high voltage cables. The cable shall be discharged for a sufficiently long period to prevent re-building up of voltage.

6.4.6.4 The earthing device when used shall be first connected to an effective earth. The other end of the device shall then be connected to the conductors to be earthed.

6.4.6.5 Except for the purpose of testing, phasing, etc, the earthing and short-circuiting device shall remain connected for the duration of the work.

6.4.7 Removing the Earth Connections — On completion of work, removal of the earthing and short-circuiting devices shall be carried out in the reverse order to that adopted for placing them (see 6.4.6), that is, the end of the earthing device attached to the conductors of the earthed mains or apparatus shall be removed first and the other end connected to earth shall be removed last. The conductor shall not be touched after the earthing device has been removed from it.

6.4.8 Safety Precautions for Earthing — The precautions mentioned in **6.4.8.1** to **6.4.8.5** should be adopted to the extent applicable and possible.

6.4.8.1 Examine earthing devices periodically and always prior to their use.

6.4.8.2 Use only earthing switches or any other special apparatus where provided for earthing.

6.4.8.3 Verify that the circuit is dead by means of discharging rod or potential indicator of approved type. The indicator itself should first be tested on a live circuit before and after the verification.

6.4.8.4 Earthing should be done in such a manner that the persons doing the job are protected by earth connections on both sides of their working zone.

6.4.8.5 All the three phases should be effectively earthed and short-circuited even though work may be proceeding on one phase only.

6.4.9 *Working on Mains Where Visible Isolation Cannot be Carried Out* — Where the electrical circuit cannot be broken visibly as set out in **6.3**, the circuit may be broken by two circuit opening devices, one on each side of the work zone, where duplicate feed is available and by one circuit opening device where duplicate feed is not available provided the following conditions are fulfilled:

- a) The position of the contacts of the circuit opening device(s) — ‘open’ or ‘closed’ — is clearly indicated by the position of the operating handle or by signal lights or by other means.
- b) The circuit opening device(s) can be locked mechanically in the open position.
- c) The mains and apparatus to be worked on are adequately earthed and short-circuited between the circuit opening device and the position of the work.
- d) In cases where duplicate feed is available, both the circuit opening devices are in series between the mains and apparatus to be worked on and any source of supply.
- e) In cases where duplicate feed is not available, the circuit opening device is between the mains to be worked on and any source of supply.

6.4.9.1 The circuit opening devices mentioned in **6.4.9** shall be locked in the open position before the work on the mains and apparatus is commenced. The locking devices shall be removed only by a competent person and not until the work has been completed, any short-circuiting and earthing removed and the permit-to-work form duly returned and cancelled.

6.4.10 *Work on High Voltage Mains with Two or More Sections* — When the mains to be worked upon are to be divided into two or more sections, the provisions of **6.3**, **6.4.6** and **6.4.9** shall be observed with regard to each section.

6.5 In addition to the general safety instructions provided above, further specific guidelines from the safety point of view applicable for installation and maintenance work on individual electrical equipment are given in individual Codes of Practice. These shall be taken note of as appropriate.

7. WORKMEN'S SAFETY DEVICES AND APPLIANCES

7.1 General

7.1.1 Rubber gauntlets, gloves, mats, boots and galoshes, insulated platforms and stools, safety belts, hand lamps, tower wagons and other special insulated devices shall be used, as required, for working on electrical equipment and apparatus as precaution against accidental electric shock.

7.1.2 Tools insulated with brittle material or otherwise liable to have its insulation damaged when in use, shall be used carefully. If the insulation has been damaged, these tools shall not be used.

7.1.3 The person-in-charge of the work should ensure proper maintenance and use of the safety equipment.

7.1.4 *Durability of Rubber Devices* — As rubber perishes rapidly in tropical climate, great care shall be exercised in seeing that only sound rubber gauntlets, gloves, mats, boots, galoshes and other safety devices depending upon rubber insulation are issued to employees for working on live apparatus.

7.2 Care of Rubber Gauntlets, Gloves, Etc

7.2.1 No person should put his rubber gauntlets or gloves into his coat or trouser pocket along with other tools. Gauntlets carried in this way are liable to get damaged and consequently become a source of danger to the wearer.

7.2.2 After the rubber gauntlets and gloves have been in use, they should be carefully cleaned at once and stored in a suitable chalk in a suitable container. No tool or other material shall be stored in this container.

7.3 Testing Rubber Gauntlets or Gloves

7.3.1 Before a person puts on his rubber gauntlets or gloves to start work on a new job, he should check each one for cuts, cracks and weak spots by rolling it up tightly, beginning at the gauntlets end, and notice if any air escapes. This is usually called as 'air test'. Gauntlets or gloves which show visible cuts, cracks or weak spots or air leakage in this test shall not be used and shall be returned and a new pair obtained. The visual lamp test may also be adopted to determine the condition of gauntlets and gloves (*see IS : 4770-1968**).

7.3.2 Every pair of rubber gauntlets and gloves shall be carefully examined on each occasion before and after the work by the person-in-charge of the work to ensure safety to the workmen. They should be tested for leakage current at frequent intervals in accordance with IS : 4770-1968*.

*Specification for rubber gloves for electrical purposes.

7.3.3 The right hand gauntlet wears out more quickly than the left hand one and in such cases the whole pair should be condemned. Under no circumstances a left hand gauntlet should be allowed to be used on the right hand as it is cumbersome and the workman is likely to discard it and meet with accident.

7.4 Inspection of Safety Equipment

7.4.1 Rubber gauntlets, gloves, boots and galoshes shall be inspected periodically.

7.4.2 All safety equipment should be inspected by frequent surprise checks by competent persons at intervals of not more than six months.

7.4.3 Any safety device found defective on inspection shall be repaired immediately; if it is not possible to effect repairs satisfactorily, the defective ones shall be discarded at once.

8. SAFETY PRACTICES

8.1 In all electrical work, it is very necessary that certain elementary safety practices are observed. It has been found that quite a large number of accidents occur due to the neglect of these practices. The details of such practices are given in Appendix C.

8.2 Fires and Fire Extinguishers

8.2.1 In the event of fire on electrical mains or apparatus, the effected parts shall immediately be isolated completely from its source of supply of electrical energy.

8.2.2 Fire extinguishers, which are not insulated, should never be employed in fighting fires near exposed live conductors. Only such fire extinguishers should be used on electrical mains and apparatus which are marked as suitable for the purpose. When using fire hose, it should be ensured that the jet of water does not come into contact with live conductors (*see* IS : 1646-1961*).

8.2.3 It is dangerous to throw a stream of water, a wet blanket or a stream from ordinary soda-acid type extinguishers on live mains or apparatus. When found necessary to use them, have all the neighbouring mains or apparatus made dead. Carbon dioxide, carbon tetrachloride and other special type of extinguishers, sand or dry blanket may be used on live conductors and static apparatus.

*Code of practice for fire safety of buildings (general) : Electrical installations.

IS : 5216 (Part I) - 1962

8.3 Lighting — Inadequate lighting of working areas is by itself a source of danger, particularly when work is undertaken at night. Never, therefore, allow any work in the dark in badly illuminated or ill-ventilated places. A schedule for values of safe and adequate illumination is given in IS : 3646 (Part II) - 1966*.

8.4 Safety Posters — (see Part III of this standard under preparation).

9. TRAINING OF EMPLOYEES

9.1 General — For maximum effectiveness, a sound safety procedure would include, in addition to the instructions on the hazards of electricity, thorough training of all employees who work on electrical installations and equipments. The employees should be trained in first aid, fire fighting, use of warning signs, guards and other protective devices and safe operational procedures.

9.2 Training Programme — The training programme should consist of not merely generalizations and indefinite recommendations, but should be specifically based upon demonstrations and training in the correct operation and maintenance of lines and apparatus.

9.3 Supervision

9.3.1 Supervising officers should maintain a close supervision over all operation and maintenance works and defective or careless handling of equipment should not be permitted.

9.3.2 Under no circumstances should deviation from safe practices be tolerated, as this could result in unnecessary hazards and danger to workmen or apparatus.

APPENDIX A

(Clause 3.6)

MODEL FORM OF PERMIT-TO-WORK

Name of the Organization.....
Department (issuing the permit).....
Permit No..... Time..... Date.....

*Code of practice for interior illumination: Part II Schedule for values of illumination and glare index.

1. I..... certify that the following apparatus has been made dead, is isolated from all live conductors and has been connected to earth and the work mentioned in para (3) can now be carried out in accordance with the safety rules and regulations:
2. For the purpose of making the above apparatus dead, the following switches/isolators/links/fuses have been opened and the section so isolated has been earthed at each isolation point and danger notice plates fixed thereon:
 - Switches
 - Isolators
 - Links
 - Fuses
3. Work to be carried out (testing work, if any, to be specifically mentioned) :
4. I have also recorded the above operations in the Log Sheet/Log Book including the instructions for the person who may relieve me.
5. This permit is now being issued to.....
(name of the person to whom the permit is being issued) for carrying out the work mentioned in para (3).

(Signature of the permit issuing authority)

(Designation)

Department (receiving the permit)

Permit No..... Time..... Date.....

I confirm that

I have been issued this permit by.....
(name of the permit issuing officer) and have been placed in direct and continuous charge of the work mentioned in para (3) and accept the responsibility of carrying out the said work taking all necessary safety precautions to avoid danger and no attempt will be made either by me or by men working under my control to carry out any other work on any apparatus other than that detailed in paras (1) and (3) on the reverse.

(Signature of the person receiving the permit
and
responsible for carrying out the above work)

(Designation)

I have transferred this permit to.....
who will now be responsible for carrying out all the works mentioned in
para (3) on the reverse.

(Signature of the person transferring
the permit)

(Signature of the person receiving
the permit)

(Designation)..... (Designation)

Time..... Date.....

I confirm that the work specified in para (3) on reverse has been completed
and all workmen withdrawn and warned that it is no longer safe to work
on the apparatus mentioned in para (1) on the reverse. I also confirm that
all temporary earths and other connections made by me and by men under
my control have been removed except that any precautionary steps taken
by the permit issuing officer before the issue of this permit have not been
interfered with by me or by men under my control. I hereby return the
permit for cancellation leaving the dead apparatus ready for putting into
service.

(Signature of the person returning the permit)

(Designation)

Time..... Date.....

The work mentioned in para (3) on the reverse has been carried out; all
earths made for the purpose have been removed and danger notice plates
put aside. The following switches/isolators/links/fuses have been closed and
apparatus put back into service. Entry has been made in the Log Sheet/Log
Book:

Switches

Isolators

Links.....

Fuses

(Signature of the permit cancelling authority)

(Designation)

APPENDIX B
(Clause 3.9)

**SPECIAL INSTRUCTIONS FOR THE SAFETY OF PERSONS
WORKING ON A JOB WITH A PERMIT-TO-WORK**

B-1. The following special instructions primarily to provide safe working conditions shall be rigidly complied with by all persons and at all times when working on a job with a permit-to-work. Any one disregarding these instructions or behaving in a manner likely to cause danger, either to himself or to anyone else, should be properly punished.

B-2. No person shall carry out or attempt any work on live mains or apparatus except with a permit-to-work and under the direct supervision of a competent person.

B-3. The person-in-charge shall explain the nature and duration of work to be carried out to the permit issuing authority, and obtain from him a permit-to-work before commencing any work.

B-4. The permit issuing authority shall not issue a permit unless:

- a) the switches have been withdrawn and are completely isolated on both sides, links and fuses opened, mains and apparatus discharged and earthed, and all adjacent live parts adequately protected. Where possible, the switches shall be locked and keys handed over to the person-in-charge, who will not return them until completion of the work. Switches and fuses of all control panels shall also be rendered inoperative,
- b) danger notice plates are attached in conspicuous place on the mains and apparatus, and at all other control points, under the permit-to-work; and
- c) an entry is made in the Log Book or Log Sheet to the effect that the mains and apparatus under permit have been made dead. On no account shall they again be made alive until the return by the person-in-charge of the permit-to-work and the keys.

B-5. The person-in-charge before allowing any workman to commence work on the mains and apparatus shall take the following precautions:

- a) Explain the nature of work, and the precautions taken by the permit issuing authority to ensure the safety of the workmen and also the precautions to be taken by them during the progress of the work;

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- b) Satisfy himself that the switches controlling the mains and apparatus have been isolated, discharged, properly earthed where possible and tested with a discharge rod and that danger notice plates have been placed at conspicuous places; and
- c) Warn the workmen and public of the danger that exists in the vicinity of the area covered by the permit.

B-6. Where work is to be carried out on live low or medium voltage mains or apparatus, the following additional instructions shall be complied with:

- a) No work shall be carried out by any person unless he is adequately protected from the risk of electric shock by the use of rubber gloves or other approved equipment specially provided for the purpose.
- b) When a person is working on live mains or apparatus, he shall always be accompanied by a second person who shall preferably be capable of rendering first aid and artificial respirations.
- c) When a man ascends a pole where the line is alive, he shall make use of a safety belt and rubber gloves; such work shall be carried out under the direction of an experienced person who is competent to supervise the specific work and who shall remain present in the immediate vicinity for the whole time the work is in progress.
- d) The person-in-charge shall examine the safety equipment before use by the workmen to ensure that it is in sound condition, and also that it is being properly used.

B-7. On completion of the work, remove all earthing devices so that the mains and apparatus are fit in all respects for charging; withdraw all workmen and warn them that it is no longer safe to touch or approach the mains and apparatus, and thereafter return the keys and the permit duly discharged to the permit cancelling authority for cancellation.

B-8. All accidents shall be immediately attended to and reported to the proper authorities. In the event of a serious accident involving danger to life, the person-in-charge shall immediately get a doctor on site or remove the victim to the nearest hospital with the minimum delay. In the event of the victim being certified dead by a doctor, the body should NOT be removed without the permission of the police.

B-9. The instructions shall be read out and explained to the workmen in the language they understand, and copies shall be pasted on the various notice boards. Ignorance of the instructions shall not be accepted as an excuse for non-compliance with them.

APPENDIX C

(Clause 8.1)

GENERAL SAFETY PRACTICES IN ELECTRICAL WORK

C-1. EXERCISE CARE

C-1.1 Place yourself in a safe and secure position to avoid slipping, stumbling or moving backward against live conductors or apparatus. Do not rely for protection upon the care assumed to be exercised by others.

C-1.2 In the event of near approach of a lightning storm, all outdoor work on electrical system should cease.

C-1.3 Make a habit of being cautious. Be on the lookout for danger notice plates, danger flags, warning boards and signals, etc. Warn others when they seem to be in danger near live conductors or apparatus.

C-2. PERSONAL APPAREL

C-2.1 Use of overalls, dungarees, jumpers and coats having metal buttons, metal straps and similar metal fittings should be avoided. Bone buttons may be used. Buttons should be sewed in place with thread. Loose clothing should not be worn.

C-2.2 While working on live conductors, do not roll up sleeves as dry cloth gives some protection against shocks.

C-2.3 Do not wear shoes with nailed soles. Shoes should have sewn soles, or preferably rubber soles.

C-2.4 Do not wear suspenders and arm bands with metal buckles or other metal parts. These might come in close proximity to live parts and cause serious, if not fatal, injury.

C-2.5 Metal key chains, or metal keepers for key rings or watch chains should not be worn on the outside of clothing. There is always a possibility that they may come in contact with live conductors or live apparatus.

C-2.6 While welding wear goggles, safety glasses or any other eye protection as instructed by the person-in-charge depending upon the type of work handled.

C-3. TREAT EVERYTHING AS LIVE

C-3.1 Treat all electrical conductors and apparatus always as live and consequently dangerous to human life, unless it is positively known to be dead and properly earthed and take precautions accordingly.

C-4. THINK BEFORE YOU ACT

C-4.1 Think carefully before you act. Make sure you are right. Watch out for the other man and make sure he is right.

C-4.2 Never speak to any person working upon live mains or apparatus, unless the person doing the work is aware of your presence.

C-5. DANGEROUS VOLTAGES

C-5.1 All voltages are dangerous. It shall be borne in mind that even low voltage shock may be fatal.

C-5.2 Every person-in-charge of work on any mains or apparatus shall ensure himself that the same is free from dangerous leakage or induction and has been effectively earthed locally before permitting men to work upon it.

C-6. DANGEROUS AREAS

C-6.1 When working in areas which contain or may contain live mains and apparatus, fix danger notice plates, barriers, rails or other guarding arrangement for the working area. Do not store materials within high voltage enclosures or low voltage areas.

C-7. WARNING BOARDS

C-7.1 Warning boards shall be placed by the person-in-charge on all switchgear before men are permitted to work and should only be removed by the person who has placed them. It is desirable that the person issuing the permit shall place one warning board on the switch energizing the mains for each permit issued so that he can be sure that all the permits-to-work are returned when he has to charge the mains.

C-8. VISITORS AND UNAUTHORIZED PERSONS

C-8.1 Visitors and unauthorized persons shall not be allowed to proceed in the vicinity of live mains and apparatus, unless accompanied by an authorized person whose responsibility it shall be to ensure that his instructions regarding safety are strictly complied with.

C-9. WORKING IN DAMP SITUATIONS

C-9.1 Extra precautions should be taken when working in abnormally damp area.

C-10. USE OF TONG OR CLIP-ON AMMETERS

C-10.1 These shall not be used on high voltage conductors, unless the conductors are lead-sheathed. On low voltage conductors, all persons, not accustomed to the handling of tong or clip-on ammeter, shall be warned of the necessary precautions to be observed before being allowed to use it.

C-11. WARNING THE PUBLIC

C-11.1 When, either accidentally or otherwise, live mains and apparatus constitute a danger to persons in a public place, a person shall be detailed to stand by and personally warn the public until the danger has been removed.

C-12. PORTABLE ELECTRICAL APPARATUS

C-12.1 All portable electrical apparatus shall be regularly examined, tested and maintained to ensure that the apparatus and leads are in good order.

C-12.2 Ensure that all portable appliances are provided with 3-pin plug and socket connections and that the metal work of the apparatus is effectively earthed.

C-12.3 All loose wiring, such as flexible cables for portable lamps, tools and trailing cables and other portable and transportable apparatus, shall be tested regularly at frequent intervals to ensure safety.

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(Continued from page 2)

Panel for Safety Procedures, ETDC 20 / P 35

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