

**The Study on Technical and Safety
Standards for Electric Power Industry
in
Vietnam**

**FINAL REPORT
SEPARATE VOLUME
(SAFETY STANDARDS)**

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JAPAN INTERNATIONAL COOPERATION AGENCY

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Chapter 1: General Provisions

Article 1 Purpose of these Safety Standards

The purpose of these safety standards is to secure the safety and health of workers on working sites, or the public safety by taking appropriate measures for the prevention of electrical accidents.

Article 2 Scope of Application

These safety standards shall apply to workers of an electric company or organization who work on electrical equipment and materials for power facilities, and their managers in the Vietnamese territory.

Article 3 Definition of Words used in these Safety Standards

In these safety standards, the terms listed in the following items shall be defined as follows:

1. "Employer" shall be defined as follows;
 - (1) The owner(s) of a company and the person(s) who is/ are committed to the responsibility of such works as production, management and personnel issues from the owner(s).
 - (2) The president, the vice-president(s) and the chief of an organization, an institution or a unit that employs workers directly.
 - (3) The person who manages the working site, the workshop and the division in charge of these issues directly.
2. "General administrator (Job instructor)" shall be defined as the responsible person who generalizes and instructs all work units of the same company or organization when the work units are involved in one work together.
3. "Supervisor (Direct commander)" shall be defined as the responsible person who directly commands and supervises workers.
4. "Work permitting person" shall be defined as the person who can permit the start of a work to the work unit when he or she has confirmed the security regarding electrical issues at the working site.
5. "Electrical safety supervisor" shall be defined as the person who is appointed to supervise the work unit for securing the safety regarding electrical issues.
6. "Watching person" shall be defined as the person who is appointed to gaze and to warn the

workers or public of any safety issues at the working site.

7. "Work unit" shall be defined as the unit (the group or team) in charge of a management work and jobs concerning electricity. The work unit shall consist of two or more persons.
8. "Worker" shall be defined as the person who belongs to a work unit and carries out the work allocated by the supervisor directly.
9. "Hot line work" shall be defined as the work at the energized facilities that uses special devices and tools.
10. "Work with power interruption" shall be defined as the work at the electrical facilities where electricity from all directions is intercepted
11. "Protective device" shall be defined as the device that is fitted on electricity lines or electrical equipment for the purpose of the prevention of an electric shock, such as an insulating rubber tube and a rubber sheet.
12. "Protective clothing" shall be defined as the clothing that workers wear for the purpose of protection against an electric shock or other accidents, such as an insulating rubber glove, a helmet, an insulating coat, insulating trousers and a safety belt to prevent falling.
13. "Electric facility and material" shall be defined as the facilities and materials such as electric machines, tools, apparatuses, conductive materials, insulating materials and supporting structures. The facilities for thermal power generation such as a boiler and a turbine, and the facilities related to construction engineering, such as a dam, a headrace tunnel and the construction of a power plant, will be excluded.
14. "Specially-equipped vehicle" shall be defined as the vehicle equipped with a special-purpose machine for electric power works.
15. "De-energize" shall be defined as the condition that the electrical facility is disconnected from a source of electricity.

Article 4 Observances of Related Laws and Regulations

The employer and each worker shall observe the laws and regulations related to the safety of

works and public safety.

Article 5 Responsibility of Employer

1. The employer shall ensure the safety conditions for both the workers and third persons around a work site.
2. The employer shall give the required education regarding work safety to the employees in accordance with the related laws.
3. The employer shall plan the inspection for confirming the adequate countermeasures at the working site.

Article 6 Contract Work

When an organization or a person commits to work with the possibility of an electric disaster to another organization or person, the mutual agreement and the clarification of responsibility shall be required for work safety.

Article 7 Safety Devices and Instruments

Safety devices and instruments referred to in these safety standards shall meet the requirements of "Standards for using and testing safety devices in electrical equipment".

Article 8 Other Regulations

1. The safety standard replaces the sector standard No. 25 DL/KT "Standards on Technical Safety for Operation of Equipment at Power Plants and Power Network" enacted by the Ministry of Electricity on the 22nd January 1985.
2. The employer can issue supplementary regulations and / or detailed instructions to ensure safety for equipment with special technical requirements, provided that they comply with this safety standard.

Chapter 2: Setting up a Work Area

Section 1: Installation of Fences and Warning Signs during Operation or Work

Article 9 Warning

It is necessary to install a fence, suitable warning sign or a signaling system to warn the public of dangerous areas and the areas where electrical equipment is installed.

Article 10 Installation Outdoors

When such electrical facilities at a power station, substation, switching station, or similar place where machines, devices or buses with voltage higher than 1,000V are installed outdoors, the employer shall take each of the following measures so that third persons other than operators and workers may not enter the place, and install the warning sign. The same shall not apply to the place where third persons cannot enter.

1. Fences or boarding, etc. are provided.
2. A warning sign to prohibit an entry is installed at an entrance and/or an exit.
3. Locking device or other appropriate device is provided at an entrance and/or an exit.

Article 11 Installation Indoors

When such electrical facilities at a power station, substation, switching station, or similar place where machines, devices or buses with voltage higher than 1,000V are installed indoors, the employer shall take appropriate measures so that third persons other than operators and workers may not enter the facilities.

Article 12 Safety Fence

If the work unit cannot secure the distance stipulated in Table 1 between the work area and the energized part around it, the work unit shall install the fence to insulate the work area from the energized part.

Table 1

Voltage of the energized part (kV)	Allowable minimum distance (m)
up to 15	0.7
15 to 35	1.0
35 to 110	1.5
220	2.5
500	4.5

The distance between the fence and the energized part must not be less than the allowable minimum distance shown in Table 2.

Table 2

Voltage of the energized part (kV)	Allowable minimum distance (m)
up to 15	0.35
15 to 35	0.6
35 to 110	1.5
220	2.5
500	4.5

Article 13 Arrangement of Work Site

Workers shall arrange the work site to constantly prevent persons from being injured.

Article 14 Luminous Intensity

1. The employer shall maintain an appropriate luminous intensity on the work area where workers are engaged in work.
2. The employer shall ensure that lighting and illumination are provided in such a way that workers do not receive a dazzling or striking contrast of light and darkness.

Article 15 Warning Sign in a Work Area

In order to ensure workers' safety and not to inflict harm on the public, the supervisor has to install a danger-warning sign in a dangerous area.

Section 2: Security of Public Safety during a Work

Article 16 Installation of Fences

Workers shall take appropriate measures such as installing fences around the work areas so that third persons may not accidentally enter and inflict an injury on them. Especially in the case of an underground electric line works, also measures necessary for public safety shall be taken to prevent third persons from falling into a ditch.

Article 17 Warning Signs

Workers shall install warning signs to secure public safety before they begin a construction or maintenance work for power facilities when necessary.

Article 18 Work on road or closed to a railway, a river, etc.

1. When workers use a road for such works as construction or maintenance, they can restrict the passage of vehicles or walkers to keep public safety if necessary.
2. When restricting passage, workers shall take necessary procedures in accordance with the regulations of the related organization such as the police.
3. When working on a road, a warning sign shall be installed in a dangerous area in order to prevent harm to third persons.
4. When interfering with the passing of pedestrians, a safe passage shall be secured with a rope, a fence, etc., and a guide shall be arranged if necessary.
5. When restricting the passing of vehicles, the necessary width of a road shall be secured, following the directions of the road administrator and police, a guide shall be arranged if necessary.
6. When works are performed on the line across or closed to a railway, an automobile way, road, and a river where danger can be present to the workers by passing vehicles, workers shall contact the related organization beforehand and request the attendance of person's, arranged by the organization concerned if necessary, in order to secure safety to the worker, a passer-by, and the work method.

Chapter 3: Organization of a Work Unit

Section 1: Work Unit

Article 19 Organization of a Work Unit

One work unit shall consist of at least two workers and include the supervisor who takes full responsibility for the work unit.

Article 20 Assignment of a Supervisor and Workers

The employer shall assign an appropriate supervisor and workers with the ability at the level by which the work is safely performed according to the purpose, the content and the method of the work.

Article 21 Assignment of an Electrical Safety Supervisor

1. The employer shall assign the electrical safety supervisor when the supervisor and the workers do not specialize in electricity and their knowledge, and skills concerning electrical safety are inadequate.
2. The employer shall assign the electrical safety supervisor when the work unit works at an especially dangerous area regarding electricity, or works on an electric line or a ground wire that intersects with an energized high-voltage line.

Article 22 Joint Work by Multiple Working Units

In case of a work in which more than one work unit engage, the employer shall assign the general administrator who is responsible for all work units in addition to the supervisor of each work unit.

Article 23 Responsibility of a General Administrator

The general administrator has a responsibility to administrate and to lead two or more work units generally.

Article 24 Responsibility of a Work Permitting Person

1. The work permitting person shall take responsibility for inspecting the countermeasures regarding electric safety to prepare the work site.
2. The work permitting person shall inform the work unit of the de-energized facilities, the energized facilities or parts and the countermeasures that workers should be careful with.

3. The work permitting person shall sign a work sheet and take over the site to the work unit.

Article 25 Responsibility of an Electrical Safety Supervisor

1. The electrical safety supervisor shall take over the work site together with the supervisor.
2. The electrical safety supervisor shall surely attend the working site to supervise the electrical safety for the workers and shall not do the other duties.

Article 26 Allowable Single Worker Work

A person who is on an administrative position or has been assigned a special duty (patrol on a transmission line or inspection for power facilities) is allowed to do single worker work. He or she shall constantly pay close attention to energized transmission lines or power facilities during the patrol or the inspection.

Section 2: Roles of a Supervisor

Article 27

The supervisor shall cooperate with related organizations closely and administrate and control the work unit so as to promote a work safety and to endeavor to keep a public safety.

Article 28

1. The supervisor shall clearly understand the contents of the assigned work and suitable safety measures for the work.
2. The supervisor shall have the following responsibilities:
 - (1) Re-check necessary measures for safety and sufficient implementation of them.
 - (2) Observance of the regulations concerning the safety of workers
 - (3) Quality of safety appliances and equipment used while working
 - (4) Installation, moving and removal of an electric safety sign, fence and an earth for work, and dissemination to all workers.

Article 29

The supervisor shall check the state of workers' health, physical condition, etc., before starting work. When the supervisor judges that it is difficult for workers to carry out normal work, the supervisor must not let the workers engage in work.

Article 30

The supervisor shall explain, in advance, the contents, method, procedure of operation of the work, and safety measures to workers.

Article 31

The supervisor shall attend the work site throughout the work and supervise each worker so that he or she may not take dangerous actions.

Section 3: Attitude of a Worker

Article 32 Obligation of a Worker

1. Workers shall realize the requirements of these safety standards and the rules related to work safety correctly and become aware of the latent dangers so that they can carry out the work safely.
2. Workers shall obey the directions of the supervisor and shall not do the work that the supervisor has not ordered. If it is impossible to do the work in accordance with the order of the supervisor, or if judging that it is dangerous to do the work in accordance with the order, the worker shall stop the work immediately, report it to the supervisor and receive an instruction from him or her.
3. The worker who finds that the order of the supervisor cannot be followed, his work is against the safety standard and that the safety of equipment, safety tools or working conditions are not enough, they can then refuse a direction from the supervisor. The worker shall report it to an appropriate responsible person immediately.

Article 33 Prohibition of entry to dangerous area

Workers shall not enter the following areas.

1. The area where entry is prohibited by the supervisor
2. A dangerous area where an accident may occur.

Article 34 First-Aid for the victims

1. A work unit shall carry first-aid kits with it when it goes to the work site.
2. When an accident occurs, workers shall endeavor to treat first aid to the victims.

Chapter 4: Protective Clothing and Devices

Article 35 Use of Protective Devices

1. The supervisor shall direct workers to use appropriate protective clothing and/or devices such as protective clothes, hard hats, insulation clothes and rubber gloves that are appropriate for the content of the work. Workers shall use protective clothing and/or devices when directed by the supervisor.
2. If the work is conducted nearby a line with 220kV or more and there is a possibility of an electric shock due to electrostatic induction, workers shall be equipped with conductive clothes and conductive shoes to shield their body from electricity caused by electrostatic induction.

Article 36 Periodical Check and Maintenance for Protective Clothing and Devices

1. Workers shall check the protective clothing and devices periodically in accordance with the existing laws and the standards of the manufacturer and maintain their performance.
2. It is prohibited to use protective clothing and safety devices that have not been tested or whose valid period of use expires. Workers shall not use protective clothing and devices with symptoms of abnormality either.

Article 37 Use of Appliances and Equipment for Hot-line Repair Work

The supervisor shall require workers to use appliances and/or equipment for hot-line repair work in accordance with the content of work. Workers shall use appliances and/or equipment for hot-line repair work when required by their supervisor.

Article 38 Daily Inspections

1. Before starting work, workers shall carefully inspect their protective clothing, protective devices, appliances and apparatus for hot-line work, and confirm that they are in good condition.
2. After using protective clothing, protective devices, appliances and apparatus for hot-line work, they shall be checked to see whether there is a crack in them or not, dirt on them shall be removed. Moreover, these apparatuses shall be kept by proper measures. Workers shall report to the supervisor when they find the symptoms of abnormality in the protective clothing, protective devices, appliances and apparatus for hot-line work.

Article 39 Periodical Inspections and Maintenance for Appliances and Equipment for Hot-line Repair Work

1. Appliances and equipment for hot-line work shall be inspected periodically in accordance with applicable standards and shall be maintained and kept in accordance with applicable regulations.
2. It is prohibited to use safety appliances and equipment and labor protection for hot-line work that have passed inspection period or whose valid period of use expires.

Article 40 Conveyance of protector

Protective devices for hot-line work must be stored in a special container in order to prevent damage, change of shape, and adhesion of oil during conveyance.

Chapter 5: Common Measures for Safety

Section 1: Work Planning

Article 41 Preparation of a Work Plan

The employer shall make a reasonable work plan considering the contents and process of the work. A work plan shall be arranged by all related sections.

Article 42 Procedure for a Work

In the case that a work on facilities with voltage over 1,000V is performed with power interruption, the supervisor shall decide the necessary items such as the chain of supervision and the procedures of the work in writing prior. The document shall be submitted to the operation management unit beforehand.

Article 43 Cancellation or Postponement of a Work in case of Bad Weather

In the case of bad weather such as heavy rain, strong wind, thunderstorm, lightning or heavy mist, works for outdoor equipment shall be cancelled or postponed depending on the situation. In the case of rain and mist, the works using safety devices for insulation shall be prohibited.

Section 2: Work Order and Work Sheet

Article 44 Scope of Application

The work on electric facilities, the work near the energized facilities and the work in the similar situations shall be performed in accordance with the following regulations.

1. The work sheet shall not be required in the case that the countermeasures to prepare the work site are not necessary, that the work is performed with adequate distance from the energized parts, that the operators are involved in the emergency work to recover the troubled facilities and that workers in charge of a repair work under the supervision of the operating manager of the concerned facility are involved in the emergency work.
2. The following works shall be performed in accordance with the work sheet.
 - (1) Work with power interruption
 - (2) Hot line work
 - (3) Work near the hot line.

Article 45 Submission and Approval of Work Sheet

1. The work sheet is the form to admit the work on the electric facility.
2. The work unit shall receive the work sheet when a work sheet is required for the work. The supervisor can receive only one work sheet for one work item.
3. The supervisor can undertake the necessary safety countermeasures and its inspection, and order the workers to start the work at the working site, only after receiving the work sheet.

Article 46 Contents of a Work Sheet

Work sheet shall include the following contents.

1. Name of the person who issues the work sheet
2. Name of the general administrator (when assigned)
3. Name of the electric safety supervisor (when assigned)
4. Name of the work permitting person
5. Name of the supervisor
6. List of names of workers
7. Content of work
8. Place of the work site
9. Period of the work (time, day, month and year)
10. Work conditions (work with power interruption, hot-line work or work near hot line)
11. Working areas
12. Safety measures performed on the working site
13. Indication or warning for the work unit
14. Other necessary information
15. Confirmation of the completion of the work

Article 47 A Work Order

1. A work order means the order that is communicated orally, by telephone or by means of written documents. The staff who accepted a work order shall record the contents of the order in the daily note. The person who announced the work order, the working site, the start time and the name of the supervisor and workers shall be recorded clearly in a daily note. The daily note shall have the column in which the completion of the work will be recorded.
2. The following tasks can be performed only by a work order.
 - (1) Opening or closing the operation of switchgears, recovery work from an accident

- (2) A work performed apart from a hot line
- (3) A simple, slight or brief work performed by an operator of the facility concerned or the other staff under supervision by the operator

Section 3: Confirmation of Safety Measures before starting a work

Article 48 Confirmation of Safety

Before starting a work, a supervisor shall confirm that the technical measures for safety on the working site have already been implemented appropriately and adequately.

Article 49 Inspection of Tools

Workers shall check the condition of such tools as a voltage detector, protective clothing and protective devices before work.

Section 4: Principles for safety during a work

Article 50 Operation with Heavy Materials

When hanging up and down a heavy material, a worker shall observe the following rules.

1. It is prohibited for a worker to enter the area below a heavy material.
2. A wire rope hanging on a heavy load shall have enough strength to endure the weight of the material.
3. The hook and pulley hanging the wire rope with a heavy material shall be locked to prevent it from dropping off.

Article 51 Conveyance of Heavy Equipment and Materials

When conveying heavy materials, appropriate measures shall be taken in order to assure safety.

Article 52 Prevention of Disability due to Vibrating Tools

The tool, which generates vibration at the time of use, such as a chain saw and a tamper, must be used appropriately so that worker may not be inflicted a disability through the vibration.

Article 53 Check before Climbing Supporting Structure

1. Before climbing a supporting structure, workers shall preliminarily inspect or check the following items:
 - (1) Condition of the foundations
 - (2) Position of the scaffolds and the safe climbing route according to the design of

conductors on the pole

(3) Judgment of necessity for protective clothing and devices

2. If it is necessary to climb up the pole whose strength is not enough, workers shall take appropriate measures in order that the pole may not fall down and that the worker may not be injured.
3. The supervisor shall suspend a work if he finds something threatening the safety for workers.

Article 54 Check of Discharging and Current Leakage before Climbing a Pole

When climbing a utility pole, workers have to check power outage and earth leakage by means of voltage detectors etc. in order to prevent an electric shock by touching an energized parts or an earth leakage.

Article 55 Use of Lift Equipment

When working at the place whose height or depth exceeds 1.5 [m], the worker shall use such a tool as a ladder for going up and down safely.

Article 56 Prevention of Fall

During the work on a supporting structure, workers shall use a safety belt. The hook of the safety belt shall be anchored to the supporting structure steadily.

Article 57 Prevention of dropping Materials or Tools from Pole

Workers working on poles shall be careful not to drop materials or tools from the pole. When a worker on the ground hands materials and tools to the worker on the pole, he or she shall take appropriate measures in order not to drop them to the ground.

Article 58 Work on Pole

1. When erecting or removing a pole, necessary measures for preventing the inclination and the collapse of the pole must be taken.
2. When erecting or removing a pole close to electric wires, suitable measures must be taken so that the accident due to the contact of the pole or the damage on electric wire may not take place.

Article 59 Work of electric wire

1. When carrying out stringing or removal work of electric wires, public safety must be ensured by the arrangement of a watch etc. in addition to a danger-warning sign if necessary.

2. When carrying out stringing or removal work of electric wires, the state of deterioration of the supporting structure and the guy wire shall be checked, and the measures of collapse prevention such as the installation of a temporary guy wire must be taken, if necessary.

Article 60 Work on Transformers, Electrical Equipment

When loading, unloading or disassembling electrical equipment such as a transformer, switchgear and an insulator, suitable measures must be taken so that accidents do not occur by the violation of safety distance to electric wire or other electric equipment.

Article 61 Excavation Work

1. When carrying out excavation, the supervisor must instruct workers to take suitable measures for the prevention of accidents due to a landslips etc. on site:
 - (1) The place where the foundation is not firm
 - (2) The place with much groundwater
 - (3) The place through which vehicles pass or close to traffic way
 - (4) The place close to a multistory building
2. In order to prevent third persons from falling down the hole, the work unit shall take the suitable measures such as the installation of a fence, an alarm light and the arrangement of a guard.
3. Whenever there is or there seems to be underground facilities such as a gas tube, a water tube, a sewer tube, communication cable and power cable, workers shall collect the necessary information such as the position and the depth of the existing underground facilities, and take appropriate measures to prevent an accident and damage to the underground facilities concerned. If finding an unexpected underground object during the work, the work unit shall suspend the work, report to the responsible person and wait for an order from the responsible person. If an existing underground facility is accidentally damaged by the work, workers shall take appropriate measures to prevent a second accident and inform the related sections of the accident immediately.
4. On ground that has moisture without deposit water and is far from underground works, it is allowed to dig up a trench and a cable hole with a vertical edge without driving pales in depth of not over, provided that there are no groundwater veins and no underground facilities near the digging point:
 - (1) Sandy land: 1m
 - (2) Mixed sandy land: 1.25m

(3) Mixed clay or clay or yellow soil: 1.5m

(4) All kinds of tight land: 2m

5. If the conditions are not within the above 4 conditions, workers shall dig according to the slope without driving pales for earth retaining. In the case of digging according to a vertical edge, pales for earth retaining must be driven.

6. In the case of digging over the depth level regulated in the above clause, the lean of the cable trench that is allowed to dig without pales for earth retaining must be conformed to those conditions described in Table 3.

Table 3

Land	The declination of slope (degree)	Depth - Width Rate
Land that has natural moisture	76	$1 : 0.25$ $\tan^{-1}(76)$ 4
Moist sandy and gravel land but not saturated	63	$1 : 0.50$ $\tan^{-1}(63)$ 2
Clay that has natural moisture, mixed sandy land	76	$1 : 0.25$ $\tan^{-1}(76)$ 4

Section 5: Measures in case of Suspension of a Work

Article 62 Suspension of a Work

When a work is stopped before being completed, safety measures such as earthing works, the installation of fences, warning signs shall remain to be taken during the interruption of the work. If there is no member who remains on the work site at night, workers shall take additional appropriate measures such as a warning indicator so that third persons may not be inflicted by an injury.

Article 63 Measures at the time of discovering unusualness of equipment

1. When discovering damage to equipment with a possibility of inflicting harm on the public by inspection etc., the worker has to report to the responsible person immediately after taking emergency measures so that it does not inflict harm on third persons.
2. When receiving a report on the damage of equipment where there has been the possibility of inflicting harm on the public, the employer has to take suitable measures immediately.

3. When there is the possibility of third persons contacting a hot line and receiving an electric shock in such case as breaking a hot line, the employer has to interrupt power supply immediately. In case the power supply cannot be interrupted, suitable measures, such as arrangement of a watching person, have to be taken so that it may not inflict harm on third persons.

Article 64 Measures for Accidents

If an accident such as the breakdown of material or equipment, or the injury of persons has occurred, the supervisor and workers shall stop the work immediately and observe the following rules.

1. The supervisor and workers shall take suitable measures to prevent a second incident. However workers shall not approach the damaged facility if it appears to be dangerous.
2. The supervisor and workers shall contact an emergency medical organization. They will give a first aid to the injured person, if possible.
3. They shall inform the concerned organizations of the accident immediately.

Article 65 First-Aid Treatment

Workers shall endeavor to take the following measures to help a sufferer when a disaster has happened.

1. First aid remedies such as artificial respiration and blood stanching
2. First aid arrangement (calling a doctor, calling an ambulance etc.)

Article 66 Stop and Suspension of a Work

The supervisor shall order the stop or the suspension of work to workers if necessary, and when the weather conditions become dangerous.

Section 6: End of Work

Article 67 Items before Handover

The supervisor shall implement the following items in descending order.

1. The supervisor shall order the workers except the worker who will remove the safety measures to withdraw from the work site.
2. The supervisor shall order the workers to remove the measures for safety that were installed before the work by the work unit.
3. The supervisor shall check the numbers of the workers, tools, materials or devices for safety and

assure them.

4. The supervisor shall prohibit workers from going back to the work site.

Article 68 Handover of Site

When a worker hands the work site over to the site manager after finishing the work, the worker shall report the completion and the result of the work to the site manager. Especially for emergency treatment or a temporary operation, he shall report on the detailed contents of it.

Chapter 6: Measures for Work on Electrical Equipment

Article 69 Work with Power Interruption

1. When a worker operates the switches for the power supply circuit to a facility, the worker shall use the appropriate safety device or tool.
2. When the work unit is involved in the work with power interruption, the work shall be carried out on condition that the workers can confirm visually that the concerned facility is separated from all energized parts. The same shall not apply to GIS facilities.

Article 70 Switching Devices connected to Equipment

1. When the work is performed while stopping equipment such as a power generator, a synchronous compensator and a transformer, all the switching devices connected to the electric power lines or the equipment shall be opened in order to prevent unexpected energization of the equipment.
2. If it is necessary to raise the insulation resistance of a winding before the parallel operation of generators, the work shall be implemented in accordance with the authorized regulations and task procedures.

Article 71 Flammable Dangerous Substance

1. In the case that there are flammable dangerous substances such as petroleum, hydrogen, acetylene generated or stored, the work that needs fire or has a possibility of generating a spark shall be prohibited. Warning signs shall be indicated which show that smoking or another behavior that needs fire is prohibited.
2. It is not allowed to create an explosive hydrogen mixture as well as oxygen during the operation of a generator or a synchronous compensator with a hydrogen cooling system. This mixture is much likely to blast in case the ratio of hydrogen accounts for 3.3 to 81.5%.

3. It is not allowed to create an explosive hydrogen oxygen mixture during the operation of electrolysis equipment. This mixture is much likely to increase the ratio of hydrogen in oxygen account from 2.63 to 95%.
4. During maintenance work on the oil pressure system or a gas circulation system of a generator or a synchronous compensator with a hydrogen cooling system, or electrolysis equipment, some measures against fire and explosion shall be taken to secure the safety, such as a blow to the gas circulation system, ventilation of the working area and separation of the system from the other running system.
5. Workers must not do the work that needs fire or generates spark directly above the sheath of an electric generator or electrolysis equipment, or directly above the tube of an oil or gas system that contains hydrogen.
6. The work that needs fire such as electric welding, oxyacetylene welding, etc. can be done only if the working site is over 10m from an oil or gas system that contains hydrogen. When the distance is 10m or less, special safety measures shall be taken such as the installation of a protection plate and the inspection of hydrogen in the air of the working place.
7. The work that needs fire in the room where electrolysis equipment is installed can be done only if all of the following measures have been taken:
 - Stopping of the electrolysis equipment
 - Confirmation that the air does not contain hydrogen by means of an air analysis
 - Continuation of running of the ventilation systemWhen it is necessary to do the work that needs fire above other electrolysis equipment which is unable to stop running, the work unit shall separate all pipes of the running equipment from the pipes of the equipment to work in addition to the above measures. The work site where fire is used shall be guarded so that sparks may not scatter to its surround.

Article 72 Operating the Electric Motor

1. When carrying out work on a motor without detaching the part of the motor or the actuation system for the motor, workers shall lock the actuation system and hang up the warning sign to prohibit a wrong switching operation.

2. When carrying out work on a motor, each phase of which is removed from a power supply circuit, workers shall shorten the three wires and shall ground the combined three terminals of the circuit supplying power to the motor at the power source side.
3. The output terminal and the cable corns of a motor shall be attached with guarding covers, and guarding covers shall be fixed firmly by bolts. All the rotation parts of electric motors such as collector rings, flywheels connected to an axis and the ventilation fans shall also be guarded in a similar manner.
4. Some measures shall be taken against the counter rotation of the electric motor before working at the electric motor of the pump or the blower.

Article 73 Work with Switchgear

1. Before working with the switchgears that have a set of the automatic actuating mechanisms and remote control function, it is necessary to take the following measures:
 - (1) Dismantle the power source of the control circuit.
 - (2) Close the valve that leads compressed air to the container of the circuit breaker or the set of the actuating mechanism and let all air out.
 - (3) Hang up the warning sign to prohibit wrong operation.
 - (4) Lock the valve that leads compressed air to the container of the air switchgear or dismantle the handling rod of the valve in case the worker has to work in the container.
2. When testing switching on and off to adjust switchgears, the workers are allowed to supply power temporally to the operation circuit, the power supply circuit of the driving part and the warning signal circuit. During the testing, such jobs as power supply of the control circuit, opening gas valves and removal of warning signs, shall be performed by the operator or the supervisor (in case that the operator agreed).

After testing, if it is necessary to continue the works at the switchgear, the operator or the supervisor (in case that the operator agreed) must take necessary and technical measures to allow the work units to work.
3. Before working in the gas tank, workers shall take the followings measures.
 - (1) Close all the valves of the gas pipe lock them or dismantle the handling rod and hang up a warning sign to prohibit a wrong operation.
 - (2) Let gas out from the tank and open the valve that lets the gas out.

4. During operation, every switching operation of a circuit breaker shall be controlled remotely. It is prohibited to push the operation button at the controlling box of a circuit breaker. Workers are only allowed to switch off the circuit breaker by this button when they are preventing a fault or saving the person who is suffering from an electric accident.
5. In case the circuit breaker has been remotely switched off but the circuit breaker hasn't been cut off or the poles of the circuit breaker haven't been cut off completely, to switch off the circuit breaker by the operation button on the spot is prohibited.

Article 74

1. Space necessary for operation and maintenance works implemented inside a cubicle shall be secured on the upper side, lower side, or lateral side of the inner equipment, in order to prevent accidents.
2. If there are any charged parts that are exposed inside an opened cubicle, these parts shall be covered with protective devices so that workers cannot touch them easily during a daily work.

Article 75 Discharge of Residual Charge

Workers shall discharge the residual charge of a cable and install an earth for work before starting a cable work with cutting off the power.

Article 76 Use of Bulldozers

1. It is prohibited to use a bulldozer on the condition that the distance between the bulldozer and a cable is less than 1m. The bulldozer with vibrant operation cannot be operated on the condition that the distance between the bulldozer and a cable is less than 5m.
2. When digging in the area where a cable may be buried, workers shall define the position and the depth level of the cable by trying to dig under the supervision of the supervisor. When digging to the depth level of 0.40 m far from the cable, workers shall not use a crowbar or mattock but shovel to dig up.

Article 77 Placement of the cables

A rough road shall be mended before rolling the cable coil on it so that the cable may not be collapsed. And workers shall pull out all of the nails on the face of the cable coil and attach tightly to the tip of the cable.

Article 78 Cables Stripping

When stripping both sheath and insulation layers of a cable, workers shall be careful not to get injured by the tool, and not to hurt others. Workers shall be careful not to damage the other part of the cable.

Article 79 Instrument Transformer

When carrying out work on a measurement circuit or a protection circuit, workers shall be careful not to affect the earthing part on the secondary side of an instrumental potential transformer or an instrumental current transformer. Moreover, the secondary side of an instrumental current transformer must not be opened.

Article 80 Safety Measures for Battery System

1. Workers shall prepare the neutralization reagent for both acid and alkali for a battery systems.
2. When dealing with acid or alkali, workers shall take appropriate measures such as wearing specific clothes, eye-protective glasses and rubber gloves to protect their body from acid or alkali.
3. It is prohibited to smoke or carry tobacco in the battery room. It must be written clearly "Battery room - No fire - No smoking" on the room door.
4. The room where a battery system is installed shall be ventilated by means of ventilation equipment to prevent the poisoning or explosion due to gas generating from the battery system.

Chapter 7: Measures for Work with Power Interruption

Article 81 Earth for a work

The work unit shall perform the following items in order.

- (1) Inspect and confirm a de-energized working site.
- (2) Install the earthings so that they can protect all workers of the work unit.
- (3) Install the earthings on all parts of the de-energized facilities where the power supply can be possible.

Article 82 Handling of earth for work

1. Workers install and remove earth for work on the instructions from the supervisor.
2. When two or more work units are engaged in work together, each work unit shall install an earth for work independently so that it is connected with each working place.
3. If it is necessary to remove an earth for work while the work is being carried out, or if an earth for work is separated from the electric power line after the switchgear is opened, workers shall take appropriate measures according to the instructions from the supervisor and reinstall an earth for work.
4. When installing and removing an earth for work, the worker shall use protective clothing and devices such as an insulating stick and gloves.
5. An earthing wire shall be a copper wire or soft alloy that has enough electric and mechanical strength and shall be the twisted wire.
6. When installing an earth for work, the line side shall be installed after the earth side is installed first. Conversely, when removing earth for work, the line side shall be removed after the line side is removed first.

Article 83 Direction for Starting Work

The supervisor shall not give the directions to start work to workers until it is clear that the electrical circuit concerned is surely de-energized and safety measures have been taken.

The supervisor shall take necessary measures for preventing unexpected power supply to the de-energized sections.

Article 84

If there are several circuit breakers, disconnectors, cable heads, etc., their identification such as feeder names, circuit numbers and equipment numbers shall be demonstrated clearly on them to prevent wrong operations.

Article 85

1. When switching on and off electrical lines or equipment, workers shall use a circuit breaker or a load switch that has sufficient ability to switch on and off the load current.
2. It is prohibited to use a disconnector to switch on and off an electric line with load current.
3. When operating a disconnector, it shall be confirmed surely that the line has no load.

Article 86

One of the following measures shall be taken for the opened switching devices during the work in order to prevent them from being switched on accidentally.

1. Locking or inter-locking its actuating part or control circuit
2. Installation of the warning sign showing prohibition of energization
3. Arrangement of a watching person, if necessary

Article 87 Discharge of Residual Charge

1. The closed circuit which includes cable, or capacitor etc. and has a danger of damage due to residual charge, shall be discharged in a safe way.
2. When discharging residual charge, it shall be regarded and handled as a hot line state, and protective clothing shall be used.

Article 88 Implementation of voltage check

1. When carrying out work with power interruption, workers shall check that the electrical circuit concerned is surely de-energized by a voltage detector etc. before installing earthing for work.
2. When a hot electrical circuit is installed on the same utility pole other than the electrical circuit, which was de-energized, workers shall check an earth leakage by a voltage detector etc. before implementing the work.
3. In the case that a de-energized electrical circuit is close to or crossing a high-voltage circuit,

workers shall check induced voltage by means of a voltage detector. When induced voltage is detected; the worker has to notify the supervisor. In order to ensure the worker's safety, the supervisor has to instruct suitable countermeasures such as an earth for work, and must not allow the start of the work until those countermeasures are taken.

Article 89 Prevention of Reverse Side Voltage

1. Workers shall install an earth against inverse voltage on the secondary side of the transformers to prevent an electric shock of workers due to inverse voltage from the low-voltage circuits, if necessary.
2. When cutting off a line with voltage up to 1000V, if there is a possibility of energizing the line from generators owned by a customer who is supplied power from the line, a worker shall separate the generators from the line and install an earth against the voltage from the generators.
3. When removing the earth, the earthing phase (N phase) shall be removed after removing the voltage phases first.

Article 90 Power Supply

The supervisor can hand over the work site to the equipment management section or the operation management section only after he or she finishes confirming that the work has been wholly completed and that the measures such as shortening a circuit and an earth have been completely removed.

Chapter 8: Measures for Hot Line Work

Article 91 General

1. When carrying out a hot line work, appropriate protective clothing and protective devices shall be used.
2. A metallic part of electric facilities such as a crossarm, and a case of transformer, etc. related to the high-voltage or low-voltage hot line works shall be checked by means of a voltage detectors to confirm that there is no earth leakage before work, if the worker has a fear of touching or coming close to it and suffering from an electric shock.
3. In the case of hot line work or work conducted nearby an energized line, a worker shall not put on accessories such as finger rings, watches and metallic objects etc.
4. When carrying out hot line work, the operating place on the supporting structures must be safe for workers to confirm visually the closest energized conductor.

Article 92 Conditions of hot line work

1. Facilities that workers are allowed to implement work on without power interruption including hot line work, shall be approved by the authorized person.
2. The worker who is involved in the hot line work shall receive the training or the exercise regarding relevant facilities, regulations and engineering beforehand.

Article 93 Measures for a Work with Voltage over 1000V

1. The employer shall, when in an operation handling a charged electric circuit with voltage over 1,000V, such as inspection, repairing and cleaning of a line or their supporting insulators there is the danger of an electric shock to workers engaged in such an operation, they must take one of the following measures.
 - (1) Have workers use appliances for hot-line operation; in this case, for the worker's body, the minimum allowable proximity shown in the right column of the Table 4 shall be maintained according to the working voltage of charged electrical circuit shown in the left column of the same table.

Table 4

Voltage of Hot Line (kV)		Minimum Allowable Proximity (m)
up to	35	0.6
35	to 66	0.8
66	to 110	1.0
110	to 230	2.0
230	to 400	3.0
400	to 500	4.0

(2) Have workers use apparatuses for hot-line work; in this case, the danger of electric shocks that may occur when the body of a worker or an electric conductor handled by workers such as metal tools and materials (hereinafter referred to as "worker's body, etc.") contacts or comes in proximity to a substance having an electric potential different from the electric potential of the charged electrical circuit handled by workers shall be eliminated

2. Workers shall, in the operations described in the preceding paragraph, use appliances for hot-line work or apparatuses for hot-line work, when so instructed by the employer.
3. Workers shall not carry out hot line work alone. In case of emergency, the worker shall not carry out the work until he or she notifies the person who is in charge of the management of him or her and receive instructions.
4. When tools or parts made of metal are lifted up on the pole during hot line work, it is necessary to make sure that they cannot reach the conductor with the distance shorter than Table 2.

Article 94 Measures for a Works with Voltage up to 1,000V

1. The employer shall, when in an operation handling a charged electric circuit with voltage up to 1,000V, such as inspection, repairing of a line where there is the danger of an electric shock to workers engaged in such an operation, take one of the following measures.

- (1) Have workers wear appropriate protective clothing or use appropriate appliances for hot-line work.
- (2) Make workers cover the charged parts of power facilities with protective devices so that he or she may not be put in danger.

2. Workers shall, in operations described in the preceding paragraph, wear personal insulating protective equipment or use appliances for hot-line operation, when so instructed by the employer.

Article 95 Use of Baffle Plate

On power lines with voltage up to 35kV, when the distance between the conductor and the center of the wooden pole or the body of steel pole, and the body of concrete is less than 1.5m, but not less than 1.0m, it is allowed to conduct works on the body of the pole, but baffle plates made of insulation materials must be used to protect workers exposed to the line or insulator.

Article 96 Repair work on a hot electric line

It is allowed to implement repair work on a hot electric line, only when all the conductors and poles are absolutely firm. It is necessary to reinforce the supporting structure firmly before the conductors are replaced, if the structural part of the supporting structure does not have enough strength.

Article 97 Replacement of Chain Insulators

When suspension insulators on the line with voltage 110kV are replaced, it is allowed to touch with the first and the second bowl from the beam of the step for hot-line work; and on the line with voltage 35kV, it is only allowed to touch with the first bowl if the suspension insulators chain have two bowls and the first bowl and the head of the second one if the insulator chain has three or four bowls.

Article 98 Cleaning of Insulators without cutting off the power

Cleaning work of suspension insulators without cutting off the power shall be conducted by at least 2 workers. And they shall wear insulating gloves and use the cleaning tool installed on the top of the specialized insulated rod.

Article 99 Apparatus for hot-line work, voltage of which is equal with the conductor

1. Workers must not touch with an insulator head or other parts with voltage different from that of the conductor when they stand on an apparatus for hot-line work that has equal-voltage with the conductor. When parts with different voltage of the phase being repaired (such as between the conductor and insulator installed on the sections of the conductor etc.) are erected, insulated gloves must be worn.
2. Workers must not hand over and receive devices, tools or materials while standing on the working section of an apparatus for hot-line work that has equal voltage with the conductors.

3. Workers must not move on an apparatus for hot-line work after its voltage has been equal with the voltage of the conductor. They are only permitted to enter and go out of the working section of an apparatus for hot-line work after they have kept the following distance from the conductor shown in Table 5.

Table 5

Operation Voltage (kV)	Minimum distance (m)
Up to 110	0.5
220 to 230	1.0
400 to 500	2.5

Chapter 9: Measures for Work near a Hot Line

Article 100 Work near a hot line with voltage over 1,000V

1. If there is a possibility of an electric shock to workers engaging in work and coming in proximity to a hot line with voltage over 1000V, the employer shall take one of the following measures:
 - (1) The workers shall be equipped with appropriate protective clothing or protective devices for hot-line work.
 - (2) The workers shall abide by the minimum allowable proximity distance stipulated in Table 4. In such cases, the warning display announcing the minimum allowable proximity distance shall be set up at a conspicuous place, or the observer shall be placed.
2. A worker shall use the protective clothing and/or protective devices when instructed by the employer.
3. If it is impossible to keep the minimum allowable proximity stipulated in Table 4, the employer must not have workers do the work near the hot line. In such cases, workers shall do the work with power interruption.

Article 101 Work near live line with voltage up to 1,000V

1. If there is a possibility of an electric shock to workers engaging in work in close proximity to a hot line with voltage up to 1,000V, the employer shall order the workers to cover the charged parts

of power facilities with protective devices so that they are not in danger.

2. Workers shall use appropriate protective clothing and protective tools even if they have covered the charged parts of power facilities with protective devices.
3. Workers shall use the protective clothing and protective devices when so instructed to by the employer.

Article 102 Replacement of Conductors at Crossing point

1. In the case that the worker has a fear that the conductor might be dropped or loosened in the span that intersects with another existing electric line with voltage higher than 1,000V (for instance, removal or overhead conductor work by the insulator ream head), the work can be performed without power interruption of the electric wire concerned only when it is necessary to repair conductors of an electric line under the conductors of another hot line.
2. When replacing conductors in the span that intersects with another existing electric line, it is necessary to bind the rope to both ends of the conductor before the installed conductor is pulled and raised to prevent it from touching the other hot line. Moreover, it is necessary to fix the end of the wire to the ground firmly.

Article 103 Working with the Ground Wire and Conductor

When the work on the ground wire is done on the supporting structure located in the area electromagnetically influenced by a hot line , it is necessary to install the short-circuit wire between the ground wire and the iron pole, or the earth wire of the wooden pole or concrete pole to remove the induced voltage. When the work with the conductor is done on the supporting structure located in the area electromagnetically influenced by a hot line , it is necessary to ground the conductor in a cross-arm of the iron pole or the earth wire of the wooden pole or concrete pole to prevent the risk of induced voltage to the workers.

Article 104 Use of Steel Cables

1. Allowable minimum distance between steel cables (pulling cable, braking cable etc.) and steel ligament to the conductor of the hot line shall be described in Table 6.

Table 6

Voltage of Hot Line (kV)	Allowable minimum distance (m)
Up to 35	2.5
60 to 110	3.0
220 to 230	4.0
350 to 500	6.0

2. If there is a fear that steel rope moves closer to an energized conductor at a distance shorter than the value stipulated in the above table, stretching rope should be used to pull the steel rope far enough from the conductor. Steel cables (pulling cables) must be arranged in order that they may not be thrown over towards the energized lines even if they are broken off or swayed by accident.

Article 105 Works on a Discharged Line with Other Lines on the Same Pole being Charged

1. Working while climbing up an electric pole with plural circuits while one or two circuits are interrupted and the other circuit(s) is/are alive, the allowable minimum distance between the two closest conductors of two circuits shall be described in Table 7.

Table 7

Voltage of Hot Line (kV)	Allowable Minimum Distance (m)
up to 35	3.0
66	3.5
110	4.0
220 to 230	6.0

2. As for the line with voltage 35kV, when the distance between the two closest conductors of two circuits is shorter than 3m, but not less than 2m, it is allowed to perform works while climbing up a pole at the cut-off circuit while the other circuit is live (except for pulling of lighting wire) only if insulated baffle plates are used.

3. The above works shall be prohibited when it is so windy that workers are in danger of an electric shock due to the sway of energized wires or cables.

Chapter 10: Measures for Work at Site in danger of Oxygen Deficiency

A work unit shall take the following appropriate measures at the site where there is a possibility of such a risk as the oxygen deficiency.

Article 106 Measures before Work

1. Installation of Guard Fence

Appropriate measures such as installation of a guard fence shall be taken to prevent third person from entering the work site. The warning sign showing the danger shall be set up at a conspicuous place.

2. Arrangement of Rescue Tools

A working unit shall carry rescue tools such as self-contained-compressed air breathing apparatus and face guards with hosepipe with it. Workers shall put the rescue tools at the place where they can be immediately be used in case of emergency. The number of self-contained-compressed air breathing apparatuses shall be more than the number of members of the work unit.

3. Measurement of Density of Oxygen and Noxious Gas

(1) A worker shall measure the density of oxygen and noxious gas to make sure that the density should be within the permissible limits stipulated in the Table 8. The result of measurements shall be recorded.

Table 8

Kinds of Gas	Density required for Safety Work
Oxygen	18% or more
Carbon monoxide	0.005% (50ppm) or less
Flammable Gas	less than 30% of lower explosion limit
Hydrogen Sulfide	10ppm or less

(2) When a worker detects that the density of flammable gas is not within the permissible values in Table 6, the supervisor shall order the workers to escape to a safe place, not to use fire or products causing ignition immediately and to take appropriate measures such as ventilating the work site.

(3) If the density of oxygen and hydrogen sulfide is not within the permissible in Table 8, workers shall ventilate the working site so that the density of oxygen should be 18% or more and that the density of hydrogen sulfide should be 10ppm or less.

4. Pure oxygen must not be used for ventilation.

Article 107 Measures during Work

1. Ventilation

The work site shall be ventilated sufficiently by means of ventilation equipment so that the density of oxygen should be constantly kept within a safe level during work.

2. Use of Products Causing Ignition

The use of fire and products causing ignition shall be prohibited, unless it is necessary for the work. When it is necessary to use fire and products causing ignition for work, a worker shall use them on the ground or in another place as much as possible.

3. Disposition of a Watching Person

A supervisor shall dispose a watching person during the work in order to keep contact with the workers inside the work site.

Article 108 Measures against an Accident

1. Evacuation

When a worker becomes aware of the possibility of an accident such as explosion or oxygen deficiency in the work site, he or she shall inform the supervisor of it. The supervisor shall judge the situation and, if necessary, order the workers to stop the work and to escape from the work site to a safe place immediately. The work unit shall take necessary measures to avoid the accident as much as possible.

2. Medical Examination and Treatment

The employer shall arrange the worker suffering from oxygen deficiency to take a medical examination and receive treatment from a doctor.

Chapter 11: Specially-Equipped Vehicles

Article 109 Operation of a Specially Equipped Vehicle

1. Only a person who has completed a skill education and has a related skill qualification can operate a specially equipped vehicle regulated in a law or regulation.
2. An operator shall check the specially equipped vehicle before the departure towards the work site and before commencement of the work on the occasion of using it.

Article 110 Running Speed in substation areas

Specially equipped vehicles are prohibited to run in substation areas at a speed of over 5km/h.

Article 111 Allowable minimum distances

Allowable minimum distance between the jut-out parts of a specially equipped vehicle and the conductive parts in substation areas shall be described in Table 9.

Table 9

Operation Voltage (kV)	Allowable Minimum Distance (m)
Up to 35	1
Up to 110	1.5
Up to 230	2.5
More than 230	4.5

Article 112 Earthing

While work is implemented in a case that power is partly interrupted, or while a work is implemented near the area without cutting off the power, the building frame of crane cars, lift-cars and forklift trucks must be connected to the ground by an earth for work.

Article 113 Measures to Electric Discharge

1. If an electric discharge occurs on a specially equipped vehicle, it is prohibited to touch, leave or get in it.
2. If a specially-equipped vehicle is on fire without cutting off the power, the driver needs to jump out of the car by two feet so that his or her two feet can get away from the vehicle simultaneously.

Article 114 Periodical Inspection

Specially equipped vehicles shall be inspected periodically.

Article 115 Prohibition of Operation in case of strong winds

It is prohibited to operate crane cars in the case of strong wind.

Article 116 Operation Plan

1. In having workers engage in the type of operations using specially equipped vehicles, the employer shall establish an appropriate operation plan in conformity with the space and lay of the land related to the operation, and the kind and capability of the vehicles concerned, and the kind and shape of the cargo concerned, and shall have the workers engage in the operation in accordance with the operation plan thus established.
2. The prepared operation plan shall include such items as the running routes and methods of operation of the specially equipped vehicles concerned in detail.
3. Upon the establishment of the operation plan as set forth by paragraph 1, the employer shall inform the workers concerned of the matters shown under the provisions of the preceding paragraph.

Article 117 Prevention of Falling

1. When having workers engage in an operation using any specially-equipped vehicles, the employer shall take measures such as securing the necessary width for the route of the vehicle concerned, preventing unequal settling of the land, taking preventive measures against destruction of road shoulders so that workers concerned may be free from dangers due to the overturning, or falling of the vehicles, etc.
2. When the workers use the specially equipped vehicles at such sites as road shoulders and an incline where there is a possibility for the workers to be injured due to overturning or falling of the specially equipped vehicles, the employer shall arrange one or more guides(s) in order to guide the vehicles.
3. A driver of any specially equipped vehicles, prescribed in the preceding paragraph shall comply with the instructions of the guide(s) as set forth by the same paragraph.

Article 118 Prevention of Being Hit

When the workers engage in work using the specially equipped vehicle(s), the employer shall not permit the workers to enter the place with the risk of being hit by the machines in operation or the cargo.

Article 119 Bridge Crane

Operating, maintaining, repairing and inspecting a bridge crane shall be performed in accordance with present regulations concerning crane equipment.

Article 120 Use of Safety Belts

When workers carry out work using an aerial working vehicle, the employer shall have the workers who are on the work platform of the aerial working vehicle described above use the safety belt for an aerial working vehicle.

Chapter 12: Testing Stations and Laboratories

Article 121 Installing Fences

1. When workers perform tests and experiments with voltage of over 1,000V in a testing station or a laboratory, the workers shall separate the concerned area with fences to prevent third persons from accidentally entering the area.
2. The distance between the conductive parts of the tested equipment and permanent fences with an earth must not be less than the allowable minimum distance shown in Table 10 and Table 11. Moreover, in case a temporary fence is used, the distance shall be twice as these values.

(1) Pulse voltages (amplitude values)

Table 10

Voltage of Hot Line (kV)			Allowable Minimum Distance (m)
upto	100		0.5
100	to	150	0.75
150	to	400	1
400	to	500	1.5
500	to	1,000	2.5
1,000	to	1,500	4.0
1,500	to	2,000	5.0
2,000	to	2,500	6.0

(2) Industrial frequency voltages (effective values) and DC voltages

Table 11

Voltage of Hot Line (kV)			Allowable Minimum Distance (m)
upto	6		0.1
6	to	10	0.2
10	to	20	0.3
20	to	50	0.5
50	to	100	1.0
100	to	250	1.5
250	to	400	2.5
400	to	800	4.0

3. Permanent fences shall have the height not lower than 1.7m, and temporary fences not lower than 1.2m. The structure of fences must ensure that people may not touch conductive parts accidentally.
4. Fence doors shall be opened outward or sideward and shall not be opened inward. The door locks are of automatic-type locking and from the inside of the fences, it is possible to open the doors without keys.
5. The fences of a testing field in a testing station need not be locked, if it has such a structure that third persons cannot access this area.
6. Permanent fences shall have such structures so that it may be possible to remove the fences and open the doors, only when using keys or exclusive tools. To enter a fence is permitted only when checking whether the transformer casings are earthed and the distance between the ceramic shade of bussing on transformers and the earthing wire is more than the allowable minimum distance described in Table 12.

Table 12

Operation Voltage (kV)	Allowable Minimum Distance (m)
10	2.5
35	2.7
110	3.5

7. The transformer used for an insulation test shall have the breaker that can break the circuit automatically and the resistance to restrict the short-circuit current when the insulation is destroyed by accident.

8. Capacitors and measuring transformers used in the testing diagrams installed in the testing ground must be fenced completely, if necessary.

9. Otherwise, the following objects shall be grounded:

- (1) The tested object, and the frame, the outer case and the main unit of test equipment
- (2) Movable table for test
- (3) Portable electric apparatus
- (4) Metallic hedge
- (5) Measurement tools with a metallic cover

When a metallic cover of the measurement tools cannot be grounded because of the conditions, it is necessary to install a fence.

10. It is necessary to set up equipment that can ground all power capacitors automatically when they are intercepted from the rectifier in an impulse generator and a direct current accumulating generator circuit.

11. Equipment that is set up in an examination room and has big electric capacity shall be short-circuited and grounded even if it is not included in the testing circuit. When the product that has big electric capacity such as a capacitor and a cable is examined, the examination room shall have equipment that shortens or grounds the tested products.

After the examination is ended, the capacitor connected with the testing circuit should be discharged and grounded.

Article 122 Inspection and Maintenance of an Experiment Device

The administrative section of a testing station or laboratory shall inspect experiment devices

periodically. When the workers find some problems with an experiment device, they shall repair the experiment device before using it.

Article 123 Checking of Testing Circuits

1. Before starting an experiment, the testing circuit connected to experiment devices shall be checked.
2. The workers cannot set up and remove the tested object without the permission of the supervisor.
3. It is necessary to check the inverse voltage from the transformer before connecting a testing circuit.

Article 124 Experiments with Electric Discharge etc.

Before performing an experiment with an electric discharge, or other tests or experiments with some risks, staff shall do the following;

1. Make sure that a people are not in the dangerous area
2. Make sure that an outsider is not in the work area
3. Turning on a warning light and locking the fence to prevent third persons from accidentally entering it.

Article 125 Switching Instruments

1. The supplying circuit for a capacitor connected to the circuit shall have switching instruments which have visible open-circuited points placed at the primary circuit of a testing transformer.
2. Workers shall not remove the tested objects until the supervisor orders after cutting electricity to the circuit.

Article 126 Earthing

1. Earthing must be placed at the following places:
Frames, casings, bodies of the objects to be tested and testing equipment, mobile testing tables, portable electric instruments, metal shielding meshes, measuring instruments with metal covers.
2. Workers cannot set up and remove the portable fences without the permission of the supervisor (or the committed person in the laboratory).
3. In the circuits of pulse generators and DC layer connection generators, equipment shall be

installed that can ground all capacitors automatically when they are intercepted from the rectifiers.

4. The equipment with high capacitance must be short-circuited and earthed, if it is not installed in the testing diagrams but installed in the testing ground.

Article 127 Check of inverse voltage

Before connecting the testing diagrams, workers must check the circuit to prevent the possibility that inverse voltage through the transformer occurs.

Article 128 Mechanical Strength Test for Insulators

When testing the mechanical strength of insulators (of ceramics, glass, synthetic plastics, etc), it is prohibited to stand at the testing field. There must be measures to prevent accidents for people due to broken pieces spattering.

Article 129 Experiments on the spot of working areas

1. It is necessary to keep the distance between two charged parts within the minimum gap described in Table 13 to prevent the test voltage from shifting to the driving voltage.

Table 13

Allowable voltage of equipment (kV)	to 10	10 to 15	15 to 20	20 to 35
Minimum Gap (cm)	15	20	25	50

2. When using a mobile experimental car or a fixed testing machine, the following condition should be complied.
 - (1) The testing instrument has to be divided into two separate parts; the one contains equipment with voltage lower than 1,000 V with a firm foothold for an operator, the other contains all facilities and conductors with voltage over 1,000V.
 - (2) Fences or boards shall be installed appropriately around the equipment with voltage higher than 1,000V to prevent people from coming near-by.
 - (3) The inter-movable lock that uses an electric contact switch, and the signal light which lights when the concerned facility is charged shall be installed at the door of the equipment with voltage higher than 1,000V.
 - (4) All facilities with voltage lower than 1,000V should be located so that they should be easily operated and inspected.

Appendix

Appendix 1: Work Sheet (Sample)

Work Sheet

Name of the Work Unit

No.:.....

.....

1. Work Unit that accepts this sheet

1.1. General Administrator (when assigned) :.....

1.2. Supervisor:

1.3. The Number of Workers in the unit:

1.4. Place of the working site:.....(1).....

1.5. Content of work:.....(2).....

.....

1.6. Period of the work:

- Start of the Work (dd - month - yyyy, hh:mm):

- End of the Work(dd - month - yyyy, hh:mm):

1.7. Work conditions (work with power interruption, hot-line work or work near hot line):

.....

This work sheet is issued on(The date of issue, dd-month-yyyy)

Issuer:

Name *Position:*

Signature:

2. Procedure for work permission

2.1. Facilities, Lines and Sections with power interruption:

.....(3).....

2.2. Installation Points of earthing:

.....(4).....

2.3. Installation of Warning Sign and the installation place:

.....(5).....

2.4. Permitted working area:

.....(6).....

2.5. Necessary Warnings or Guidance:

.....(7).....

2.6. Permit the work unit to start the work at

(hh:mm, dd-month-yyyy)

Permitter

Name :..... Position:

Signature:

3. Hand over of the work site:

3.1. Safety measures inspected on the work site:

.....

3.2. The points where safety measure(s) or/and an earth is/are additionally installed:

.....(9).....

3.3. The Work unit starts at

(hh:mm, dd-month-yyyy)

General Administrator (when assigned)

Name :..... Position:

Signature:

Supervisor

Name :..... Position:

Signature:

Electric Safety Supervisor (when assigned)

Name :..... Position:

Signature:

4. Name List of workers

No.	Name	Time (Month-dd, tt)		Signature
		Start of Work	Evacuation from the site after finishing the work	
1				
2				
3				
4				

5. Start and End of daily work, and moving from the work site

No.	The working place	Time (Month-dd, tt)		Supervisor (Signature or registration)	Permitting Person (Signature or registration)
		Start	End		
1					
2					
3					
4					

6 End of the Work

6.1 I checked and confirmed the completion of all works, cleanup of tools, the evacuation of workers, and the removal of all earths and safety measures installed by the unit during the work, and the electric safety is secured without fail. Therefore, I, the supervisor of this work unit, am now handing over this work site to you, the responsible person of the management section, (.....(Name),(Position)). at(hh:mm, dd-month-yyyy).

Signature (Supervisor)

Signature (General Administrator (when assigned))

6.1 I took over and checked the work site.

And I finished this work sheet at(hh:mm, dd-month-yyyy).

Signature and Registration (Permitting person)

I completely checked this work sheet at(hh:mm, dd-month-yyyy).

Signature and Registration (Issuer of this sheet)

(Remark) A work unit can have the work sheet with a more detailed format decided by each company according to its organization and working conditions, but its contents must not be against the stipulations of this sample of work sheet.

