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PART 9 – ELECTRICAL SAFETY

DEFINITIONS

9.01 In this part, the following definitions apply:

“conductor”

means a wire, cable or other metal component installed for the purpose of conveying electric current from one piece of equipment to another or to ground;

“control system”

means a manual, remote, automatic or partially automatic system for controlling the operation of equipment;

“electrical equipment”

includes machinery, plant, works, wires, pipes, poles, conduits, apparatus, appliances and equipment, designed or used, or intended for use, for, or in connection with, generation, transmission, supply, distribution or use of electrical energy for any purpose;

“electrical vault”

means an isolated enclosure, either above or below ground, with fire-resisting walls, ceilings and floors for the purpose of housing transformers and other electrical equipment;

“electrical worker”

means an electrical journey person or a person with equivalent training and experience who can perform electrical work under the supervision of an electrical journey person;

“electrofishing”

means the capture or control of fish by the use of electrical equipment;

“hardwired”

means the electrical connection of components within a system by means of electrical conductors so that the only way the system can be modified is by changing the connections;

“high-voltage”

means a potential difference (voltage) of more than 750 volts between conductors or between a conductor and ground;

“isolated”

means that normal sources of energy have been disconnected by opening and securing all associated switches, and that mechanical equipment has been rendered and secured non-operative by disconnecting, stopping, depressurizing, draining, venting or other effective means;

“low-voltage”

means a potential difference (voltage) from 31 to 750 volts inclusive, between conductors or between a conductor and the ground;

“mimic display”

means a symbolic representation of the configuration and status of all or part of a power system, complete with device designations;

“power system”

means all plant and equipment essential to the generation, transmission or distribution of electricity, including any plant or equipment that is out of service, being constructed or being installed;

“safety protection guarantee”

means an assurance that a power system or part of the power system is isolated and will remain isolated;

“safety watcher”

means a qualified person whose sole task is to observe the activity when equipment, vegetation or material will be moved relative to energized electrical equipment or conductors, and signal in a clear and predetermined manner to stop the movement whenever contact with electrical equipment, conductors or guarding appears probable, or whenever conditions prevent the watcher from having a clear view of the movement relative to the electrical equipment;

“service room”

means a room or space in a building provided to accommodate building service equipment, and meeting the requirements of cities, towns, villages or other applicable legislation.

GENERAL

Worker qualifications and duties	9.02	A worker who installs, alters or maintains electrical equipment shall be an electrical worker who carries out duties in accordance with the <i>Electrical Protection Act</i> .
Work on poles	9.03	<ol style="list-style-type: none">(1) Before a worker climbs a pole or is supported by a pole or structure, or before any work is done that will affect the stability of the pole or structure<ol style="list-style-type: none">(a) the pole or structure shall be tested for soundness and stability,(b) if there is any doubt as to soundness or stability, the pole or structure shall be effectively supported before any wires or cables are changed, and the supports left in place until workers are clear of the pole or structure, and(c) a worker shall not climb or work on a pole or structure supported laterally by pike poles only.(2) When workers are working on poles or such structures where persons below could be injured by falling tools or materials, a temporary guard, fence or standard safety signs appropriate to the situation shall be placed to warn the public and workers of the danger zone.
Obstructions on poles		<ol style="list-style-type: none">(3) Mailboxes, signs, clotheslines, or other obstructions shall be removed from poles on which workers are required to work.(4) Tags placed on a pole for identification purposes shall be positioned on the side of the pole that minimizes risk to a worker climbing the pole.
Ladders		<ol style="list-style-type: none">(5) Metal ladders or wire reinforced side rail wooden ladders shall not be used while working around electrical equipment.
Space around equipment	9.04	<ol style="list-style-type: none">(1) Passageways, service rooms, electrical vaults and working spaces around electrical equipment shall be kept clear of obstructions, arranged so as to give authorized persons ready access to all parts requiring attention, and not used for storage.
Housekeeping		<ol style="list-style-type: none">(2) Flammable material shall not be stored or placed close to electrical equipment.(3) Where work is being performed, all tunnels and manholes that contain electrical cables, equipment and apparatus shall be kept free of debris, unused tools, materials and seepage or stagnant water.

LINES AND EQUIPMENT

- Standards** **9.05** (1) All electrical utility and communication lines and equipment shall meet the requirements of
- (a) *CSA Standard C22.3 No. 1-01, Overhead Systems*, and
 - (b) *CSA Standard C22.3 No. 7-94, Underground Systems*.
- Test equipment** (2) Electrical testing equipment used by workers shall meet the requirements of
- (a) *CSA Standard C22.2 No. 160-M1985, Voltage and Polarity Testers*,
 - (b) *CSA Standard C22.2 No. 231 Series-M89, CSA Safety Requirements for Electrical and Electronic Measuring and Test Equipment*, or
 - (c) other similar standards acceptable to the director.
- (3) Appropriate safe work procedures shall be established by the employer and followed by the workers for testing electrical equipment and circuits.
- Switches, panels and services** (4) A switch and temporary panel board controlling a service entrance, service feeder or branch circuit shall meet the following requirements:
- (a) a switch and temporary panel board shall be securely mounted on a well-constructed vertical surface, be obstruction free and have a cover over the insulated current-carrying parts,
 - (b) the switch and temporary panel board shall be located in an area where water will not accumulate, and be within easy reach and readily accessible to workers,
 - (c) the switch controlling a service centre, service feeder or branch circuit shall not be locked in the closed position, and
 - (d) the switch controlling a service centre, service feeder or the branch circuit shall be housed in a lockable enclosure and be provided with a device for locking the enclosure.
- Other electrical equipment** (5) Where electrical transformers, capacitors or other electrical equipment are installed on exterior walls or buildings, they shall be located at a sufficient distance from the windows or such openings to avoid fire hazards or accidental contacts through the wall openings.
- Insulated aerial devices** **9.06** (1) An insulated aerial device shall be dielectrically tested at least every 12 months in accordance with *CSA Standard C225-00, Vehicle-Mounted Aerial Devices*, or other similar standard acceptable to the director, and its insulating capability certified by the testing agency.
- (2) An insulated aerial device that has not passed the testing required by subsection (1) shall
- (a) be considered and positively identified as being non-insulated, and
 - (b) have any markings or identification on the device indicating insulated capability removed or effectively covered over.
- (3) Workers shall be informed of the non-insulated status of an aerial device before it is used.

WORKING ON LOW-VOLTAGE ELECTRICAL EQUIPMENT

- Hazards** **9.07** (1) A worker shall be informed of potential electrical hazards before being permitted to do work in proximity to energized electrical conductors or equipment.
- Disconnection and lockout** (2) Before a worker begins work on low-voltage electrical equipment, it shall be completely disconnected and locked out.
- (3) Except as specified in subsection (4), if it is not practicable to completely

disconnect low-voltage electrical equipment, work shall be authorized by the employer and performed by electrical workers in accordance with written safe work procedures that

- (a) require the use of appropriate electrical protective equipment, including rubber gloves and cover up, and other necessary live line tools,
- (b) provide that uncontrolled liquid is not permitted close to any worker working on the equipment, and
- (c) control the use of metal scaffolds, metal ladders or metal work platforms.

(4) No work shall be undertaken on energized parts of electrical equipment associated with lighting circuits operating at more than 250 volts-to-ground without the prior direction in writing from a professional engineer or a journeyman electrician.

(5) Remotely controlled switches alone shall not be used as a means of disconnection, but shall be supplemented by manually operated disconnecting means.

Signs

(6) Before completing installation and after energizing low-voltage electrical equipment, signs visible to workers shall be placed close to the equipment stating "Danger, Energized Equipment".

Working close to energized equipment

9.08

(1) Uninsulated, energized parts of low-voltage electrical equipment shall be guarded by approved cabinets or enclosures, unless the energized parts are in a suitable room or similar enclosed area that is only accessible to electrical workers authorized by the employer.

Warning signs

(2) Each entrance to a room and other guarded location containing uninsulated and exposed energized parts shall be marked with a warning sign limiting entry to electrical workers and persons authorized by the employer.

Written procedures

(3) Where uninsulated, energized parts are not guarded with approved cabinets or enclosures

- (a) the workers shall be informed of the potential hazards, provided with and follow appropriate written safe work procedures, or
- (b) suitable barriers or covers shall be provided if a worker unfamiliar with the hazards is working within 1 m (3.3 ft.) of the uninsulated parts.

Equipment identified

(4) Each electrical distribution switch, circuit breaker and control shall be clearly marked to indicate the equipment it serves.

WORKING ON HIGH-VOLTAGE ELECTRICAL EQUIPMENT

Isolation and lockout

9.09

(1) Where practicable, high-voltage electrical equipment shall be completely isolated, grounded, and locked out before starting work on it.

Alternatives to isolation

(2) Where it is not practicable to completely isolate high-voltage electrical equipment prior to electrical workers beginning work on it

- (a) written safe work procedures shall be prepared and certified by a qualified person and followed by the workers,
- (b) two or more electrical workers authorized by the employer shall be present while the work is being done, unless the procedures being followed under paragraph (a) specifically permit the work to be done by one worker, and
- (c) appropriate electrical protective equipment, including rubber blankets, hoses, hoods, gloves and live line tools shall be selected, used, stored, tested, and maintained in accordance with their applicable Underwriters Laboratories of Canada standards

- i. CAN/ULC-D60832-99, *Insulating Poles (insulating sticks) and Universal Tool Attachments (Fittings) for Live Working*,
- ii. CAN/ULC-D60855-00, *Live Working - Insulating Foam-Filled Tubes and Solid Rods for Live Working*,
- iii. CAN/ULC-D60900-99, *Hand Tools for Live Working up to 1000 V a.c. and 1500 V d.c.*,
- iv. CAN/ULC-D60984-00, *Sleeves of Insulating Material for Live Working*,
- v. CAN/ULC-D61112-01, *Blankets of Insulating Material for Electrical Purposes*,
- vi. CAN/ULC-D61229-00, *Rigid Protective Covers for Live Working on a.c. Installations*,
- vii. CAN/ULC-D61230-99, *Live Working – Portable Equipment for Grounding and Bonding*,
- viii. CAN/ULC-D61235-00, *Live Working – Insulating Hollow Tubes for Electrical Purposes*,
- ix. CAN/ULC-D61236-99, *Saddles, Pole Clamps (Stick Clamps) and Accessories for Live Working*,
- x. CAN/ULC-D61243-1-00, *Live Working – Voltage Detectors – Part 1: Capacitive Type to be Used for Voltages Exceeding 1 kV a.c.*,
- xi. CAN/ULC-D61243-2-99, *Live Working – Voltage Detectors – Part 2: Resistive Type to be Used for Voltages of 1 kV to 36 kV a.c.*,
- xii. CAN/ULC-D61243-3-00, *Live Working – Voltage Detectors – Part 3: Two-Pole Low-Voltage Type*, or
- xiii. other similar standards acceptable to the director.

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| Equipment not in use | 9.10 | Electrical equipment or power lines which are not being used for the purposes for which they were originally designed shall be isolated and de-energized, and either removed or, if left in place, shall be tagged and locked out or effectively grounded. |
| Warning signs | 9.11 | <ul style="list-style-type: none"> (1) Before completing installation and after energizing high-voltage electrical equipment, signs visible to workers shall be placed close to the equipment stating "Danger – Energized Equipment". (2) After installation is complete, signs in the high-voltage equipment area shall meet the requirements of the <i>Electrical Protection Act</i> and the regulations made under it. |

WORKING ON DE-ENERGIZED HIGH-VOLTAGE POWER SYSTEMS

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| Isolation and lockout | 9.12 | (1) Before working on a de-energized power system, which for reasons of safety is de-energized, the person in charge shall ensure that the part of the system being worked on is isolated, grounded, and where practicable, locked out. |
| Identification | | (2) Barriers or distinctive identification shall be used to differentiate de-energized high-voltage electrical equipment from similar energized equipment. |
| Alternative to lockout | | <ul style="list-style-type: none"> (3) Where it is not practicable to lock out a power system or part of the power system <ul style="list-style-type: none"> (a) the boundaries of the power system or part shall be clearly defined, (b) written work procedures governing the issuance of safety protection guarantees for a specific location and equipment shall be prepared by a senior qualified person, reviewed by the person in charge, and followed by the workers, and |

		(c) all major equipment used to establish safety protection guarantees shall be uniquely identified at a conspicuous place on or near the equipment.
Person in charge	9.13	(1) One qualified person at a time shall be appointed and designated the exclusive authority as the person in charge to establish the conditions for, and to issue safety protection guarantees for, the power system or a part of it to be worked on. (2) All duties and responsibilities shall be communicated to the person in charge.
Written procedures		(3) Where a safety protection guarantee involves two or more power systems, or two or more persons in charge of different parts of a system, appropriate written procedures shall be established and followed to ensure that any safety protection guarantee will be effective.
Duties of person in charge	9.14	The person in charge shall ensure that (a) the status of the power system or assigned part of the power system is accurately represented on a mimic display or an up-to-date power system map, (b) a log of switching details, safety protection guarantees and operational events is maintained, (c) the commencement of any work on the power system or assigned part of it has been authorized, (d) there is an effective communication system between the person in charge and the workers doing the work, and (e) only a worker specifically authorized and instructed by the owner of the power system receives the safety protection guarantee and does work on the power system.
Switching sequences	9.15	If a switching sequence requires the operation of three or more devices, a written switching order is prepared, communicated to the workers and followed by them.
Isolating devices	9.16	The person in charge shall ensure that (a) isolating devices used for safety protection guarantees provide for visual verification of the opening of the isolation point, (b) lockable isolating devices are effectively locked in the position or condition required to protect workers before work commences under a safety protection guarantee, and (c) a distinctive "DO NOT OPERATE" tag is placed securely on each isolating device used for a safety protection guarantee.
Grounding and blocking	9.17	The person in charge shall ensure that (a) after a safety protection guarantee is in effect, the equipment to be worked on is tested to verify isolation before grounding and blocking begins, (b) after testing to verify isolation, the worker at the worksite responsible for each crew verifies that required grounding and blocking devices are in place before work begins, (c) grounding and blocking of any equipment that may be hazardous to workers is carried out as close as practicable to the worksite, (d) where grounding and blocking are not safe or practicable, written safe work procedures are developed by a senior qualified person, communicated to and followed by the workers, and (e) the removal of grounding and blocking devices prior to completion of the work is restricted to conducting tests.

WORKING CLOSE TO ENERGIZED HIGH-VOLTAGE EQUIPMENT AND CONDUCTORS

Limits of approach

9.18 (1) The voltage of any energized electrical equipment shall be accurately determined and the general limits of approach in Table 9-1 maintained by workers and equipment.

Table 9-1 General Limits of Approach		
Voltage phase to phase	Limit of approach distance	
up to 750V	1.0 m	3 ft.
750V – 40 kV	3.0 m	10 ft.
69 kV, 72 kV	3.5 m	12 ft.
138 kV, 144 kV	4.0 m	13 ft.
230 kV, 260 kV	5.0 m	16 ft.
500 kV	7.0 m	23 ft.

(2) Where the voltage of any energized equipment or conductor cannot or has not been determined, the limit of approach of 7.0 m (23 ft.) shall be maintained.

Assurance in writing

9.19 (1) Where the minimum distance in Table 9-1 cannot be maintained because of the circumstances of work or the inadvertent movement of workers or equipment, an assurance in writing, on a form and signed by a representative of the public utility company, shall be obtained that states

- (a) while the work is being done, the electrical equipment and conductors will be displaced or rerouted from the work area, if practicable, and
- (b) the electrical equipment will be isolated and grounded where compliance with subsection (a) is not practicable, or
- (c) the electrical equipment will be visually identified and guarded where isolation and grounding is not practicable.

Guarding

(2) If guarding is used to protect workers

- (a) neither equipment nor unqualified workers shall touch the guarding, and
- (b) a safety watcher shall be designated, or range-limiting or field detection devices shall be used.

Safeguards

(3) The safeguards specified in the assurance shall be in place before work commences and be maintained while work is taking place.

Assurance available

(4) The assurance shall be available for inspection at the workplace, as close as practicable to the area of work, and be known to all workers or other persons with access to the area.

Equipment in motion

(5) While equipment is in motion in an area in proximity to energized electrical equipment or conductors, no person other than the equipment operator shall be allowed to touch any part of the equipment or the material being moved by it.

Loads and lines

(6) No person shall move a load or any rigging line from its position of natural suspension if it is in proximity to an energized electrical conductor or equipment.

Assurance not practicable

- (7) If exposed high voltage electrical equipment and conductors cannot be isolated, rerouted or guarded, work shall not be done within the minimum distance in Table 9-1 until approval and direction is obtained from the public utility company and, at a minimum, the following precautions shall be taken:
 - (a) the area within which equipment or materials are to be moved is barricaded and supervised to restrict entry only to those workers necessarily engaged in the work,
 - (b) a safety watcher is designated,
 - (c) a positive means is provided for the safety watcher to give a clear, understandable stop signal to workers in the area, and the watcher gives the stop signal by no other means, and
 - (d) subsections (5) and (6) are complied with.

Adjusted limits of approach

- 9.20** Only an electrical worker who has taken a course of instruction approved by the director shall be allowed to work up to the adjusted limits of approach in Table 9-2 when the following conditions apply:
- (a) the high voltage electrical equipment is energized to a potential of not more than 75 kV,
 - (b) a professional engineer has determined that rerouting, de-energizing or guarding of the equipment is not practicable for the type of work being performed,
 - (c) the work is not being done for the owner of the power system,
 - (d) the work is of a type that is done regularly, and
 - (e) the worker follows written safe work procedures developed and implemented under the supervision of a professional engineer.

Table 9-2		
Adjusted Limits of Approach		
Voltage phase to phase	Limit of approach distance	
600V (DC)	0.8 m	31.5 in.
600V – 4.60 kV	0.8 m	31.5 in
13.8 kV	0.85 m	33.5 in.
25 kV	0.95 m	37 in.
34.5 kV	1.05 m	41 in.
69, 72 kV	1.35 m	53 in.
138, 144 kV	1.65 m	65 in.
230, 260 kv	2.15 m	85 in.
500 kV	3.45 m	136 in.

Limits for electrical workers

- 9.21** Only an electrical worker with journeyman qualification shall work up to the limits specified in Table 9-3, provided the worker is authorized by the owner of the power system and uses written safe work procedures developed by a competent person for the work to be done.

Table 9-3		
Limits of Approach for Qualified Electrical Workers		
Voltage phase to phase	Limit of approach distance	
600V (DC)	0.5 m	20 in.
600V – 4.60 kV	0.5 m	20 in.
13.8 kV	0.55 m	22 in.
25 kV	0.65 m	26 in.
34.5 kV	0.75 m	30 in.
69, 72 kV	1.05 m	41 in.
138, 144 kV	1.35 m	53 in.
230, 260 kv	1.85 m	73 in.
500 kV	3.15 m	124 in.

Emergency work

- 9.22** (1) During emergency actions all reasonable precautions shall be taken to control the hazards including
- (a) restricting entry of workers into the area where equipment or materials are to be moved,
 - (b) designating a safety watcher,
 - (c) when equipment is in motion, preventing any person other than the equipment operator from touching any part of the equipment or the material being moved by it, and
 - (d) requiring the equipment operator to operate the controls from the seat provided on the equipment, or from a metal stand that is integral with the frame of the equipment and clear of the ground, or from a metallic mat bonded to the frame of the machine and located on the ground beside the machine.

Authorization by owner

- (2) Only electrical workers with journeyman qualification and workers under their direct supervision shall be allowed to work within the minimum distances to energized high voltage electrical equipment and conductors, as specified in Table 9-1 and Table 9-2, when authorized by the owner of the power system and when using work procedures acceptable to the director.

TREE PRUNING AND FALLING NEAR ENERGIZED CONDUCTORS

Preliminary inspection

- 9.23** (1) Before commencing tree pruning or falling close to an energized high voltage overhead conductor, the workplace shall be inspected by a qualified person, authorized by the owner of the power system, to identify the areas affected by the falling or pruning activity, including the situation where a part of a tree to be pruned or felled is within the applicable minimum distance from an energized conductor as specified in Table 9-1, or may fall within that distance.

Second inspection

- (2) Immediately before commencing work, an inspection shall be performed by a qualified person to verify that the results of the initial inspection done under subsection (1) are still valid.

Work in a hazardous area

- (3) Tree pruning or falling shall not commence in a hazardous area until
- (a) an assurance is issued by the owner of the power system that any reclose feature is disabled, and
 - (b) workers are informed of any voltages of the conductors.

Site crew requirements

- (4) Tree pruning or falling shall not be permitted within the minimum distances in Table 9-1 from overhead high voltage energized conductors, unless
 - (a) a certified utility arborist or an electrical worker is present at the site, directing and conducting the work,
 - (b) at least one additional qualified worker, trained in appropriate emergency rescue procedures, is present, and
 - (c) the owner of the power system has authorized the work.

Limits of approach

- (5) A certified utility arborist or any conductive tool used shall not be closer to an energized high voltage conductor than the applicable limit of approach in column B of Table 9-4.
- (6) Except as provided in subsection (7), apprentice utility arborists and their tools shall not work closer to an energized high voltage conductor or any vegetation that is closer to, or that could swing closer to, the limit of approach allowed in column C of Table 9-4.
- (7) An apprentice utility arborist shall not work within the limit of approach permitted for a certified utility arborist in subsections (5) and (9) and shall work in the presence of and under the direct supervision of, a certified utility arborist or an electrical worker with tree pruning and falling training.
- (8) Vegetation closer to an energized high voltage conductor than the applicable limit in column B of Table 9-4 shall be cut by a certified utility arborist using approved insulated tools
 - (a) up to the limit of approach in column A of Table 9-4, and
 - (b) using an insulated aerial device to remove vegetation closer than the limit of approach in column A of Table 9-4 up to but not touching an energized high voltage conductor of 75 kV or less.
- (9) Vegetation touching an energized high voltage conductor, or within the applicable limit in column A of Table 9-4 for a conductor at a potential of 75 kV or more, shall be removed only with the line isolated and grounded or by an electrical worker using approved live line methods.
- (10) Vegetation encroaching past the limits of approach in column B of Table 9-4 that cannot be removed using an insulated aerial device shall be restrained from encroaching past the limit of approach in column A before removal.
- (11) A tree shall be topped before being felled, or other precautions shall be taken to prevent the tree or any part of it from falling closer than the limit of approach in column A of Table 9-4.

Tree pruning and falling equipment

9.24

- (1) An insulated tool shall be used, stored, tested and maintained as required by the manufacturer or a professional engineer.
- (2) Insulated hand tools and insulated aerial devices shall be maintained in clean condition and dielectrically tested to a standard set by the manufacturer.
- (3) An insulated aerial device shall not be operated or used within the limits of approach in column D of Table 9-4.

Table 9-4 Limits of Approach for Utility Arborists								
Voltage phase to phase	A.		B.		C.		D.	
	Insulated tool limit for certified utility arborists		Work limit for certified utility arborists		Work limit for apprentice utility arborists		Limit of approach for insulated devices	
4.16 kV	0.04 m	1.5 in.	1.05 m	41 in.	3 m	10 ft.	0.5 m	20 in.
13.8 kV	0.12 m	5 in.	1.1 m	43 in.	3 m	10 ft.	0.55 m	22 in.
25 kV	0.21 m	8 in.	1.2 m	47 in.	3 m	10 ft.	0.65 m	26 in.
34.5 kV	0.29 m	11 in.	1.3 m	51 in.	3 m	10 ft.	0.75 m	29 in.
69, 72 kV	0.61 m	24 in.	1.6 m	63 in.	3.5 m	12 ft.	1.05 m	41 in.
138, 144 kV	0.92 m	36 in.	1.9 m	75 in.	4 m	13 ft.	1.35 m	53 in.
230, 260 kV	1.41 m	55 in.	2.4 m	94 in.	5 m	16 ft.	1.85 m	73 in.
500 kV	2.71 m	107 in.	3.7 m	146 in.	7 m	23 ft.	3.15 m	124 in.

CONTROL SYSTEMS

- Preventing automatic start-up** **9.25** (1) A control system shall be used to prevent automatic start-up after a power interruption or low-voltage occurrence, if automatic start-up in such circumstances is likely to create a hazard to workers.
- System failure** (2) A control system shall be designed so that the controlled equipment does not create a hazard to workers if the system fails or is shut down.
- Testing systems** (3) Equipment operated by a new or altered control system shall not be used until the control system has been checked and tested to verify that it will function in the intended manner.
- Documentation** (4) There shall be up-to-date documentation readily available to the affected workers describing the design, installation, operation and maintenance of a control system.
- System design** (5) Only a qualified person who is authorized shall design, install, operate and maintain a control system.
- (6) When designing a control system, the types of potential system failure and the effects of failures on the control system and the controlled equipment shall be analyzed.
- (7) To minimize risk to workers, a control system shall be designed so that
- (a) the controlled equipment cannot be inadvertently activated,
 - (b) an effective basic diagnostic capability is incorporated,
 - (c) hardwired emergency stop devices are provided at operator stations, and
 - (d) operator controls other than emergency stop devices can be activated at only one station at a time.

- Protection for system** (8) Control system hardware shall be protected from circumstances that could adversely affect the performance of the system, including mechanical damage, vibration, extreme temperatures or humidity levels, high electromagnetic field levels, and power disturbances.
- Safe work procedures** (9) Written safe work procedures shall be developed for the use of equipment operated by a control system, including lockout procedures.
- Programmable control systems** (10) Where a programmable control system is used
 - (a) the documentation provided for the system shall include a copy of the control program that will allow the equipment to be reprogrammed if necessary to ensure the safe operation of the system, and
 - (b) only a qualified person who is authorized by the power system owner shall have access to the installed control system software,
- Automatic control systems** (11) Where an automatic control system is used to prevent a hazard to workers, the control system shall be designed so that during an automatic sequence
 - (a) the operator may make an emergency stop of the controlled equipment,
 - (b) the operator may, if safe, be allowed manual control of the equipment, and
 - (c) the sequence will abort when a protective timer completes its assigned time without the expected event occurring.
- Remote control systems** (12) Where a remote control system is used
 - (a) written safe work procedures shall be developed and implemented that incorporate the maximum distance from which the operator is allowed to remotely control the equipment, and
 - (b) the safe work procedures shall require that workers remain at a safe work distance from the remotely controlled moving parts and any remotely controlled mobile machine.
- Wireless control systems** (13) Where a wireless remote control is used, the system shall incorporate
 - (a) error checking to prevent the controlled equipment from responding to corrupt data, and
 - (b) identification coding methods to prevent a transmitter other than the designated transmitter from operating the equipment.

ELECTROFISHING

- Qualified workers** 9.26 (1) Only qualified persons, trained in a course acceptable to the director, shall conduct electrofishing operations.
- Safe work procedures** (2) Workers shall be provided with a statement of their responsibilities and written safe work procedures.
- Training** (3) Workers shall be trained in, and be knowledgeable of, their responsibilities and the work procedures.
- Approved equipment** (4) Electrofishing equipment shall be approved by an agency acceptable to the director, and if such approval is not readily available, a professional engineer shall certify the equipment.
- Equipment operation** (5) Electrofishing equipment shall be operated and maintained in accordance with the manufacturer's instructions.
- (6) Safe operating procedures, from the manufacturer or a professional engineer, shall be readily available at the worksite for electrofishing equipment.

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