

APPENDIX L

Con Edison Safety Guide

5.3 General Protection Requirements

5.3-1 In each case when construction, maintenance, test or repair work is to be performed on system electrical equipment, protection of the type prescribed for the particular conditions shall be provided in order to fulfill the following objectives:

- I Safety to personnel
- II. Continuity of service to customers.
- III. Prevention of damage to equipment.

5.3-2 There are, in general, two approved methods of protection for safeguarding personnel working on system electrical equipment. These are:

- a. Protection applied at the working point or at other points to prevent accidental energizing of current-carrying parts which have been de-energized for dead work - the use of this method of protection is applicable to work on equipment in any voltage classification. The means employed to prevent accidental energizing of current-carrying parts varies for equipment in different voltage classifications and in different working locations. To verify that electrical equipment which is not visibly grounded at the work point, is dead prior to proceeding with dead work, all conductors at the work point must be tested dead with an approved voltage detector. A spear may be utilized in field situations as outlined in 11.8-1 when it is impractical to test the cable dead at the work point. Approved rubber gloves must be used while performing this test and the portable voltage detector must be tested before and after use.
- b. Protection applied by the worker at the working point in the form of insulating protective devices approved for live work - Such devices include high-voltage or low-voltage rubber gloves, as required, rubber mats, and insulating stools and platforms or insulated tools for insulating the worker from contact with current carrying or grounded parts. The term "insulating protective devices" also includes blankets, bandages, line hose, hoods, pigs, and other approved insulating devices intended primarily for protecting the worker from contact with current carrying parts in close proximity to the parts being worked upon.

Note 1 The Station Operator shall determine the need to apply supplemental static grounds to prevent the buildup of charge on otherwise isolated underground equipment in the vicinity of electric fields caused by non-shielded energized conductors.

Note 2 If there is any doubt about the identification of cable or equipment to be worked upon or the adequacy of protective measures taken to insure safety, employees shall not proceed with their work, but shall consult their Supervisor.

5.3-3 No connection shall be installed between an energized cable, wire, or bus and a network protector unless the network protector is in the open position, has been made non-automatic, and the network protector fuses removed. Network protectors shall be blocked open when installing or removing network protector fuses or links.

A network protector shall not be blocked closed or closed manually without permission from the operator having jurisdiction unless the network protector has first been isolated from the associated transformer and street mains. Where no initial connections exist, a connection shall not be installed between a cable, wire, or bus and a network rectifier unless the ac supply switch is open and the dc fuses are removed.

5.3-4 Where a new network distribution transformer is equipped with a ground switch, the ground switch shall be locked in the ground position until the transformer is ready to be energized.

5.4-1 A Work Permit must be obtained before any surface penetration, structural alterations, excavations, renovations, or demolition work can be performed within the confines of station areas. Before a Work Permit is issued, a survey shall be made to determine if any hazards exist in the specific area in which the work is to be performed.

5.4-2 The operator having jurisdiction shall be responsible for determining the protection required for dead work or for tests, shall order the protection applied, and shall ascertain that the protection has been applied before issuing or ordering the issuance of a Work Permit or a Test Permit.

5.4-3 When it is practicable, the person who has received the Work Permit shall verify, by inspections, the protection at the work location in the presence of the operating employee who is responsible for applying the protection.

5.4.4 When required by operating conditions, certain kinds of work, may be permitted on equipment while the equipment is alive. Examples are:

- a. Applying or removing arc-proofing or bonding on cables having a grounded metallic sheath or armor.
- b. Cleaning and painting metal clad equipment if all current-carrying parts are fully covered by grounded metallic enclosures.
- c. Drawing off samples of insulating liquid from apparatus, which is equipped with sampling valves and either a provision for venting a point above the fluid level or where a positive nitrogen pressure is present. Certain types of apparatus are designated as unsuitable for sampling insulating liquid while the apparatus is energized. Drawing samples of insulating liquid from energized apparatus is prohibited if the level of liquid is below or can be brought below the prescribed "minimum" level.

- d. Adding tested insulating liquids or gases to apparatus, which is equipped with valves and connections approved for such use. Adding insulating liquid to energized apparatus is prohibited if the level is initially below that which the level indicator is capable of showing unless specifically designed and approved by an Engineering Department specification. Certain types of apparatus are unsuitable for adding insulating liquid while the apparatus is energized. Adding dielectric liquid to station circuit breakers which are energized is prohibited.
- e. Connecting and disconnecting dielectric fluid reservoirs used in connection with dielectric-fluid filled cables if dielectric-fluid supply to the cable is maintained.
- f. Connecting and disconnecting joint regulators and tubing up to the oil line insulator used in conjunction with solid type cable.

5.5 On The Overhead System All Voltage Classifications

5.5-1 No construction, maintenance, or repair work which requires contact or which may result in contact with current-carrying parts of cables, wires, or other equipment shall be started unless one of the two following forms of protection is employed.

- a. The work shall be done as live work using all of the precautions prescribed for such work, including a Work Permit, when required. For specific operating and protection requirements see "General Instructions Governing work on Overhead System Electrical Equipment. Where practical, permission to perform work on overhead systems shall be submitted in writing to the operator having jurisdiction.
- b. The equipment to be worked upon shall have been removed from service, isolated, identified, and protected as prescribed for dead work. A Work Permit covering the work to be done shall also be obtained from the operator having jurisdiction.

5.6 On Other Than The Overhead System

5.6-1 Low Voltage Classification

Proceed in accordance with paragraphs 5.5-1a or 5.5-1b.

5.6-2 Intermediate Voltage Classification

No construction, maintenance, or repair work which requires contact or which may result in contact with current-carrying parts of cables, wires, or other equipment shall be started unless one of the two following forms of protection is employed:

- a. The equipment to be worked upon shall have been removed from service, isolated, identified, and protected as prescribed for dead work. A Work Permit shall also be obtained from the operator having jurisdiction.

- b. When it is impractical to isolate, identify and protect the equipment as prescribed, the equipment shall be de-energized and the work done as "Dead as Alive" using all of the precautions prescribed for such work. A Work Permit shall also be obtained from the operator having jurisdiction. This applies to single conductor cables only.

5.6-3 **High Voltage Classification**

Proceed in accordance with paragraph 5.6-2a above.

5.7 **Working Clearance**

5.7.1 When construction, maintenance, inspection, testing, or repair work is to be performed on any cables, wires, or other equipment, the group responsible for applying the protection shall determine whether there is adequate working clearance from exposed current carrying parts of adjacent equipment as outlined in Table #1.

5.7.2 Table #2 shall be used as the reference for determining clearances when utilizing vehicles and mechanical equipment.

5.7.3 Table #3 is for qualified electrical employees working on exposed, energized parts. The clear live line tool distance shall equal or exceed the values for the indicated voltage ranges. Phase to phase clearances apply to live line bare handed work.

**TABLE 1
STATION WORK**

MINIMUM APPROACH DISTANCES

<u>VOLTAGE</u>	Unqualified Personnel Working Near Exposed Energized Parts	Qualified ¹ Personnel Working Near Exposed Energized Parts	Qualified Personnel Working On Exposed Energized Parts
4 kV	3' 4"	2' 1"	2' 1"
13 kV	3' 6"	2' 1"	2' 1"
27 kV	4'	2' 4"	2' 4"
33 kV	4'	2' 4"	2' 4"
69 kV	4' 11"	3'	3'
138 kV	6' 8"	4' 7"	3' 7"
230 kV	9' 4"	6' 3"	5' 3"
345 kV	14' 8"	9' 6"	8' 6"
500 kV	22' 10"	12' 3"	11' 3"

¹These distances also apply to unqualified personnel who have been trained in the safe work practices and are under the direct supervision of a qualified person.

TABLE 2

**VEHICLE AND MECHANICAL EQUIPMENT
CLEARANCE DISTANCE**

<u>VOLTAGE</u>	Qualified Personnel Operating Grounded Equipment With A Designated Watcher	Unqualified Personnel Operating Grounded Equipment Lowered	All Personnel Moving Ungrounded Equipment W/Structure
4 kV	2' 1"	10'	4'
13 kV	2' 1"	10'	4'
27 kV	2' 4"	10'	4'
33 kV	2' 4"	10'	4'
69 kV	3'	10' 8"	4' 8"
138 kV	3' 7"	12' 11"	7'
230 kV	5' 3"	16'	10'
345 kV	8' 6"	19' 10"	13' 10"
500 kV	11' 3"	25'	19'

TABLE 3**AC LIVE-LINE WORK MINIMUM APPROACH DISTANCE**

	Nominal voltage in kilovolts		Distance phase to phase	
	Phase to ground exposure		Phase to phase exposure	
	(ft-in)	(m)	(ft-in)	(m)
0.05 to 1.0	Avoid Contact		Avoid Contact	
1.1 to 15.0	2-1	0.64	2-2	0.66
15.1 to 36.0	2-4	0.72	2-7	0.77
36.1 to 46.0	2-7	0.77	2-10	0.85
46.1 to 72.5	3-0	0.90	3-6	1.05
72.6 to 121	3-2	0.95	4-3	1.29
138 to 145	3-7	1.09	4-11	1.50
161 to 169	4-0	1.22	5-8	1.71
230 to 242	5-3	1.59	7-6	2.27
345 to 362	8-6	2.59	12-6	3.80
500 to 550	11-3	3.42	18-1	5.50
765 to 800	14.11	4.53	26-0	7.91

The following notes pertain to Table 3:

NOTE 1: These distances take into consideration the highest switching surge an employee will be exposed to on any system with air as the insulating medium and the maximum voltages shown.

NOTE 2: The clear live-line tool distance shall equal or exceed the values for the indicated voltage ranges.

NOTE 3: Phase to phase clearances apply to live line bare handed work.

NOTE 4: Lesser distances may be employed based on specific engineering studies.

5.7-1 Where there is not adequate working clearance from exposed current-carrying parts of adjacent equipment, no work shall be performed on any cables, wires, or other devices unless:

- a. A barrier of an approved type has been installed temporarily to prevent accidental contact with adjacent live parts, or

- b. The adjacent equipment has been removed from service and protected as directed by the operator having jurisdiction.

5.7.4 Whenever there is any question of the adequacy of the clearance between the specific area in which work is to be done and exposed current-carrying parts of adjacent equipment a field inspection shall be made by the appropriate management representative. The results of this inspection shall be the basis for a departmental written work procedure, where required, which shall include all protection necessary to complete the work safely, including watchers where needed. The procedure shall be prepared by the operating group and distributed to all groups involved in advance of the starting time. If required, a watcher or watchers shall be delegated to assure that confines of the work area are not violated. The watcher shall be an approved employee who has a comprehensive understanding of the job.

5.7.5 Employees shall not pass over or perform work above exposed or unprotected live equipment unless necessary safety precautions have been taken to prevent the worker or his tools and equipment from falling into such equipment.

5.7.6 No work shall be done on throughbolts, operating rods, pipes, conduits, mounting brackets, shelves, screens, iron details etc. in a dead compartment which may in any way alter the clearance in an adjoining compartment unless it is definitely known that all equipment and parts therein are dead. Compartment doors must be removed to present a clear view of the work procedure and the effects of work on the equipment in the adjoining compartment must be noted and corrected if necessary.

5.7.7 When it is necessary to snake a duct, precautions shall be taken to guard against personal injury or damage to equipment, particularly at the far end of the duct. Adjoining ducts also shall be observed when there is a possibility that a snake might be directed to a different location through a break in the duct wall, especially if the snake could make contact with live or moving parts when it emerges.

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