

## Chapter E 142

## SUPPLY SYSTEMS; GENERAL RULES FOR ALL EMPLOYEES

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**E 142.01 General precautions.** (1) **RULES AND EMERGENCY METHODS.** The safety rules should be carefully read and studied. Employees may be called upon at any time to show their knowledge of the rules. Employees should familiarize themselves with approved methods of first-aid, resuscitation, and fire extinguishment.

(2) **HEEDING WARNINGS, WARNING OTHERS.** Employees whose duties do not require them to approach or handle electrical equipment and lines should keep away from such equipment or lines. They should cultivate the habit of being cautious, heeding warning signs and signals, and always warning others when seen in danger near live equipment or lines. An employee should report as soon as practicable to his superior or some suitable authority any obvious hazards to life or property observed in connection with any electric equipment or lines. Any imminently dangerous conditions shall be guarded until they can be made safe.

(3) **INEXPERIENCED OR UNFIT EMPLOYEES.** (a) No employee shall do work for which he is not properly qualified on or about live equipment or lines.

(b) If an employee is in doubt as to the proper performance of any work assigned to him, he should request instructions from the foreman or other responsible person.

Exception: Work done under the direct supervision of an experienced and properly qualified person is excepted.

(4) **SUPERVISION OF WORKMEN.** Workmen, whose employment incidentally brings them in the vicinity of electrical supply equipment or lines with the dangers of which they are not familiar, shall proceed with their work only when authorized. They shall then be accompanied by a properly qualified and authorized person, whose instructions shall be strictly obeyed.

(5) **EXERCISING CARE.** Employees near live equipment and lines should consider the effect of each act and do nothing which may endanger themselves or others. Employees should be careful always to place themselves in a safe and secure position and to avoid slipping, stumbling, or moving backward against live parts. The care exercised by others should not be relied upon for protection.

(6) **LIVE AND ARCING PARTS.** (a) *Treat everything as alive.* Electrical equipment and lines should always be considered as alive, unless they

are positively known to be dead. Before starting to work, preliminary inspection or test should always be made to determine what conditions exist. (See section E 142.03(1) for general requirements and section E 142.05(3) for test of circuit).

(b) *Protection against arcs.* The hands should be covered by protecting and insulating gloves and the eyes by suitable goggles or other means if exposed to injurious arcing. Either a thin rubber glove used with a protective outer glove or a heavier rubber glove used alone shall be considered as both protecting and insulating. Employees should keep all parts of their bodies as far away as possible from brushes, commutators, switches, circuit-breakers, or other parts at which arcing is liable to occur during operation or handling.

(7) **SAFETY APPLIANCES.** Employees at work on or near live parts should use the protective devices and the special tools provided. Before starting work these devices or tools should be examined to make sure that they are suitable and in good condition.

*Note:* Protective devices may get out of order or be unsuited to the work in hand.

(8) **SUITABLE CLOTHING.** Employees should wear suitable clothing while working on or about live equipment and lines. In particular, they should keep sleeves down and avoid wearing unnecessary metal or flammable articles, such as rings, watch or key chains, or metal cap visors, celluloid collars, or celluloid cap visors. Loose clothing and shoes that slip easily should not be worn near moving parts.

(9) **SAFE SUPPORTS.** (a) Employees should not support themselves on any portion of a tree, pole structure, scaffold, ladder, or other elevated structure without first making sure that the support is strong enough. Supports should be reinforced if necessary.

(b) Where portable ladders are treated for preservation, only a transparent coating or other preservation which does not hide the grain and wood structure shall be used. Only a non-conducting preservation and non-conducting bracing shall be used where ladders are used in stations or around electric equipment. (See Department of Industry, Labor and Human Relations rules on safety in construction.)

(c) Portable ladders should be in a safe position before being climbed. The slipping of a ladder at either end should be carefully guarded against, especially where the supporting surfaces are smooth or vibrating.

(10) **SAFETY BELTS.** Employees working in elevated positions should use a suitable safety belt or other adequate means to guard against falling. Before an employee trusts his weight to the belt, he should determine that the snaps or fastenings are properly engaged and that he is secure in his belt. No safety belt or other protective device shall be used that has not been approved and recently inspected as provided in section E 141.02(7).

(11) **FIRE EXTINGUISHERS.** In fighting fires near exposed live parts, employees should avoid using fire-extinguishing liquids which are non-insulating. If necessary to use them, all neighboring equipment should be first killed.

(12) **REPEATING MESSAGES.** Each person receiving an unwritten message concerning the handling of lines and equipment shall immedi-

ately repeat it back to the sender and secure his full name or other identification and acknowledgment. Each person sending an unwritten message shall require it to be repeated back to him by the receiver and secure the latter's full name.

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**E 142.02 Operating routines.** (1) **DUTIES OF CHIEF OPERATOR.** The chief operator, described in section E 141.01(6) shall:

(a) Keep informed of all conditions affecting the safe and reliable operation of the system.

(b) Keep a suitable record or log book showing all changes in such conditions. He shall read and sign such record when assuming duty and sign again on being relieved.

(c) Keep within sight operating diagrams or equivalent devices indicating whether electrical supply circuits are open or closed at stations under his immediate jurisdiction, and where work is being done under his special authorization.

1. Exception: These indicating devices shall not be required for any chief operators classed under sections E 141.01(6) (c) and (d), if the record or log sheets show all conditions affecting the safe and reliable operation of the system.

*Note:* In these rules the person performing these duties is designated as chief operator, regardless of his ordinary title.

(2) **DUTIES OF FOREMAN.** Each foreman in charge of work shall adopt such precautions as are within his power to prevent accidents and to see that the safety rules are observed by the employees under his direction. He shall make all the necessary records, and shall report to his chief operator when required. He shall, as far as possible, prevent unauthorized persons from approaching places where work is being done. He shall also prohibit the use of any tools or devices unsuited to the work in hand or which have not been tested as provided in section E 141.02(7).

(3) **QUALIFIED GUIDES.** The qualified persons accompanying un instructed workmen or visitors near electrical equipment or lines shall take precautions to provide suitable safeguards and see that the safety rules are observed.

(4) **SPECIAL AUTHORIZATION.** (a) *Special work.* Special authorization from the chief operator shall be secured before work is begun on or about station equipment, transmission, or interconnected feeder circuits or live circuits of more than 8,700 volts, and in all cases where lines are to be killed by regular procedure at stations, and a report shall be made to him when such work ceases.

1. Exceptions: In emergency, to protect life or property, or when communication with the chief operator is difficult, due to storms or other causes, any qualified employee may make repairs on or about the equipment or lines covered by this order without special authorization if the trouble is such as he can promptly clear with help available in compliance with the remaining orders. The chief operator shall thereafter be notified as soon as possible of the action taken. (See subsection (8) (b) for crossed or fallen wires).

(b) *Operations at stations.* In the absence of specific operating schedules for opening and closing supply circuits at stations, or start-

ing and stopping equipment, employees shall secure special authorization from the chief operator before performing these operations. In all cases such special authorization shall be secured where circuit or equipment control devices are tagged at stations to protect workmen. (See subsection (6) for tagging electrical circuits).

1. Exceptions: In emergency, to protect life or property, any qualified employee may open circuits and stop moving equipment without special authorization if, in his judgment, his action will promote safety, but the chief operator shall be notified as soon as possible of such action, with reasons therefor. To maintain service, any qualified employee may also reclose circuits which have opened by fuses or automatic circuit-breakers except where this is prohibited by rule.

(c) *Cutting out sections of circuits.* Special authorization shall be secured from the chief operator before sections of overhead or underground circuits are cut off by employees at points other than at stations by means of sectionalizing switches.

1. Exception: Portions of distribution circuits of less than 8,700 volts may be cut off by authorized employees without special authorization from the chief operator, by means of sectionalizing switches, if the chief operator is thereafter notified as soon as possible of the action taken. This may also be done even for circuits of more than 8,700 volts when communication with the chief operator is difficult.

(5) RESTORING SERVICE AFTER WORK. Instructions for making alive equipment or lines which have been killed by permission of the chief operator to protect workmen shall not be issued by him until all workmen concerned have been reported clear. When there is more than one workman at a location, a person authorized for the purpose shall report clear for such workmen, but only after all have reported clear to him. If there is more than one gang, each shall be so reported clear to the chief operator.

(6) TAGGING ELECTRICAL SUPPLY CIRCUITS. (a) *When tags are placed at direction of chief operator.* Before work is done at direction of chief operator on or about equipment or circuits, under any of the conditions listed below, the chief operator shall have "Man at work" or equivalent tags attached at all points, where such equipment or circuits can be manually controlled by regular operators. The tags should be placed to plainly identify the equipment or circuits worked on.

1. Transmission or interconnected feeder circuits.
2. Circuits operating at more than 8,700 volts.
3. Circuits killed at stations and substations to protect workmen.

(b) *When tags are placed at direction of authorized employees.* Before work is done on or about any equipment or lines which are killed by authorized employees at points other than at stations, the employees shall have "Men at work" or equivalent tags placed at all points where the circuit has been disconnected to identify the portion worked on.

(7) MAINTAINING SERVICE. (a) *Closing tagged circuits which have opened automatically.* When live circuits on which "Men at work" or equivalent tags have been placed have opened automatically, they should be kept disconnected until the chief operator has given proper authorization for reconnection.

(b) *Closing circuits operated automatically.* When overhead circuits, other than trolley and third-rail circuits, open automatically, the employer's local operating rules shall determine in what manner and how many times they may be closed with safety for persons on or near those circuits. The chief operator shall be advised of the conditions.

(c) *Grounded circuits.* When circuits feeding supply lines become accidentally grounded, they shall be tested to determine where the ground exists. If the ground cannot be definitely located and removed by the station operator, an immediate report of the finding shall be given to the chief operator, who shall order a patrol of the lines affected to definitely locate and remove the ground as soon as practicable.

*Note:* On circuits exceeding 8,700 volts, it will usually be found advisable to disconnect the circuit or effectively ground the accidentally grounded conductor until the lines have been cleared of the accidental ground.

(8) **PROTECTING TRAFFIC.** (a) *Barrier guards.* Employees shall first erect suitable barrier guards before engaging in such work as may endanger traffic. They shall also display danger signs or red lamps placed so as to be conspicuous to approaching traffic. Where the nature of work and traffic requires it, a man shall be stationed to warn passers-by while work is going on.

(b) *Crossed or fallen wires.* An employee finding any crossed or fallen wires which may create a hazard shall remain on guard or adopt other adequate means to prevent accidents, and shall have the chief operator notified. If the employee can observe the rules for handling live parts by the use of insulating appliances, he may correct the condition at once; otherwise he shall first secure the authorization from the chief operator for so doing. (See subsection E 142.02(4) for special authorization).

(9) **PROTECTING WORKMEN BY SWITCHES AND DISCONNECTORS.** When equipment or lines are to be disconnected from any source of electrical energy, for the protection of workmen, the operator shall first open the switches or circuit-breakers designed for operation under load, and then the air-break disconnectors, when provided.

**History:** Cr. Register, January, 1968, No. 145, eff. 2-1-68.

**E 142.03 Handling live equipment or lines.** (1) **GENERAL REQUIREMENTS.** (a) *Touching live parts.* An employee should never touch with bare hands two parts at different potential at the same time. He should never touch with bare hands even a single exposed ungrounded live part at a dangerous potential to ground unless he is insulated from other conducting surfaces, including the ground itself, and stands on insulating surfaces. Employees may be supported by an insulating support especially designed for the purpose of working on live parts and whose position can be controlled within narrow limits.

(b) *Wire insulation.* Employees should not place dependence for their safety on the insulating covering of wires. All precautions in this section for handling live parts shall be observed in handling insulated wires.

*Note:* Covering or insulation on a wire may look perfect, but it frequently will not prevent shock.

(c) *Exposure to higher voltages.* Every employee working on or about equipment or lines exposed in overhead construction to voltages higher than those guarded against by the safety appliances provided should as far as practicable assure himself that the equipment or lines worked on are free from dangerous leakage or induction or have been effectively grounded.

(d) *Cutting into insulating coverings of live conductors.* When the insulating covering on live wires or cable must be cut into, the employee should use a suitable tool.

*Note:* Recommendation: While doing such work, it is recommended that suitable goggles be worn to protect the eyes, and insulating gloves to protect the hands.

When metal sheathing must be removed from cables, it should be done with special tools which will not injure the insulation. The sheathing should be cut so as to leave enough exposed insulation after the conductor has been bared to avoid arcing over between the conductor and the sheath. If the cable consists of more than one conductor, similar exposed insulating surface should be left for each conductor, using insulating separators between conductors, if necessary.

Insulating devices, such as wood separators, etc., should be examined, and conducting dust or chips, sharp edges, or nails should be eliminated to avoid defeating the purpose for which the devices are intended.

(e) *Metal tapes or ropes.* Metal measuring tapes, and tapes, ropes, or hand lines having metal threads woven into the fabric should not be used near exposed live parts.

(f) *Metal reinforced ladders.* Ladders reinforced by metal in a longitudinal direction should not be used near exposed live parts.

(2) **VOLTAGES BETWEEN 750 AND 8700.** No employee should go, or take any conducting object without a suitable insulating handle, within 6 inches of any exposed live part whose voltage exceeds 750, where it is practicable to avoid this. Where safe distance from live parts cannot be secured by use of the special insulating tools and appliances furnished, properly tested insulating gloves and sleeves may serve as the sole portable insulating devices between the person and live parts.

(a) *Exception 1:* In dry locations this distance may be less than 6 inches, if insulating devices, such as shields, covers, or gloves are placed between the person and the part or object.

(b) *Exception 2:* In dry locations, the distance may also be reduced if insulating barriers (such as mats, stools, or platforms) are placed between the person and the ground, and suitable insulating shields between the person and all other conducting or grounded surfaces, which he could accidentally touch at the same time.

(c) *Exception 3:* In all damp or dark locations, the distance may be less than 6 inches only if insulating devices are used between the person and the live parts and also between him and all other conducting surfaces with which he might otherwise come in contact at the same time.

*Note:* Care should be exercised in using insulating gloves to avoid puncturing them on sharp edges, especially in making wire splices. It is generally advisable to wear protecting gloves over insulating gloves.

Under some circumstances it is desirable to cover with protective insulating material any grounded conductor or other grounded metal adjacent to work on live conductors, where the lineman might inadvertently contact it while handling a live conductor.

(3) **VOLTAGES EXCEEDING 8,700.** (a) *Clearances from live parts.* No employee should go, or take any conducting object, within the distances named below from any exposed live part at or above the voltage specified.

Operating Voltage	Distance in Inches
8,700	12
13,800	22
15,000	24
26,400	28
34,500	31
44,000	34
50,000	36
69,000	48
70,000	48
88,000	55
110,000	60
132,000	72

Distances for intermediate voltages to be determined by interpolation.

1. Exception 1: In dry locations these distances may be reduced if suitable insulating guards or barriers are placed between the person and such part or object.

2. Exception 2: These distances need not be maintained if the person uses an insulating support especially designed for the voltage to be worked on and arranged so that its position can be controlled within narrow limits.

(b) *Guards.* If the part is being directly worked on, the tools or other mechanical appliances used shall have insulating handles of sufficient length to permit the operator to maintain the distance specified in section E 142.03 (3) (a) preceding.

1. Exception: This does not apply if protective guards are also used between the person and the live part.

*Note:* These protective guards may be permanent insulating covers or shields, or may be disks of insulating material, suitable for the voltages to be handled and for the attendant conditions, attached to the handles of rods or tools.

(4) REQUIREMENT FOR TWO WORKMEN. In wet weather or at night no employee shall work alone on or dangerously near live lines of more than 750 volts.

(a) Exception: Trouble and emergency work is excepted.

(5) WHEN TO KILL PARTS. An employee shall not approach, or willingly permit others to approach, any exposed ungrounded part normally alive closer than permitted by sections E 142.03 (1), (2) or (3), unless the supply equipment or lines are killed.

*Note:* This is to ensure the employee of his own safety and the safety of those working under his direction.

(6) OPENING AND CLOSING SWITCHES. Manual switches and disconnectors should always be closed by a single unhesitating motion, and, if possible, with one hand. Care should be exercised in opening switches to avoid causing serious arcing.

(7) WORK FROM BELOW. Employees should avoid working on equipment or lines from any position by reason of which a shock or slip will tend to bring the body toward exposed live parts. Work should, therefore, generally be done from below, rather than from above.

(8) ATTACHING CONNECTING WIRES AND GROUNDS. (a) *Handling connecting lines.* In connecting dead equipment or lines to a live circuit by means of a connecting wire or device, employees should first attach the wire to the dead part before attaching it to the circuit. When dis-

connecting, the live end should be removed first. Loose conductors shall be kept away from exposed live parts.

(b) *Applying grounds.* In applying a grounding device to normally live parts, the device shall be grounded before being brought near the parts and shall be removed from the live parts before being removed from the ground connection.

(9) **HANDLING SERIES CIRCUITS.** Secondaries of current transformers to meters or other devices should not be opened when alive until a jumper has been connected across the point of opening or the circuit has been short-circuited elsewhere. Before working on arc lights connected to series circuits, they shall be short-circuited or (when necessary to avoid hazard) disconnected entirely from such circuits by absolute cutouts.

(10) **STRINGING WIRES.** In stringing wires near live conductors, they should be treated as alive unless they are effectively grounded.

**History:** Cr. Register, January, 1968, No. 145, eff. 2-1-68.

**E 142.04 Killing equipment or lines.** (1) **APPLICATION OF RULE.** (a) If workmen must depend on others for operating switches to kill circuits on which they are to work, or must secure special authorization from the chief operator before themselves operating such switches, the following precautionary measures shall be taken in the order given, before work is begun on or about the equipment or lines concerned, as a means for preventing misunderstanding and accident.

(b) In small organizations the chief operator may himself operate the switches and disconnectors instead of instructing others to do so, thus much simplifying and abbreviating the procedure. In certain cases the chief operator may direct the workman who wishes the section killed for his own protection to operate some or all switches necessary himself, thus also abbreviating the procedure.

(c) In cases where there is no station with regular attendants at either end of a section of line to be killed for the protection of workers, the rules below need not apply for disconnection of that end of the section concerned, provided that the employee under whose direction that end of the section is disconnected is in sole charge of the section and of the means of disconnection employed or that the point of disconnection at that end of the section is suitably tagged before work proceeds.

(2) **WORKMAN'S REQUEST.** The workman in charge of the work shall apply to the chief operator to have the particular section of equipment or lines killed, identifying it by position, letter, color, number, or other means.

(3) **OPENING DISCONNECTORS AND TAGGING.** (a) The chief operator at his discretion shall direct the proper persons to open all switches and air-break disconnectors through which electrical energy may be supplied to the particular section of equipment and lines to be killed, and shall direct that such switches and disconnectors be tagged with a tag of a distinctive character indicating that men are at work. All oil switches and remotely controlled switches should also be blocked where necessary for avoiding mistakes.

(b) A record shall be made when placing the tag giving the time of disconnection, the name of the man making the disconnection and the



name of the workman who requested the disconnection, and the name of the chief operator.

(c) Where the section of equipment or lines can be made alive from 2 or more sources, all such sources shall be disconnected.

*Note:* This will apply to work on lines with more than one station, also sometimes to work on transformers in banks, rotary converters, motor generators, switches, and other similar equipment.

(4) **STATION PROTECTIVE GROUNDS.** When all the switches and disconnectors designated have been opened, blocked, and tagged in accordance with section E 142.04(3), the chief operator shall require that protective grounds be made upon the lines which have been killed and that they are reported to him when placed.

(a) **Exception:** This requirement does not apply under conditions where the making of such grounds or the conditions resulting from having made the grounds would be more hazardous than working on lines without grounding.

(5) **PERMISSION TO WORK.** Upon receipt of information from all persons operating switches and disconnectors that protective grounds are in place, the chief operator shall advise the workman who requested the killing of the section that the specified section of equipment or line has been killed and that he may proceed to work.

(6) **WORKMEN'S PROTECTIVE GROUNDS FOR OVERHEAD LINES.** The workman in charge should immediately proceed to make his own protective grounds on the disconnected lines, except under conditions where the making of such grounds or the conditions resulting therefrom would be more hazardous than working on the lines without grounding. Such grounds shall be made between the particular point at which work is to be done and every source of energy.

(7) **PROCEEDING WITH WORK.** After the equipment or lines have been killed (and grounded, if required by section E 142.04(6)), the workman in charge and those under his direction may proceed with work on the grounded or killed parts. Care, however, shall be taken to guard against adjacent live circuits or parts.

(8) **PROCEDURE FOR OTHER GANGS.** Each additional workman in charge desiring the same equipment or lines to be killed for the protection of himself or the men under his direction shall follow the same procedure as the first workman and secure similar protection.

(9) **REPORTING CLEAR; TRANSFERRING RESPONSIBILITY.** The workman in charge, upon completion of his work, and after assuring himself that all men under his direction are in safe positions, shall remove his protective grounds and shall report to the chief operator that all tags protecting him may be removed, and shall give his location and report as follows: "Mr. ----- and men clear and all grounds removed." The workman in charge who received the permission to work may transfer this permission and the responsibility for men under him, as follows: He shall personally inform the chief operator of the proposed transfer, and if this is permitted, the name of the successor shall be entered at that time on the tags concerned or in the records of the persons placing the tags and of the chief operator. Thereafter the successor shall report clear and shall be responsible for the safety of the original workmen, so far as this is affected by the removal of tags.

(10) **REMOVAL OF TAGS.** The chief operator shall then direct the removal of tags for that workman and the removal shall be reported back to him immediately by the persons removing them. Upon the removal of any tag, there shall be added to the record the name of the chief operator and workman who requested the tag, the time of removal, and the signature of the person removing the tag.

(11) **RESTORING SERVICE.** Only after all protecting tags have been removed by the above procedure from all points of disconnection shall the chief operator, at his discretion, direct the removal of protective grounds and blocks and the closing of any or all disconnectors and switches.

**History:** Cr. Register, January, 1968, No. 145, eff. 2-1-68.

**E 142.05 Making protective grounds. (1) APPLICATION OF RULE.** When making temporary protective grounds on a normally live circuit, the following precautionary measures shall be observed in the order given, and the ground shall be made to all wires of the circuit which are to be considered as grounded.

(2) **GROUND CONNECTIONS.** The employee making a protective ground on equipment or lines shall first connect one end of grounding device to an effective ground connection supplied for the purpose.

(3) **TEST OF CIRCUIT.** The normally live parts which are to be grounded should next be tested for any indication of voltage, the employee carefully keeping all portions of his body at the distance required from such parts when alive by the use of suitable insulating rods or handles of proper length, or other suitable devices.

(4) **COMPLETING GROUNDS.** If the test shows no voltage, or the local operating rules so direct, the free end of the grounding device shall next be brought into contact with the normally live part and securely clamped or otherwise secured thereto before the employee comes within the distances from the normally live parts specified in subsections E 142.03(1) and (2), or proceeds to work upon the parts as upon a grounded part. In stations, remote-control switches can sometimes be employed to connect the equipment or lines being grounded to the actual ground connection. On lines it is generally necessary to resort to portable grounding devices handled directly by means of insulating handles, rods, or ropes.

(5) **REMOVING GROUNDS.** In removing a protective ground the employee shall not remove the grounding device from the ground connection until the device has been disconnected from all normally live current-carrying parts.

**History:** Cr. Register, January, 1968, No. 145, eff. 2-1-68.