THE PENNSYLVANIA RAILROAD COMPANY
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EDUCATIONAL COURSE

PAMPHLET A-1
RESUSCITATION FROM ELECTRIC SHOCK

OFFICE OF
SUPERINTENDENT OF TELEGRAPH
PHILADELPHIA
RESUSCITATION.

On account of the Pennsylvania Railroad using electricity in so many different ways at the present time and to caution its employes against the possibility of injury by accidentally coming in contact with dangerous electric circuits and to give them instructions regarding the proper treatment of those who become injured from this source, the following pamphlet has been prepared. This should be carefully studied and understood because it may be necessary on a moment's notice to take proper and immediate action in order to save the life of a fellow workman.

These precautions and the proper instructions are given before any pamphlets on power and lighting circuits or apparatus are issued in order to warn the employes of the possible dangers in the use of such equipment. This applies not only to those who have occasion to handle this apparatus in their daily work, but also to all employes who might be present or in the vicinity where a serious accident might occur, as they could be of assistance in properly treating the victim until the services of a physician could be obtained.

Injury is generally caused by direct contact with a line conductor, though with extremely high voltages, shock may result from coming too close to a live conductor. It is, therefore, obvious that the first precaution to be observed is:

Keep away from live conductors, as far as convenience will permit or safety may require.

Even telephone, telegraph and lighting circuits may be dangerous, as they may become crossed with high potential power circuits at some point out on the line. For this reason, employes whose regular duties do not demand their coming in contact with such wires should not do so intentionally.

The victim may be injured by shock, by burns, or by both, and in falling he may bruise his body or break some of his bones. Shock is caused by passage of current through the body, some part of which accidentally comes in contact with a live wire. This tends toward a more or less complete paralyzation of the nervous system, causing the
heart and lungs to slow up and even cease to perform their functions. The degree of injury is largely dependent upon the conditions under which the shock was received. For instance, if the electric circuit be completed by making contact with the body at the shoulder and hand of the same arm, current will pass through the arm and the shock will probably not be fatal, as it is possible for the vital organs to perform their functions without the aid of the arm. If, however, contact be made from one hand to the other, current will pass through the body near the heart and the shock may be sufficient to stop the action of the heart entirely and thus apparently cause death.

It should be remembered that in most electric circuits, one side of the circuit is generally connected to the ground, either intentionally or through a weak point in the insulation. For this reason a shock may be received by coming in contact with the other conductor, which would complete the circuit through the body to ground.

The victim may be burned by the flash from an arc or by the heating of the tissues of the body caused by the passage of current through them. In breaking contact between a live conductor and the victim, or between two live conductors, an arc may be drawn in such a manner as to produce a burn. While such a burn may be very painful, it is not, as a rule, very serious and may be readily treated. If current passes through the body, however, sufficient heat may be generated to burn the victim internally. Such a burn may be very serious, owing to its being inside the body, which makes its treatment difficult.

**Promptness and Perserverance.**

Accidental electric shock does not always kill, it may only stun the victim and stop his breathing for a while. The shock is not likely to be immediately fatal, because:

The live conductor may make only a brief and imperfect contact with the victim's body.

The skin, unless wet, offers high resistance to the current.

Prompt and intelligently directed efforts in removing the victim from contact with live conductors, and prompt, intelligently directed and continued efforts in restoring natural respiration, are necessary for successful results. While promptness is essential, undue haste is to be condemned. The failure of the victim to respond quickly to resuscitation should not cause discouragement; the effort should be continued because—
The body depends upon a continuous exchange of air, as shown by the fact that we must breathe in and out about fifteen times per minute.

If the body is not thus repeatedly supplied with air suffocation occurs.

Persons whose breathing has been stopped by electric shock have been restored after artificial respiration has been continued three hours or more.

**Release of Victim from Contact with Live Conductor.**

Extreme care must be exercised in releasing the victim from contact with a live conductor to avoid receiving a shock. A piece of dry non-conducting material, such as a piece of wood, a coat, piece of rope, rubber hose, or other material which you are sure is a non-conductor, may safely be used to remove the live conductor, or handle the victim while he is in contact with the live conductor. The use of conducting materials such as metal, moist or damp cloth, etc., is extremely dangerous. Many persons by their carelessness in such matters have been severely shocked or burned while trying to remove a fellow workman from a dangerous position.

Break contact between the victim and live conductor as quickly as possible. Open the nearest switch, cut the wires, or do any other thing that appears to be the quickest, safest and surest method of opening the circuit.

If the live conductor lays on the victim, or on the ground in a dangerous position, a dry coat, rope or other flexible dry non-conductor may safely be wrapped around the live conductor to pick it up, carry it to a place of safety, or to hold it in a safe position. The coat or whatever is used to hold the wire should be grasped several feet from the conductor to avoid receiving a shock.

If the victim is clutching a live wire, or if he is so entangled in live wires as to render the removal of either the victim or the live wire difficult or dangerous, either to him or to the rescuer, the live wire may be safely cut with an axe or cutting pliers having well insulated handles.

In cutting or handling a live conductor, or in handling the victim, be careful to see that the free end of the live conductor does not come in contact with either the victim, the rescuer or bystanders.
If the victim must be touched while in contact with a live conductor, the rescuer should cover his hands with rubber gloves, several thicknesses of dry cloth or paper, or stand on a dry board or other dry insulating surface. If practicable, he should use only one hand.

Send for a physician promptly and have him take charge of the patient upon arrival, but do not wait for him before starting to resuscitate the victim.

**Resuscitation.**

Resuscitation is the act of reviving, or attempting to revive, by manual methods, a victim of suspended animation simulating death, caused by electric shock, drowning, inhalation of gas, effects of cold, surgical or other shock, or the administration of an anesthetic.

If the victim can be made to breathe and to continue to breathe, the major part of resuscitation has been accomplished, and recovery is practically assured. Having freed the victim from contact with the live conductor, artificial respiration should be started immediately without waiting for a physician. Resuscitation may be delayed or discontinued only long enough to carry the victim to a convenient spot where fresh air is abundant, or to remove him to or from a train, and then only for the shortest possible time. Bystanders must not be permitted to collect closely about the victim; this prevents his getting fresh air.

If the accident happens on a train, the victim should be removed to the baggage car, or if it happens on the right-of-way between stations, a train should be stopped and the victim placed in the baggage car. The doors and ventilators should be opened to admit fresh air. Upon the arrival of the train at the first station where a physician is at hand, the care of the victim should be turned over to him and he should be furnished with whatever assistance is necessary to continue the artificial respiration.

The operator should quickly feel with his fingers and remove from the victim's mouth and throat any foreign substance such as tobacco, false teeth, etc.

He should not stop to loosen the victim's clothing at this time; every moment of delay is serious.
The victim should be laid on his belly, with arms extended forward, as shown in Fig. 1. His face should be turned to one side in such a manner that the nose and mouth will be free for breathing. An assistant should draw the victim's tongue forward.

The operator should kneel, straddling the victim’s thighs, and facing his head. He should place the palms of his hands on the muscles of the victim’s back over the lower ribs. His thumbs should parallel the victim’s back bone, and his fingers should spread over the lower ribs as shown in Fig. 1.

He should hold his arms straight and swing his body forward slowly, bringing his weight to bear gradually upon the victim as shown in Fig. 2. Pressure is thus applied over the lower ribs by the heels of his hands, compressing the lower part of the chest and the abdomen, and forcing the air out of the victim's lungs. This movement should take from two to three seconds, and pressure must be applied gradually and firmly—not violently. Excessive pressure may injure the internal organs and sudden thrusts do not resemble natural respiration.

He should immediately swing backward to quickly remove the pressure. The hands should be kept in place, thus returning to the position shown in Fig. 1. Through their elasticity the chest walls expand and draw fresh air into the lungs.

After two seconds the double movement of compression and release should be repeated, making a complete respiration in four or five seconds or twelve to fifteen respirations per minute. If a watch or clock is not visible the operator should follow the natural rate of his own breathing, swinging his body forward with each exhalation, and backward with each inhalation. While doing this an assistant should loosen any tight clothing about the victim's neck, chest or waist.

Artificial respiration should be continued without interruption for at least three hours, or until natural breathing is restored. The movement should be continued for sometime after natural breathing has begun. In continuing the movement, the operator should be careful to keep his movements in step with the natural breathing of the victim. In stopping the movement the operator should see that the victim continues
to breathe; if he stops, artificial respiration should be started again immediately.

The above method is known as the Schaeffer or Prone Pressure method.

Liquids should not be given by mouth until the victim is fully conscious. A physician only may administer stimulants; this should not be attempted by any other person.

**CARE OF THE VICTIM.**

In handling the victim, burned parts should not be touched or irritated if possible, and in artificial respiration pressure should not be brought to bear upon burns.

During the period of restoring natural respiration, an assistant should keep the victim warm by applying a cover and by laying bottles or rubber bags filled with warm—NOT HOT—water beside the body.

If hot water is not available, rubbing the body or limbs with the hands or some rough fabric will produce the same result. Care should be taken not to rub the body at any point where the skin has been burned.

When natural respiration has been restored, any serious burns which the victim may have sustained should be cared for until the physician arrives.

Blisters must not be opened.

A raw or blistered surface should be protected from the air. If the clothing sticks, cut around it; do not peel it off. A dressing of soft material should be applied to the burn, and this, or the cloth adhering to the wound, should be saturated with a solution of baking soda (one teaspoonful to a pint of water) or the wound may be coated with a paste of flour and water.

Cover the dressing with cotton, gauze, lint, clean waste, clean handkerchiefs, or other soft clean cloth, and hold lightly in place by a bandage.

Similar coverings should be lightly bandaged over dry, charred burns, but *without* applying oil, acid or other liquid dressings.
After regaining consciousness, the victim should be watched carefully to see that he does not exert himself except in moderation. Violent exertion is liable to cause the breathing to stop, recovery from which is doubtful, although the same methods should be followed just as persistently as at first.

CONCLUSION.

While the above instructions may be readily comprehended, experience has shown that instructions, and even demonstrations on the part of others, are not sufficient in themselves to sharply fix the details of the operations in mind. Actual practice in the movements is necessary to insure a correct understanding of the ends desired, and the proper methods of accomplishing them. It is, therefore, necessary for those who desire to become proficient along this line, to go through the manipulations from time to time as both patient and operator. In emergencies, they will then be prepared to proceed without the necessity of reviewing printed instructions, thereby saving valuable time.

PROBLEMS.

NOTE—These problems should be answered all at one time, as one lesson.

1.—What is the first thing to be done with the victim in case he has received a dangerous electrical shock?
2.—Describe fully several methods which may be used in removing a body from contact with a live wire without danger to the rescuer?
3.—(a) On what do all such methods depend? (b) What articles should not be used to assist in removing a body?
4.—How would you cut a conductor if it was laying on the victim or if he was entangled in it?
5.—After removal of the body from the live conductors what are the first three things to be done?
6.—What is resuscitation?
7.—What should be the position of the patient when the work of resuscitation is begun?
8.—What should be done while placing him in this position?
9.—Why is the position of the head in this method so effective?
10.—What should be the position of the operator's body at the start?
11.—Where and how should he place his hands?
12.—What is the first movement which the operator should make?
13.—In making this movement, should his arm be held rigid or otherwise?
14.—How much time should be consumed in making the first movement?
15.—Describe the second movement and how much time should it consume?
16.—How much time should be consumed in the two movements, and why?
17.—How long should artificial respiration be continued?
18.—Who would be best qualified to say that artificial respiration may be discontinued?
19.—What may be done by persons other than the operator to assist in the resuscitation?
20.—Should any liquid stimulant be given the patient before breathing is established?
21.—After the patient is fully conscious, how would you treat any burns which he may have sustained?
22.—What is necessary in order that one may be ready to use this method at any time?
23.—Do you think you could properly perform the "prone-pressure" method of resuscitation which is described in this pamphlet? If not, why?