

SECTION 4
CENTRAL OFFICES

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4.1 GENERAL — CENTRAL OFFICES

4.11 Accident prevention in Central Offices requires that the things we do, and especially the things we do daily, be done with care and deliberation.

4.12 Deliberation does not necessarily mean slowness. To deliberate means "to think carefully or attentively." Therefore, anything done deliberately would indicate a planned act or one that was performed thoughtfully. Accidents seldom result from actions thus planned. They often result from hurried, unconsidered actions.

4.13 An important factor in the prevention of accidents is orderliness. This statement is double barreled in its meaning. Of great importance is orderliness of thought. If our minds are orderly, our actions are more likely to be orderly, and therefore safer. Of almost equal importance is an orderliness of habit. If, when we do a job, our tools are in order; if we haven't shoved a panel door, or a can cover, or a spool of wire where it doesn't belong; if all is not upset and in confusion where we are working, then we are promoting safety.

4.14 SEE SECTION 2—GENERAL—2.1 to 2.4 INCL.

4.2 BATTERIES

4.21 When working on batteries keep the eyes well above the top of the cells.

4.22

- (a) In moving the hydrometer from cell to cell avoid splashing or throwing the electrolyte.
- (b) Keep the eyes well above the cells except when taking the reading.
- (c) Be sure that the rubber tip does not catch as electrolyte might be flipped into the eyes.

4.23 The gas emitted by batteries during charge is explosive. To guard against explosions of gas within enclosed type cells:

- (a) Open flames shall be kept at a safe distance.

- (b) Do not cause sparks in the vicinity of battery vents. Follow Bell System Practices regarding precautions against static discharge.
- (c) Only standard voltmeters and voltmeter leads approved for battery maintenance shall be used. Defective insulation of the leads may result in sparking due to short circuiting of the terminals.



Keep Eyes Well Above Level of Cells in Making Battery Readings

- (d) Apply voltmeter picks to cell terminals at points as remote from vent as is practicable.

4.24 Rubber gloves, rubber apron and goggles should be worn when handling electrolyte or acid. Avoid stepping on rubber apron when working on a ladder.

4.25 If it is necessary to dilute sulphuric acid, pour the acid SLOWLY INTO THE WATER so as to allow the heat to dissipate. The reverse procedure might generate sufficient heat to cause an explosion.

4.26 Before the removal of electrolyte from batteries or the addition of acid or any other handling of either electrolyte or acid, review Bell System Practices A501.001 and A501.003

4.3 POWER PLANTS

4.31 General-Power Plants. In many of our central offices there are potentials which, under certain conditions of the human body, may be hazardous. All reasonable care is taken to guard these, but the employee should treat them all with respect.

- (a) When working near power boards see that tools or materials such as solder do not project from pockets or belts.
- (b) Do not use metal rules, metal-bound rules, metal tapes or tape measures containing metallic threads, nor metal lamp guards, around power boards or fuse panels.
- (c) The wearing of rings, watches, wrist watches, key chains, and the like constitutes a hazard when working at or near power switchboards, fuse boards and other power equipment. They should not be worn.

4.32 Rotating Machinery

- (a) Motor-generators, ringing generators, and other rotating machinery shall not be cleaned while in operation except as covered in authorized instructions.
- (b) Under no circumstances shall work be done on a commutator of an energized high voltage generator. (Over 100 volts).
- (c) The clothing worn shall be suitable for the job.
- (d) Shirt sleeves shall be rolled up and flowing neckties removed.
- (e) Vests shall be kept buttoned or removed.
- (f) Fountain pens, pencils, etc., clipped to vest pockets or shirt fronts should be removed.

4.33 Charging Rectifiers-It is hazardous to work on a charging rectifier while it is in operation or while power is connected to it.

- (a) DISCONNECT THE POWER SUPPLY BEFORE STARTING WORK WITHIN THE RECTIFIER CASE.
- (b) When rectifiers are so arranged that the power supply must be disconnected before the cover can be removed, the power shall not be reconnected until the cover has been replaced.

4.34 Bus Bars, Fuse and Switch Terminals

- (a) In working on bus bars, or on fuse or switch terminals of power switchboards or fuse boards of normal voltage, insulated tools should be used and suitable protection provided. It may save you from serious burns. For high voltages, protection as specified in standard instructions is provided.
- (b) A fuse puller shall be used in removing or replacing tubular type fuses.
- (c) SEE SECTION 4.31—GENERAL—POWER PLANTS.

4.35 Transformer Vaults—Enclosures protect our transformer vaults. They shall be entered:

- (a) Only when necessary.
- (b) Only by an employee who is well acquainted with the switching arrangements and the correct method of operation.
- (c) Only by an employee in the company of another employee.

4.36 Engines—Generators

- (a) Every employee who may be required to maintain, start, operate, or stop engine-generators should know and follow the correct, safe sequence of operations.
- (b) During operation of the engine keep the engine room well ventilated.
- (c) Open flames in engine rooms shall be avoided.

4.37 Fly-wheels and Belts

- (a) The starting, operation, and stopping of engines that are belt connected to generators shall be performed only by employees who have been trained in the proper procedures.
- (b) Care shall be taken to avoid entanglement with belts or flywheels.

4.38 Engine Repairs

- (a) In effecting repairs, care shall be taken in handling engine parts, gears, and machined castings.

- (b) Many engine parts have sharp edges and should be handled with wiping cloths wherever feasible to avoid cuts.
- (c) Where "wire edges" are present they should be removed with a file.
- (d) Some parts are of necessity heavy and may be located in confined areas. Keep this constantly in mind to avoid personal injury.
- (e) Before engine parts such as crankshafts are rotated be positive your fingers are in the clear.
- (f) Never place your hand or fingers between parts being assembled regardless of how securely they appear to be held.
- (g) Use the correct size wrenches to avoid slipping and consequent injury to the knuckles or hands.

4.4 LADDERS --- CENTRAL OFFICES

4.41 Types-Four general types of ladders are used in Central Offices. For safety, each of the following types shall be used for the purpose for which they are designed :

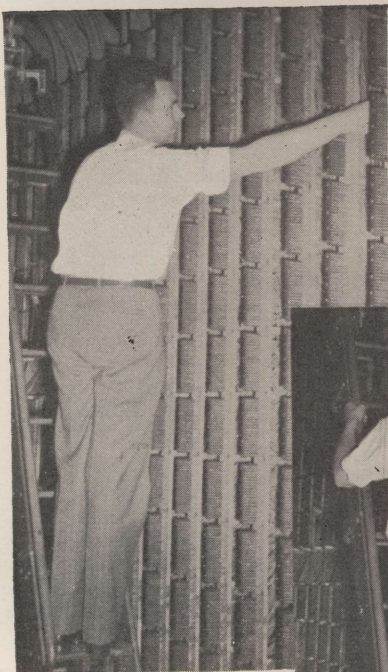
- (a) Track type rolling.
- (b) Portable rolling.
- (c) Step.
- (d) Platform.

4.42 Track Type Rolling ladders

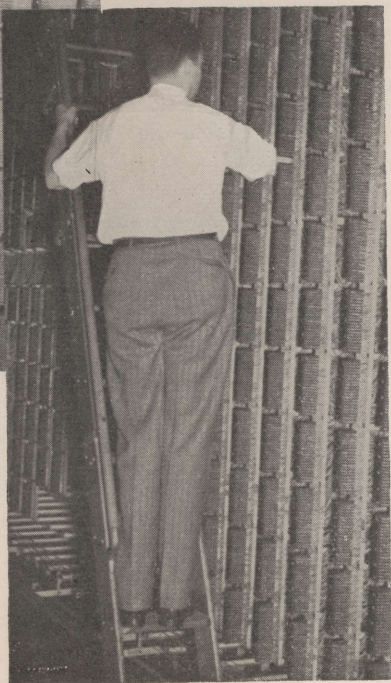
- (a) This type is provided for use at distributing frames and distributing fuse bays where the panels extend above reach from the floor and in lines of bays in which equipment such as telephone repeaters, ringers and relay equipment are located.
- (b) These ladders must be equipped with a standard brake.
- (c) The ladder shall not be used unless the brake operates when a person stands on the specified step as outlined in standard instructions.
- (d) Pulling the brake release rope permits moving the ladder without descending.
- (e) Use caution when it is necessary to move these ladders.

4.43 Portable Rolling Ladders

- (a) This ladder is intended for use in performing regular work operations in connection with Central Office equipment.



←UNSAFE



SAFE →

Do Not Overreach From A Ladder—Move It.

- (b) The wheels should be equipped with adjustable springs so that when a person ascends the ladder to the third step all four legs of the ladder rest on the floor.
- (c) The ladder spreaders should be of the type which mount on the outside of the side rails of the ladder.
- j(d) **DO NOT USE THE PLATFORM AS A STEP.** It is intended as a space on which to place tools or testing equipment.
- (e) Be sure ladder is fully opened and spreaders locked before using.

4.44 Step Ladders

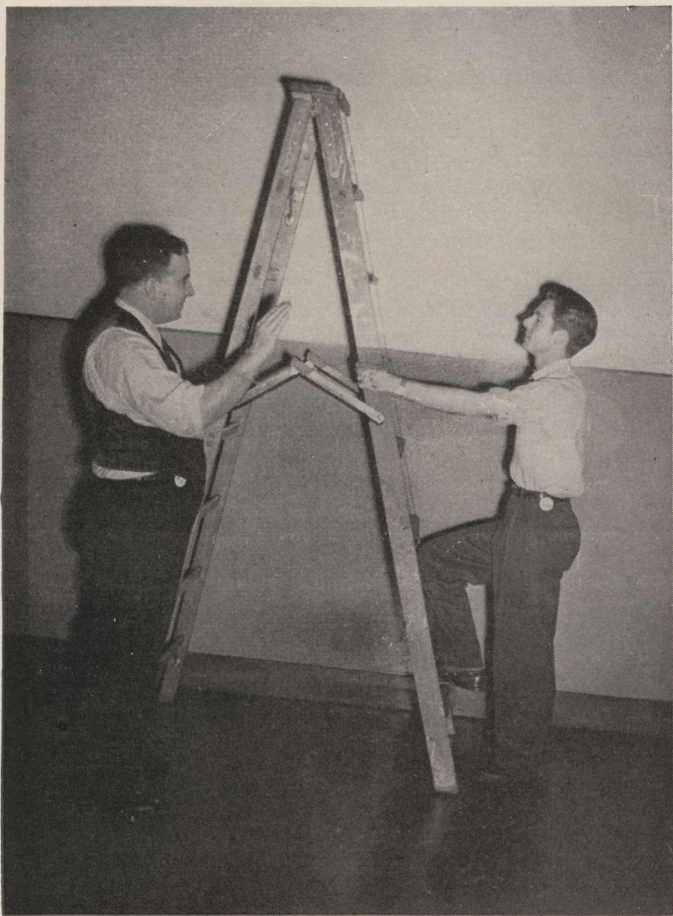
- (a) The step ladder is for use in cleaning, painting or similar work or may be used in installation work.
- (b) **DO NOT USE THE PLATFORM FOR A STEP.** It is intended for use as space to place tools.
- (c) Be sure ladder is fully opened and spreaders locked before using. (See Picture on Page 10.)
- (d) More than one man shall not occupy stepladder at the same time.

4.45 Platform Ladders

- (a) This ladder is designed for use where the work is largely near the ceiling or superstructure.
- (b) Due to its construction it is safe to work from the platform.
- (c) Because of its peculiar design, it is more easily and safely opened, closed, raised, and lowered from the rear.

4.46 Precautions in Using Ladders

- (a) Be sure your ladder is in good condition.
- (b) Use only an approved ladder and the one designed for the purpose at hand. Painted ladders are prohibited. Use only clear varnish or shellac for refinishing.
- (c) Do not overreach from ladder. Move it or get a longer one.
- (d) Do not attempt to lean more than 12 inches beyond side rail while on a ladder.
- (e) A ladder with tools or testing equipment thereon shall not be left by an employee unless such tools or equipment are fastened securely.



Be Sure Step Ladder is Fully Opened—See Paragraph 4.44 (c)

- (f) Employees shall always face a ladder when ascending or descending. The rear of stepladders or platform type ladders shall not be used for this purpose.
- (g) Stepping from one ladder to another without descending is forbidden.
- (h) Do not stand with one foot on a ladder and the other foot on some other support.
- (i) Look up before moving a ladder. Do not move it with another workman on it.
- (j) Never place a ladder against any movable object not under your absolute control, or on a box, barrel or insecure support.
- (k) Never "walk" a ladder; get off and move it.

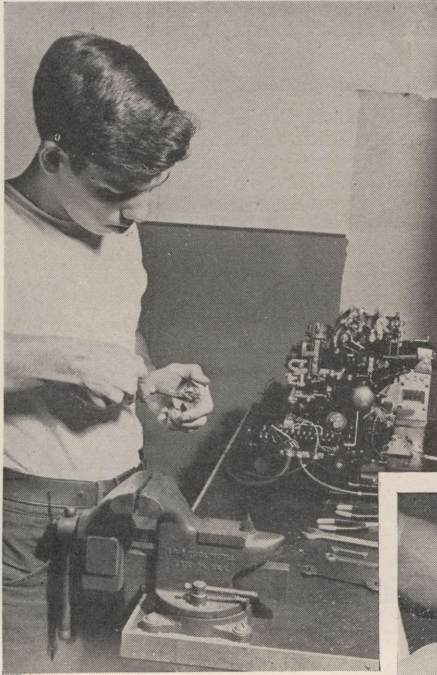
4.5 SOLDERING AND SOLDERING COPPERS

4.51 Soldering

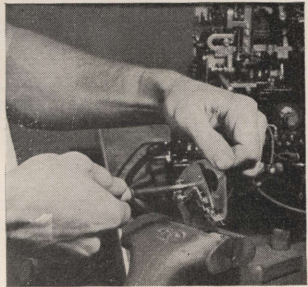
- (a) Solder shall never be snapped from a soldering copper. Wipe it on a pad or tin plate.

4.52 Soldering Coppers

- (a) When using an electric copper always have a holder within easy reach.
- (b) The holder should be secured to the ladder or other structure, and the soldering copper should be equipped with a collar so that to remove it from the holder it must be raised.
- (c) Electric cords for soldering coppers shall be:
 1. As short as practicable.
 2. Connected so as not to extend across the floor of an aisle or passageway if it can be avoided.
 3. Connected to a receptacle on the line of equipment on which work is to be performed.
 4. Inspected before using for defective insulation.
 5. Used only with approved plugs in good condition.
- (d) Do not use a soldering copper on which the tip or handle is loose or defective.
- (e) If necessary to extend electric cord across the floor of a passageway, mark it with a sheet of white paper. Where electric cords are extended across the floor, they should be equipped with pull apart connections.



UNSAFE
CONSIDER
WHAT
WOULD
HAPPEN
IF THE
SCREWDRIVER
SHOULD
SLIP



THE SAFE WAY →

4.6 TOOLS — CENTRAL OFFICES

4.61 Use tools only for the purpose for which they were designed. Do not leave them scattered around where they might be stepped on and cause a fall.

4.62 In use of cutting tools such as knives, saws, or chisels, consider what would happen if the tool should slip.

4.63 Wear goggles while operating an emery wheel, drilling holes in concrete, stone or brickwork or while using a high speed electric drill on metal.

4.64 In stripping the sheathing from switchboard cable use only the approved tool. The hand which holds the cable should be behind the tool.

4.65 In working with a screwdriver on a small object, such as a plug, jack, or key, place the object on some secure surface, or in some clamping device. Do not hold in the hand. When a screwdriver is required select and use the correct size. A screwdriver, incorrectly handled, can inflict a nasty wound. See Page 12.

4.66 See that defective tools are removed from service, and either repaired promptly or disposed of.

4.7 RADIOTELEPHONE AND POWER AMPLIFIER EQUIPMENT

4.71 High voltages exist in the equipment and wiring of radiotelephone transmitters and receivers, and in some other circuits using power amplifier tubes. CONTACT WITH TERMINALS OR WIRING CARRYING THESE POTENTIALS MAY RESULT IN SERIOUS OR FATAL INJURY.

4.72 Protective Devices--These are of various types provided to safeguard the employee against injury from high voltages. Some of these are: Warning signs, guards, locks, key interlock systems isolating and grounding devices. Every reasonable effort has been exerted to design and construct protective systems that are reliable, and which, if they fail, will operate to deenergize the equipment or render it inaccessible.

4.73 Know the circuit arrangements and switching sequences.

4.74 When it is necessary for an employee to work on the wiring or equipment of a transmitter, receiver, transformer vault, or high voltage power supply:

- (a) Always follow precisely and deliberately the procedures established for they have been chosen to guard the employee against possible failure of the protective system.
- (b) Check all voltage, current and other devices which indicate whether the equipment is energized. One or more of these may fail, read zero or off-scale, especially after the occurrence of a trouble which requires investigation.
- (c) Use ground rods or grounding switches as specified in authorized instructions.

- (d) Assume that bus bars, transformer terminals, and the like are alive and dangerous, until YOU have assured YOURSELF that they are discharged and cannot be reenergized except under your control.
- (e) If there be any indication of failure of a protective device, or if there be any uncertainty as to the reason for some unusual occurrence, check indicating devices, check the sequence procedure, request assistance from another operator and inform your supervisor of the condition. Be **DELIBERATE** and **CAREFUL**. No service, no routine, no prescribed function or duty, is of such importance as to justify taking a chance of possible serious or fatal injury.
- (f) The disabling or circumvention of any feature of the protective systems as an operating expedient is dangerous, and specifically forbidden. Maintenance and adjustment work on protective systems shall be carried out in strict accordance with specific instructions covering such work.

4.8 TELETYPEWRITERS

4.81 The following precautions shall be observed in working on teletypewriter equipment:

- (a) Stop the machine before removing or replacing covers, distributors, typing units, keyboards and perforators. Where remote motor control is used remove the power plug so that the machine cannot be started while work is being done.
- (b) Carriage should be locked in the extreme left position to prevent operation while working on the unit.
- (c) In operating machines with covers removed, avoid contact with rotating or moving parts such as shaft, gears and typebar or platen carriages. Neckties and loose clothing shall be secured to prevent their being caught.
- (d) Avoid contact with exposed electrical connections.
- (e) Do not touch the governor adjusting wheel of running teletypewriter motors with the hand.
- (f) In lifting teletypewriter units use approved methods, and be sure hand holds and hands are free of grease or oil. (See Section 3.71)
- (g) When dismantling and assembling smaller teletypewriter parts hold or brace the work securely. If an assembly, such as a shaft, must be held in the hand, wrap the shaft with a cloth to prevent slippage and possible personal injury.
- (h) Refer to SECTION 2—GENERAL.

4.82 Tools-Teletypewriters

- (a) When a screwdriver is used, select the proper size to avoid burring screw slots. Keep the hands and face in safe positions.
- (b) Many screws are provided with slotted hexagonal heads. Use a wrench of proper size in preference to a screwdriver.
- (c) Use a spring hook for anchoring springs. To prevent injury in the event of breakage, hold the head to one side.

4.83 Customers' Premises

- (a) When working on customers' premises do not scatter tools or equipment so as to constitute a hazard.
- (b) Check working surroundings carefully for possible hazards.
- (c) Before doing any work that may involve contact with exposed terminals in the power circuit, disconnect all sources of voltage from that portion of the circuit to be worked on.

4.9 "L" CARRIER EQUIPMENT

4.91 Power Transformers on "L" Carrier Main Station Repeater Panels.

- (a) Do not remove either cover of the power transformer before turning the power off.

4.92 Coaxial Conductors at "L" Carrier Main Repeater Stations.

- (a) Do not remove the cords to 30A terminals before turning the power off.

4.93 Rectifier Inverter

- (a) 220 volts is present at several points in the cabinet at all times unless the fuses are removed at the commercial power distribution panel.
- (b) The rear door safety switches *do not* disconnect the 220 volt A.C. power supply within the cabinet.
- (c) Door safety switches shall not be blocked at any time. If switches are blocked, voltages as high as 450 volts may be experienced within the cabinet.
- (d) Rectifier tubes may be very hot. Gloves should be worn when removing.

4.94 Power Control Panels

- (a) Power control panels may supply as much as 2,000 volts.
- (b) Opening the inner compartment door will operate safety switches and interrupt the high voltage.
- (c) The operation of the safety switches does not remove the 220 volts.
- (d) 220 volts will still be present even though the 6 ampere fuses have been removed.

4.95 Auxiliary Repeater Stations

Bell System Practices E34.580 and G74.440 specify in detail the precautions to be taken when entering and leaving auxiliary repeater stations.

- (a) Do not remove covers of power transformers or remove any cords or repeater or other panels until the power has been turned down as covered in E34.579.
- (b) Auxiliary repeater panels are relatively heavy and awkward to handle. The precautions outlined pertaining to lifting in the Safety Code, Section 2.7 should be followed.
- (c) The precautions for testing and ventilating manholes containing "I " carrier equipment are the same as for any other manhole Bell System Practices G10.209, G10.212, G10.216, together with any local instructions on this matter should be observed in connection with entering all manholes.
- (d) The precautions outlined in the "Safety Code," Section 3.34 Item (d) concerning entering manholes should be followed.

4.96 Turning Power On and Off Coaxial Tubes.

- (a) Follow instructions given in E33.579.
- (b) In addition to the above, local instructions should specify where the safety fuse unit removed from the power control panel should be kept while the power is off.

4.97 Television Monitoring Viewers

- (a) Power must be disconnected from the Monitoring Viewers before any work is done inside the set.
- (b) Keniscope tubes must be carefully handled. They are under considerable pressure (inward) and may break with violence. Wear shatterproof goggles and gloves.

The gloves should be of leather sufficiently pliable and well fitting to permit grasping the tube securely and yet not so bulky as to interfere with the operations of placing or removing the tube.

In handling the Keniscope tube, follow the instructions on the tube carton and the instructions which are furnished for or accompany the television monitor being worked on.

- (c) Before working within a viewer in which the Keniscope is installed and in which no protection against mechanical damage to the tube has not been provided by set design or by shields applied later, temporary covering must be provided.

4.10 MISCELLANEOUS

4.101 Only approved extension cords in good condition and with plugs correctly polarized shall be used.

4.102 It is desirable to use a polarized pull-out arrangement with the extension cord, so that if unusual tension be applied the cord will pull apart. This can best be secured by means of an extension cord about one foot in length arranged to plug into the electrical outlet and equipped with a connector body into which to plug the regular extension cord.

4.103 In removing or replacing protector blocks use the approved tool. You may avoid a burn or shock by so doing.

4.104 Use rubber gloves at all times when working on high current protectors. There may be high voltages on wires that are not apparent.

4.105 Infection may result from cuts or scratches from wire ends or lugs. Clean spare lugs and clip the skinned ends of wires before coiling and storing.

4.106 Authorized instructions relating to heating and handling paraffins and wax should be followed closely. These materials should not be left unattended while being heated.

4.107 Testboardmen - In addition to following the safety precautions outlined in the Code for their own personal safety, craftsmen operating testboards and testing positions are often called upon to render advice and assistance to workers in the outside plant. In this connection testboardmen shall :

- (a) Be familiar with all sections of this Safety Code so that when directing the work of outside people the requests will be consistent with the safety rules prescribed for such work.

- (b) Use all possible means to warn all employees who might be exposed to suspected hazardous conditions of an electrical or other nature. Such conditions may consist of any of the following:
 - 1. Contact between power and telephone conductors.
 - 2. High voltages on telephone conductors due to lightning, power induction, earth currents, Aurora Borealis, etc.
- (c) Under the conditions outlined in (b) above, a local telephone shall be used for communication and the lineman shall be instructed not to climb into the wires until they are free from high voltage.
- (d) Notify the lineman before applying testing battery and tell him the pin positions of the wires involved so he will not come in contact with the testing voltage.
- (e) Maintain an up-to-date list of telephone numbers and addresses of doctors, ambulances, first aid stations, etc. for the town or city in which the office is located.

4.108 Central Office Craftsmen-The following general precautions shall be observed:

- (a) Keep alert for working hazards. Remove them where feasible or mark them suitably for safety reasons and report them to the supervisor. Some of these items are:
 - 1. Chairs or obstructions in aisles.
 - 2. Patch cords or extension cords across aisles.
 - 3. Sharp projections of equipment requiring guards.
 - 4. Defective tools or equipment.
 - 5. Broken or chipped edges of glass on desks, testboards or writing shelves.
 - 6. Poor housekeeping.
 - 7. Excess wax causing slippery floors.
- (b) Do NOT stand on chairs, foot rails of chairs or improvised structures to perform work out of reach. Secure a ladder suitable for the work to be done.
- (c) The removal and replacement of can covers shall be done carefully to avoid bruised fingers.
- (d) Handle vacuum tubes carefully; use gloves or specially designed tool. They may be hot or they may break.
- (e) Relays such as the 209 type should always be carried to and from the sets in which they are used by grasping the cover after it and the relay have been inverted, i.e. with the terminal block and associated contacts of the relay up. This is to prevent accidental release of the relay cover.

- (f) Use care to avoid accidental contact with foreign potentials that might appear at the primary jacks, etc.
- (g) Use care in handling patch cords and the cord on the attendant's telephone set. The plug may become a hazardous missile when out of control, therefore:
 1. Swinging cords and plugs is prohibited.
 2. In removing cords and plugs from jack fields follow standard instructions that prescribe grasping the plug.
 3. Remove individual cords from cord hooks by grasping the plug as well as the cord.

4.109 Cleaning Agents and Devices

- (a) The supervisor in charge of the cleaning operations shall be responsible for training the personnel assigned to do the work. The following precautions shall be observed when utilizing compressed air for cleaning toll central office equipment :
 1. The compressor discharge air regulator should be adjusted to deliver a nozzle pressure not to exceed 60 pounds per square inch measured with the duster nozzle open.
 2. When working within enclosures, the workman shall wear respirator and goggles for protection against dust and other flying particles caused by the high pressure of the jet of air used.
 3. The jet of air should never be directed toward the body, nor should it be used for the purpose of dusting the workman's clothing.
- (b) Carbon Tetrachloride, because of its highly toxic effect, shall be used only for those purposes and only in the small quantities prescribed in the Bell System Practices.
- (c) When use is made of KS-7860 petroleum spirits cleaning fluid, all rings, watches, bands, etc. should be removed. This fluid when confined as when spilled under a wrist watch or ring has irritating qualities and may cause blisters or infection.