should remove any grounds he has used, and his lock-out tags He should clear with the chief electrician or foreman or operator (whoever is in charge) before the equipment is returned to service

If the feed-in circuit to a switchboard, bus, or other equipment must be kept live on the incoming side of a breaker or switches, the electrician should provide ample clearance, barriers, or other protection between this section and the part on which he is to work He should not work in cramped quarters unless he has to, and he should insist that the men with him have freedom of movement in case of emergency

Live buses, conductors, and switches should be covered with insulated blankets or isolated with barriers

Electrically operated or remote-control circuit breakers or contactors should not be depended upon for protection A ground or other disturbance on the control system may permit the circuit breaker to close If no disconnects are installed ahead of or behind the circuit breaker, it will be necessary to block, rackout, or otherwise lock the breaker so that it cannot be closed

If the electrician must leave the circuit on which he is working before he completes the test, he should check all markings, breakers, and switches upon his return before he continues the tests

Rotating equipment

Before work is started on a rotating machine that is presumed out-of-service and stopped, an inspection of all the electrical control and starting devices should be made with the plant electrician or foreman

For example, when inspections or repairs are to be made on motors, generators, converters, or synchronous condensers, any part of which is remotely controlled, circuit breakers or switches should be locked out and provided with hold-off tags, and the fuses should be pulled

Where direct current machines are used, the electrician must make sure that both positive and negative lines are completely disconnected These machines are sometimes shut off by opening one side of the line only, but contact with an exposed part and with the frame will permit current to flow and the motor to start

Lockout procedures should be followed on generators driven by prime movers The throttle, starting valve, or other means of controlling the energy to the driving part of the unit should be locked and tagged

While the equipment is in operation, motor brushes should not be removed or adjusted, contacts or other parts of the electrical equipment should not be worked on, and no attempt should be made to clean, sandpaper, or polish commutators, or slip or collector rings

Machinery connected to blowers, water wheels, or pumps, without check valves, may start turning even when the current to the motor has been disconnected For this reason, the rotor or armature should be blocked before inspections are made

When inspecting electrical equipment, do not wear loose clothing because it may become entangled in couplings, coils, or other moving parts Remove wrist watches, rings, metal pens and pencils Do not use metal flashlights Accidental contact with live parts by a nonconducting case will not result in injury, whereas a metal case may cause a short circuit and shock the holder

During inspection of rotating equipment, the insulation on the wire and coils should not be depended upon to confine the current, and feeling exposed metal connections and windings with the bare hands should be prohibited

To check the heat dissipation of coils and windings, thermometers or temperature indicators should be installed when the apparatus to be tested is out of service and deenergized After the instruments are fastened securely, the equipment can be set in motion and readings taken

Although glass is a fairly good insulator, thermometers should never be held while temperatures of energized apparatus are checked Moisture and accumulations on the surface may permit passage of current

If air-insulated circuit breakers or contactors are installed to start motors or other machines, and the control circuit cannot be deenergized by opening switches or pulling fuses, a block of wood should be inserted in the magnet, solenoid, or mechanism to prevent automatic or manual closing of breakers or contactors

A separate record card should be maintained for each motor Space should be pro-