

Metropolitan Transit Authority

INSTRUCTIONS TO DRIVERS IN ELECTRIC TRAM OPERATION

- Q.1 What is a line breaker?
- A. It is an electrically-operated device fixed under the tram, which closes and completes the main power circuit when the driver moves the controller handle from the "off" position to the first power notch, and opens the main power circuit when the controller is moved towards the "off" position from any "on" position. It is also opens the main power circuit automatically in cases of overload, that is, when there is an excessive current, due either to faulty operation of the Controller (bad driving) or to some defect of the electrical equipment.
- Q.2 What is the use of the combined line breaker switch and fuse?
- A. The line breaker switch is used to open and close the line breaker control circuit manually. The fuse automatically opens the control circuit in the event of electrical trouble.
- Q.3 Name the circuits which are protected by a fuse.
- A. (1) Line breaker control circuit.
(2) Air compressor circuit.
(3) Lighting circuit.
- Q.4 What must a driver do first when it is necessary to renew a fuse in one of these circuits?
- A. In all cases, place in the "off" position the switch controlling the supply of current for that particular circuit. Then, before changing the lighting circuit fuse, remove the trolley pole from the overhead.
- Q.5 What is the use of a controller?
- A. The controller is used to control the current to the motors.
- Q.6 What is the use of the controller key?
- A. To reverse the direction of travel of the tram, and to lock the controller handle when the key is in the neutral position or removed. It is also used in the operation of electrical brakes.

Q.7 What are the names of the groups of notches on the controller?

A. Series and parallel.

Q.8 What is the difference between series and parallel?

When the controller is operated on the series notches the motors divide the line pressure (voltage) and the tram attains half speed. When the controller is operated on the parallel notches each motor receives the full line pressure (voltage) and the tram attains full speed.

Q.9 What must a driver do when it is necessary to examine the inside of a controller or cut out a defective motor or motors?

- A.
- (1) In all cases place in the "off" position the line breaker switch in the driving cabin.
 - (2) See that the track ahead is clear for at least one tram length.
 - (3) Cut all notches to make sure there is no power in the controller.
 - (4) Open the controller case. The controller contains special coloured switches for cutting out a defective motor or motors.

Q.10 When starting or bringing the tram up to speed, how long would you pause on each resistance notch?

A. Just long enough to maintain smooth acceleration. If a driver dwells too long on a resistance notch, power is wasted, the resistances get overheated and a fire may be caused.

Q.11 What is the result of moving the controller handle in the "on position too quickly?

A. Excessive current flows to the motors. This may cause the line breaker to blow or the wheels to spin.

Q.12 Why is it necessary to pause on the full series running notch before cutting into parallel?

A. To prevent jolting and to protect the electrical equipment.

Q.13 Why should drivers not pause between notches?

A. Only so long as it is necessary to run at reduced speed using power.

Q.14 How long would you operate the tram on the full series running notch?

A. Only so long as it is necessary to run at reduced speed using power.

Q.15 How can power be saved?

- A.
- (1) By cutting through resistance notches as smoothly and quickly as driving conditions allow.
 - (2) By cutting off power as far as possible from a stopping place.
 - (3) By coasting as far as practicable.
 - (4) By releasing the brakes immediately power is applied.
 - (5) Bu cutting off power before applying the brakes.

Q.16 How should a driver report a disabled tram?

A. Report by telephone to Radio Centre or Control. Give your name, cap number, tram number, run number, table number, route, direction of travel, nearest pole number and nature of trouble.

Q.17 What must the driver do if the controller becomes locked in the operating position?

- A.
- (1) Place the line breaker switch in the "off" position, apply brakes and stop the tram.
 - (2) Advise Radio Centre or Control.
 - (3) Arrange for the tram to be pushed (only in the direction it was going) to the terminus or until overtaken by the emergency vehicle.

NOTE: If the controller is locked in the "off" position make sure the controller key is in the full forward position. If this is not the cause notify Radio Centre or Control, put the controller key in the neutral position and the tram may then be pushed in either direction.

Q.18 What are the first things to be done if a tram has to be pushed?

A. All passengers must leave the tram and must be advised to board following trams.

Q. 19 What is the correct procedure to be followed when a tram has to be pushed?

- A.
- (1) Place the controller key in neutral position.
 - (2) If the air brake is in working order keep the air compressor switch "on" so that the air brake may be used. If the air brake is out of order put the air compressor switch to the "off" position and use the hand brake.
 - (3) The signal to start (two strokes of the gong) must be given from the rear tram first and repeated from the front tram, but the driver of the rear tram must not apply power to start until he received the start signal (two strokes) from the gong of the front tram.
 - (4) Series speed must not be exceeded.
 - (5) The driver of the front tram must keep a sharp lookout and give the signal to stop (three strokes of the gong) in case of emergency and must also apply his own brake promptly, using the hand brake if the air brake is out of action. He must also be ready, when on a grade, to apply his brakes quickly to stop the tram or to prevent it running backwards.
 - (6) The conductor of the front tram must take up a position in the rear saloon at the door to the driver's cabin and keep it open to give a clear view to the driver of the rear tram in case of necessity.

Q.20 What is the correct procedure when pushing a tram through automatic points?

- A.
- At automatic points the front tram must be stopped at the compulsory track stop mark.
- (a) To proceed on the straight both trams pass under the overhead contactor with power off. The conductor of the pushing tram must stand beside the track opposite the stud.
 - (b) To proceed around the curve, the driver of the front tram must indicate the curve to the driver of the second tram, and set the points correctly using the points bar. The conductor of the front tram must place the trolley pole under the hook. On hearing the signal to start the rear tram driver will push the front car until its trolley pole will clear the overhead contactor. The pole will then be put back on the overhead and both trams will proceed around the curve.

Q.21 If a tram fails to start, how would you find out if the power is on?

- A. (1) Turn on lights. If they burn this proves that the power is on and the wheels are not completely insulated from the rails by dirt or other matter.
- (2) If the lights do not burn make sure that the trolley pole is on the overhead wire and is not in contact with a section insulator. If it is necessary to descent from the tram, jump to the roadway from the smoker's entrance.

Q.22 If a tram fails to start when the power is on, what should the driver do?

- A. (1) Make certain that the track is clear for at least one tram length ahead.
- (2) Cut notches slowly to full series.
- (3) If the tram will not start on the first notch but will start on a later notch up to full series (this indicates broken resistance) the tram MUST NOT be operated beyond the full series position.
- (4) If the tram will not start on any series notch cut the first notch in parallel. If it then starts, the controller handle may be moved to the full parallel position notch by notch.
- (5) If the tram will not start on any parallel notch, put the line-breaker switch to the "off" position, renew the fuse, put the switch to the "on" position and test again on series and parallel notches.
- (6) If the tram still does not start on series or parallel notches, put the linebreaker switch to the "off" position, open the controller (and the arc shield on K35 controllers) and examine the ratchet spring. If the spring is unhooked, replace it. If the spring is broken remove it and use the spring from the other controller. Close arc shield (if opened) close controller, put switch to "on" position and test again.
- (7) If all these methods fail to start the tram, transfer passengers and arrange for the tram to be pushed.

Q.23 What must be done if the line breaker blows more than once, while the controller is being operated correctly?

- A. (1) Unless notching too quickly is the reason, this usually indicates a defective motor. If a defective motor is the cause and the line breaker blows in series, put the line breaker switch to the "off" position, see that the track is clear for at least one tram length and cut all notches to make sure there is no power at the

controller. Then cut out No. 1 and No. 3 motors. Put the line breaker switch "on" and try again. If the tram will not start or if the line breaker still blows, put the line breaker switch "off" cut all notches to make sure there is no power at the controller, then cut in No. 1 and No. 3 motors and cut out No. 2 and No. 4 motors. Put the line breaker switch "on" and try again. If there is still no success put the line breaker switch "off" advise Radio Centre or Control and arrange for the tram to be pushed.

- (2) If the line breaker blows in parallel, put the line breaker switch "off" cut all notches to make sure there is no power at the controller and then cut out No. 2 and No. 4 motors. Put the line breaker switch "on" and try to start the tram again. If the tram will not start or if the line breaker still blows put the line breaker switch "off", cut all notches to make sure there is no power at the controller then cut in No. 2 and No. 4 motors, cut out No. 1 and No. 3 motors, put line breaker switch "on" and try again. If this fails, advise Radio Centre of Control and arrange for the tram to be pushed.
- (3) If the tram starts without blowing when a pair of motors is cut out, notify Radio Centre or Control, ask for a changeover and drive the tram carefully to the changeover point. When driving with a pair of motors cut out, do not use the electric brake but drive so that the tram can be stopped with the service brake.
- (4) If it is necessary to change ends while driving with a pair of motors cut out, the corresponding motors must be cut out at the other end except on trams with RC2 controllers which have the motor cut out switches at No. 1 end only.

CAUTION: It is absolutely essential when the line breaker blows more than once to carry out the foregoing tests otherwise serious damage will be caused to substation and tram equipment.

Q. 24 What must be done if a fire occurs on a tram?

- A.
- (1) If the tram is in motion the driver must stop the tram as soon as the fire is discovered and immediately endeavour to extinguish the fire with sand from the sand boxes or with water. A tram must not be driven while it is on fire.
 - (2) The conductor must see that all passengers leave the tram promptly, pull down the trolley pole and then immediately call the fire brigade by breaking a nearby alarm or by telephone.

- (3) Radio Centre or Control must then be notified.
- (4) Unless absolutely necessary trap doors must not be pulled up until a fire is out. If a motor is on fire, the motor case must not be opened.
- (5) After a fire in a motor or in the motor leads has been extinguished, the driver must cut out the motor effected, ask for a changeover and drive the tram carefully to the changeover point.
- (6) If a fire in a controller has been extinguished but breaks out again when an attempt is made to start the tram, the driver must extinguish the fire again and arrange for the tram to be pushed.

Q.25 How would you get a tram ready for the road?

- A.
- (1) Make sure that:- no employee is working, beneath or beside the tram; the front trolley pole is under the hook and the rope is tied down; the rear trolley pole is on the proper trolley wire and the rope is in the guide.
 - (2) Put all switches to the "on" position.
 - (3) Test: all lights, including headlights, lifeguards, sand gear and brake air pressure.
 - (4) Inspect: spare lamps and fuses, points bar, run number plates and auxiliary notice boards. Report any item missing.
 - (5) Examine the tram for signs of recent damage. Driver will be held responsible for any damage not reported.
 - (6) Adjust: destination and route number signs.
 - (7) Release hand brake at both ends, sound gong to warn men working in pits, drive tram a short distance and try brakes.

CAUTION: If it is necessary for a driver to change poles in a depot, the pole on the overhead wire must be pulled down and secured under the hook before the other pole is released from the hook.

Q.26 What are the driver's duties when "running in" a tram?

A. Drivers when running trams into depot must place them in accordance with the road number shown on the "run-in" board.

The driver must -

1. (a) Operate tram from leading end only.
- (b) Drive at a speed not exceeding 4 miles per hour, with front pole securely under hook and rear pole in trailing position.

Note: Special instructions may also apply in some depots.

Before leaving tram -

2. (a) Pull all switches to "off" position.
- (b) Transfer brake handle, controller key and door valve handle to outward end of tram. Place reverse handle on top of controller. Place air brake handle in position and release brakes.
3. Untie rope of leading pole.
4. Place auxiliary destination signs and run number plates in the racks provided for the purpose.
5. Hand in any defective fuses and lamps to the Depot Starter. Do not leave them on the tram.
6. Report all tram defects and irregularities, including lamps or fuses changed, on the tram sign-off sheet. If there are no defects the tram is to be booked off "O.K."

CAUTION: If it is necessary for a driver to change poles in a depot, the pole on the overhead wire must be hooked down securely before the other pole is released from the hook.

Q.27 What are the main parts of the air system?

- A. (1) The combined air compressor switch and fuse. The switch controls the air compressor circuit and the fuse protects it.
- (2) The air compressor, driven by an electric motor compresses the air which is used to operate the brakes, the sand vales, the windshield wipers and the sliding or folding doors.
- (3) The air reservoir which holds the compressed air. A safety valve is fitted and there is a drain cock for removing water from the reservoir.
- (4) A governor which automatically switches on the compressor motor when the air pressure in the reservoir falls below 60 pounds to the square inch and switches

the motor off when the air pressure reaches 70 pounds to the square inch.

- (5) The driver's valve for operating the air brakes. As the valve handle is moved to the right, air under pressure is applied (through a double check valve and relay valve) to the brake cylinder. The movement of the valve handle regulates the pressure of the air in the brake cylinder which operates the brake levers connected to the brake shoes.
- (6) The door operating valves by which the driver or the conductor opens and closes the doors. On sliding door trams, there is an isolating cock at No. 1 end only, by means of which the compressed air is disconnected from the door engines.
- (7) The sand valves. When the driver presses the sand punch with his foot, compressed air is applied to the valves at the bottom of the sand hoppers and sand is blown through the hoses on to the rails.
- (8) The windshield wiper mounted on the windshield pillar. It is controlled by turning a small knurled knob.

Q.28 What must be done if the compressor motor does not start when the air pressure drops below 60 pounds per square inch?

- A.
- (1) If in motion stop the tram. If the air brake is not effective use the handbrake. If the air brake has been used to stop the tram, apply the hand brake and then release the air brake.
 - (2) See that the trolley pole is on the overhead wire and turn on the lights. If they burn, put the compressor switch "off" and then "on" again to be sure it is making good contact.
 - (3) If the compressor still does not start, put the compressor switch "off", renew the compressor fuse and put the compressor switch "on" again.
 - (4) Notify Radio Centre or Control, ask for a changeover and proceed cautiously using only the handbrake for service braking. The tram must be changed over whether the fault is corrected or not.

Q.29 What must a driver do if the air compressor governor fails to cut out?

- A.
- (1) If the air pressure as shown by the red needle in the gauge does not go over 90 pounds per square inch, notify Radio Centre or Control and drive as carefully as possible using service braking only.

- (2) If the red needle rises above 90 pounds per square inch, put the compressor switch to the "off" position and reduce the pressure by making several service applications until the red needle falls below 90 pounds per square inch.

Notify Radio Centre or Control and drive carefully using service braking only. When the red needle falls below 60 pounds per square inch, use only the hand brake for service braking. Compressor switch off. Remove fuse from compressor switch and switch on.

CAUTION: If it is necessary to change ends the pressure must be reduced to below 90 lbs. per square inch, as described above, before putting the air brake handle to the emergency braking position. When the pressure is over 90 lbs. per square inch application of the air emergency brake is liable to lock the wheels and also seriously damage the brake rigging.

Q.30 If the air pressure suddenly drops down below 60 pounds per square inch and air can be heard escaping beneath the tram, what is the probable cause and what must the driver do?

- A.
- (1) Probably the drain cock on the air reservoir has been struck and opened or broken by some obstruction on the roadway.
 - (2) Stop the tram using the hand brake if necessary. Examine the drain cock. If the tap has been opened turn it off. If the cock or a pipe has been damaged causing a leakage of air, switch off the compressor, notify Radio Centre or Control and proceed carefully using only the handbrake for service braking.

Q.31 What must be done if the wheels of the tram become locked?

- A.
- (1) See that the hand brake is released at both ends of the tram.
 - (2) If this is not the cause notify Radio Centre or Control.
 - (3) Arrange for the tram to be pushed and in the meantime try to unlock the wheels. To do this, first change the poles then to the rear cabin, and, having made sure that the track is clear for at least one tram length, smartly cut several notches, two to three times, if necessary, and try to drive the tram a short distance back along the track.
 - (4) If this is not successful, find out which wheels are locked and cut out the pair of motors of which one

drives the locked wheels. It may then be possible, after the tram has been pushed, to drive it under its own power with the two motors cut out, but sand must not be used.

Q.32 What must be done if air-controlled sliding doors fail to operate?

- A.
- (1) If all doors fail to operate, examine the isolating cock at No. 1 end. See that the cock is turned "on", that is, the handle is in the upright position.
 - (2) If the nearside doors only fail to operate see that the conductor's valve lever is in the correct position, that is, pointing in the direction the tram is going.
 - (3) If one door only fails to operate the cause is probably some obstruction in the floor track. See that the floor track is clear.

Q.33 What must be done if air escapes excessively from the door piping?

- A.
- (1) Turn the isolating cock at No. 1 end to the "off" (horizontal) position.
 - (2) Notify Radio Centre or Control.
 - (3) Remove the leading trolley rope and tie it across the offside door openings.
 - (4) The conductor must then operate the doors by hand.

Q.34 What three types of braking are used on a tramcar?

- A.
- (1) The air-brake, which is applied by operating the Westinghouse self-lapping valve.
 - (2) The electric brake, which is applied by operating the controller key on the controller with the controller handle in the "off" position. (This will not hold a tram stationary on a slope).
 - (3) The hand brake, which is applied by turning the hand brake wheel with the right hand while the right foot holds the paul into the ratchet.

Q.35 What two distinct forms of air brake application are available?

- A.
- (1) Service braking for all normal stops.
 - (2) Emergency braking known as the "First Emergency".

Q.36 What is the correct way to apply the service braking?

- A. (1) Move the brake handle smoothly, quickly and firmly without hesitation, from the release position towards, but not beyond the full service position. The extent of the movement varies with the load carried, the downhill or uphill slope and the characteristics of the particular brake handle and valve. (The maximum service position is about two-thirds of the way from release to the "handle off" position and can be found by feeling the service notch with the handle).

NOTE: The handle must be moved until sufficient air pressure has been applied to the brake cylinder to bring the tram under control. To get the most efficient braking the greatest air pressure necessary should be obtained as soon as possible. Reduction of the speed of a tram is most effectively obtained by slowing down the wheels without skidding them. The wheels are less likely to skid when the speed is high so the greatest pressure should be applied at highest speed.

- (2) As the speed of the tram is reduced, gradually move the handle back towards release position, reducing air pressure and risk of skidding until the car comes to an easy stop without any jolt.
- (3) When the tram has stopped, increase the air pressure until it is ample to hold the car on the particular slope under it.

Q.37 When should sand be used?

- A. (1) Sand should be used with service braking when rails are greasy; it should be used sparingly. Sand must be applied at the beginning of braking otherwise the wheels may lock before the sand gets to them.

NOTE: Sand is used to increase friction and thus reduce the risk of skidding. If the wheels lock when making a service stop the brakes should be released immediately, sand applied and the brakes re-applied.

- (2) Sand must always be used first when applying emergency braking and kept on until the tram stops.
- (3) Sand must be used if the wheels spin when starting on a wet or greasy track. If necessary, sand must be taken by hand from the same boxes and spread on the rail in front of the wheels.

- (4) If the wheels spin when starting on an upward slope the driver should change ends and poles and having made sure that the track is clear, release the brakes and apply sand as the tram coasts for one tram length. Re-applying brakes, change ends and poles again and start again, using sand until the greasy section has been passed.

Q.38 What is the First Emergency brake, when is it used and how is it applied?

- A.
- (1) The First Emergency brake is obtained by applying the full air pressure as quickly as possible.
 - (2) The First Emergency brake should be used when it is necessary to make a sudden stop to avoid an accident.
 - (3) The correct way to apply First Emergency brake is: Apply sand with the right foot on the sand punch, put the controller handle to the full "off" position with the left hand. Move the brake valve handle quickly to the extreme right (full on) with the right hand. The three actions should be performed automatically and without delay.

NOTE: A good driver avoids accidents by careful driving and by keeping alert at all times.

Q. 39. What is the Fourth Emergency brake, when is it used and how is it applied?

- A.
- (1) The Fourth Emergency brake is the supplementary electric brake used on bogie trams (four motors).
 - (2) The Fourth Emergency brake is used when the First Emergency brake fails or is ineffective. As soon as this is apparent the Fourth Emergency brake is applied while the First Emergency brake is left on. The hand brake must then be applied.
 - (3) To apply the Fourth Emergency brake, pull the controller key back to the reverse position with the right hand. The right foot is kept on the sand punch and the air is left full on. After the Fourth Emergency brake has been applied the controller key must not be moved again until the tram has stopped. When the controller key is pulled back the motors become generators and produce electric current. Because they are not "balanced" one of the motors is a weaker generator than the others and the current from the strong motors tries to drive this motor in the opposite direction.

Q.40 How does the hand brake work, when should it be used and how should it be applied?

- A.
- (1) The hand brake applies the brake shoes to the wheels using the same levers and rigging that are operated by the air brake.
 - (2) The hand brake must be used if the air brake is out of action. In an emergency, should all brakes fail at the driver's end, the conductor must be directed to apply the hand brake at the rear end of the tram, he must first apply hand brake, release air brake and make sure that the hand brake is holding the tram and then re-apply the air brake.
 - (3) To operate the hand brake, the pawl must be forced into the ratchet with the side of the right foot. The hand wheel is turned until the slack is taken up and the handle is brought to a position on the right of the wheel from where it can be pushed down with repeated powerful strokes until the tram has stopped. When releasing the hand brake, the wheel should never be allowed to spin freely as the handle may strike the driver and injure him.

IMPORTANT: The hand brake must be used if the air brake is out of action and therefore drivers must be efficient in its use.

Q.41 What must be done if the air brake fails when the tram is on an uphill slope and the tram rolls backwards?

- A.
- (1) Leave the controller key in the forward position and smartly cut one notch of power.
 - (2) Quickly apply hand brake.
 - (3) As soon as hand brake is on, cut off controller.
 - (4) Continue to drive using only the hand brake for service braking.

Q.42 What should be done if the air brake fails when the tram is on a downhill slope and the tram rolls forward?

- A.
- (1) Reverse controller key and smartly cut one notch of power.
 - (2) Quickly apply hand brake.
 - (3) As soon as brake is on place controller handle in "off" position, controller key in forward position and continue to drive using only the hand brake for service braking.

Q.43 What should a driver do if all the lights fail, assuming that the otherwise normal operation of the tram shows that power is on?

A. Remove the pole from the overhead and renew the fuse. Replace the pole on the overhead and see that the lighting switch is "on". If the trouble still exists notify Radio Centre or Control. Do not move the tram. The conductor must warn following traffic and control its movement past the stationary tram until the Emergency Vehicle arrives.

Q.44 What precautions are necessary when there is water on the track?

A. Drivers must strictly observe the following:-

- (1) Trams must not be driven through water exceeding a depth of 9 inches (bottom of axle box).
- (2) In water up to 2 inches deep do not operate beyond series speed.
- (3) In water between 2 inches and 9 inches deep, proceed at walking pace (4 m.p.h.) if possible without power, keeping the foot on the life-guard pedal to prevent its being tripped by the water.
- (4) If a tram becomes stranded in water, remove the trolley pole from the overhead wire. Notify Radio Centre or Control. At night the conductor must warn and control following traffic until the Emergency Vehicle arrives.

Q.45 What must be done if the trolley pole leaves the overhead wire and the normal trolley rope breaks?

- A.
- (1) Mount the footsteps, reach up and pull the emergency rope from the clip under the roof step, then pull the rope clear from the other clips along the roof of the tram.
 - (2) From a position as near as possible to the end of the trolley pole, pull on the rope so that the ring slides along to the end of the trolley pole and the pole is then pulled down and placed under the hook. If the broken trolley rope has become tangled in the overhead wire it may be loosened by shaking the trolley pole with the emergency rope, taking care not to pull so vigorously as to bring down any overhead wires.

NOTE: If this method fails to release the broken rope the driver must climb to the roof of the tram and free the rope by hand. Then pull the pole down and place it under the hook.

CAUTION:

The tram must not be moved if a broken rope, still attached to the pole, is entangled in the overhead.

- (3) Cut free the broken end of the rope from the trolley pole or tie it to the emergency rope so that no loose end can be caught in the overhead.

CAUTION:

In no circumstances may a tram proceed with a broken rope hanging loose from the trolley pole. Report to Radio Centre or Control if any broken rope is left entangled in the overhead.

- (4) Remove the lower portion of the broken rope from the bracket beside the driver's door and attach the emergency rope to the bracket.
- (5) Place the trolley pole on the overhead wire and pull the rope gently into the guide clip. The tram may then be driven away.
- (6) Report the use of the emergency rope to the first Traffic Officer encountered and submit a Special Day Report before ceasing duty. The driver who finally runs the tram into the depot must report "trolley rope broken" on the car defect sheet.

Q.46 What must be done if a trolley pole becomes badly damaged and un-usuable?

- A.
- (1) Tie down the damaged pole securely.
 - (2) Release rope of leading pole from bracket beside driver's door.
 - (3) Mount the footsteps, reach up and pull emergency rope of leading pole from the clips under the roof step then pull the rope clear from clips along the roof of tram.
 - (4) Driver releases pole from under hook, walks and swings the pole to the offside centre of the tram, then pulls the pole to the horizontal position while the conductor slides the emergency rope to the end of the pole. Conductor will hold pole while driver throws his rope over the roof to the nearside of the tram.
 - (5) Driver walks to nearside of tram and again takes hld of his rope. The driver and conductor, holding a rope each, place the pole on the trolley wire in the trailing position.

- (6) Driver throws his rope back to the offside of the tram, takes up excess slack in emergency rope (which will slide to bottom pole) and ties both ropes to the top of the centre stanchion outside the smoking compartment.
- (7) If the above procedure is not successful the driver must climb to the roof of the tram and adjust the pole by hand.
- (8) Report to Radio Centre or Control.

Q.47 If the trolley pole leaves the overhead wire when the tram is running, what must be done?

A. It is essential that the driver stop the tram as soon as possible after a pole becomes dewired, to reduce the possibility of a swinging poll breaking a span wire or damaging overhead fittings or the pole itself.

- NOTE:
- (1) Under no circumstances must a section insulator be bridged by both poles or both poles allowed to touch the wire at railway crossings.
 - (2) If the tram stops with the trolley pole on a section insulator or any other special overhead fitting, remove the pole from the fitting before letting the other pole touch the wire.

Q.48 When passing under overhead crossings, section insulators or frogs, what is the correct position of the controller handle?

A. The controller handle must be in the "off" position.

- NOTE:
- (1) Several notches may be cut on smartly after passing according to the speed at which the car is travelling.
 - (2) When travelling under line contactors of automatic point controllers and traffic signals, the speed of the tram should not exceed three miles per hour.

Q.49 What must be done when the trolley wire breaks and falls on the roadway?

- A.
- (1) The conductor must immediately notify Radio Centre or Control giving the location of the breakage.
 - (2) If the broken wire is hanging so as to endanger trams, other vehicles or pedestrians, both driver and conductor must take up positions on each side of the

"break" and warn people of the danger until the arrival of the Tower Wagon or some authorised person from the Engineering Department. If a person is in contact with a live trolley wire or span wire immediately request the Control to cut the power off until the person is released.

Q.50 How would you free a person who has come in contact with a live wire from the overhead?

- A.
- (1) Obtain a dry board such as a motor hatchway cover, and being careful to avoid contact with the wire, stand on the board as close as possible to the victim.
 - (2) Using any dry non-conductor such as a hat, a coat, rope or boards, free the victim from the wire with a single quick motion either by pulling him away by his clothing or by pushing the wire away from him.
 - (3) In all cases treat the wire as being alive.

CAUTION: The wire must not, on any account, be allowed to make contact with persons, animals, the tram or any metal.

Q.51 What must a driver do when a tower wagon or any emergency vehicle is on the track?

- A.
- Bring the tram to a stop not less than two tram lengths (100 ft.) from the vehicle and wait until he has received "all clear" signal from the linesman or a member of the emergency crew before proceeding.

Q.52 What special care and procedure are necessary when repairs to overhead wire or fittings are in progress?

- A.
- (1) When a tower wagon "crew" is working proceed as instructed by a linesman. If there is an obstruction or a break the driver will proceed at sufficient speed to clear the fault and put the controller to the "off" position. The conductor will pull the trolley pole well down until the fault is passed. The driver will then stop the tram and the conductor will replace the pole on the overhead.
 - (2) If a red flag by day or a red lamp by night is fixed to a span wire near the overhead wire, drivers must coast past the spot with the trolley pole pulled down.
 - (3) If a green flag by day or a green lamp by night is fixed to the span wire, drivers must proceed with caution past the spot.

Q.53 What precautions must be taken when a tram is parked at a siding or if the tram has to be left standing on the track?

- A.
- (1) The line breaker control switch must be put to the "off" position.
 - (2) Apply hand brake, release air brake and make sure hand brake is holding the tram.
 - (3) Leave hand brake on and re-apply air brake. The air compressor switch must be left in the "on" position.
 - (4) Remove controller key and air brake handle and place them on canopy beside the destination box.
 - (5) With the exception of trams parked at a siding, the conductor should be instructed to remain on the tram. This is necessary to comply with the rule which provides that the tram must not be left unattended.

Q.54 What are the likely effects when the wheels of a tram are insulated from the rails by dirt, sand or other material?

- A.
- (1) The tram will not start when the brakes are released and nothces are cut on the controller.
 - (2) The lights may not burn.

NOTE: There may be sufficient contact for the lighting current to flow but too great a resistance for a starting current for the motors.

- (3) The compressor motor will not start.

Q.55 What must be done if a tram becomes insulated from the rails by sand, dirt or other material?

- A.
- (1) Driver applies air brake and hand brake. It must be remembered that in such circumstances all metal parts of the tram are alive and therefore it is highly dangerous to make contact between the tram and the roadway (or between the tram and another tram) by passengers or crew until the pole has been removed from the overhead.
 - (2) Driver and conductor warn all passengers to remain on the tram and intending passengers to sdtand clear.
 - (3) Driver goes through the tram to rear cabin, unties trolley rope and then instructs conductor to jump to the roadway from the smoker's entrance, pull the pole free from the overhead and place it under the hook taking care not to touch the tram.

- (4) Passengers are then requested to leave the tram and wait on the footpath.
- (5) Driver jams the points bar between the back of a rear wheel and the rail, and then replaces the pole on the overhead.
- (7) If the lights come on, driver enters tram and drives onto clean rail. Passengers are then requested to re-enter tram. Conductor picks up point bar and replaces it in driver's cabin.
- (8) If lights do not come on when pole is replaced on overhead, again pull pole from overhead, pick up and replace point bar, wait for following tram and get pushed on to the clean part of rail. The driver must remain on the tram while it is being pushed in order to operate the brakes if necessary. Passengers should not be permitted to board until the wheels are making good contact and there is no risk of any kind to the passengers.
- (9) The dirty track must be reported to Radio Centre or Control.

Q.56 What must be done when a tram is badly derailed and the electric contact between the wheels and the rails is broken?

- A.
- (1) It must be remembered that in such circumstances all metal parts of the tram are alive and therefore it is highly dangerous to make contact between the tram and the roadway (or between the tram and another tram) by passengers or crew until the pole has been removed from the overhead.
 - (2) Driver and conductor warn all passengers to remain on the tram, and intending passengers to stand clear.
 - (3) Driver applies air brake and hand brake.
 - (4) Driver goes through tram to rear cabin, unties trolley rope and then instructs conductor to jump to the roadway from the smoker's entrance, pull the pole from the overhead and place it under the hook taking care not to touch the tram.
 - (5) Passengers are then requested to leave the tram and wait on the footpath.
 - (6) Notify Radio Centre or Control and wait for Emergency Vehicle.

Q.57 What must be done if the tram becomes "alive" or if passengers complain of receiving shocks from any metal part of the tram?

- A.
- (1) Driver applies air brake and hand brake.
 - (2) Driver and conductor warn all passengers to remain on the tram, and intending passengers to stand clear.
 - (3) Driver goes through tram to rear cabin, unties trolley rope and then instructs conductor to jump to the roadway from the smoker's entrance, pull the pole from the overhead and place it under the hook taking care not to touch the tram.
 - (4) Passengers are requested to leave the tram and advised to board following trams.
 - (5) Notify Radio Centre or Control.
 - (6) Driver instructs conductor to close doors or barrier rails and pull down blinds and alter destination signs and then to put pole back on overhead.
 - (7) Proceed to nearest depot unless instructed otherwise.

Q.58 What must be done in the event of power failing in the overhead wire?

- A.
- (1) Place controller handle in the "off" position, stop tram and turn light switch "on".
 - (2) Apply hand brake and release air brake in order to maintain air pressure in the reservoir.
 - (3) If the power failure exceeds three minutes the conductor must notify Radio Centre or Control, stating route and position.
 - (4) The driver must remove the pole from the overhead and replace the pole after one minute. (This allows sub-station equipment to operate).
 - (5) When the overhead power is off at night, the driver must protect the tram by standing on the track at the front end, the conductor protecting the rear end in like manner.
 - (6) When the power is restored, make sure that air brake pressure is available before starting the tram.

Q.59 How should trams be started after delay caused by traffic block?

- A. After a traffic block, trams must be started one at a time, each driver must wait until the tram ahead has moved at least a distance of one pole span.
- Q.60 What must a driver do at each terminus?
- A. (1) Make sure that the trolley poles are in the correct position for the return journey, with the rear pole on the overhead wire and the front pole under the hook, and securely tied down.
- (2) When time permits, make a brief inspection for hot bearings, loose axle box covers and blocked sand and for any damage, especially to lifeguards.
- Q.61 What persons, apart from the tram crew, are permitted to ride in the read cabin of a tram?
- A. Track men travelling on duty and any officer travelling for inspection purposes. All such persons must produce a Tramways Board pass or other authority at the request of the conductor.

A.B.C. FOR TRAM DRIVERS

- AIR PRESSURE** is of vital importance. Glance occasionally at the pressure gauge, particularly when stationary.
- BRAKES** are most effective while the wheels are still turning, NOT when the wheels are locked. Avoid skids.
- COMFORT** of passengers must be considered at all times.
- DISTANCE** behind the tram in front must not be less than three full pole lengths (120 yards) with the tram under proper control when travelling at more than series speed.
- ELECTRIC SHOCKS** can be serious. See that the switch controlling the circuit you are about to examine is in the OFF position. When on the roof of a tram be careful not to make contact with any metal work, particularly the route number box, while handling the trolley pole. Before opening the controller case, see that the track ahead is clear, put the line breaker switch to the OFF position and test the controller by cutting all notches.
- FIRE** may occur on a tram. Be prepared by knowing what you must do.

- GONG** signals are important, be sure you know them. Always sound the gong when passing a stationary tram, sound it repeatedly when approaching workmen on track or road, and be prepared to stop in an emergency.
- HEADLIGHT** on at the driving end, destination box open in the rear cabin only. Make sure your lights are burning.
- INSPECT** your tram at terminus for hot bearings, loose axle box covers or any damage to lifeguards. Make sure the front pole is under the hook and securely tied.
- JUNCTIONS** and compulsory stops must be approached with care. Be always on the alert so that the tram can be stopped quickly in an emergency, particularly when descending grades.
- KNOWLEDGE** of the route is necessary. Keep in mind, especially at night, the exact position of all loops, crossovers, curves, junctions, cut-off and slow-down discs.
- LIFEGUARDS** save lives. Inspect the gear at every terminus. Do not place any object near the lifeguard pedal. If the movement of the pedal is obstructed the lifeguard gear will not operate.
- MOTORS** may become defective. Every driver must know the correct safe way to cut a pair of motors.
- NOTICE BOARDS** must be inspected every day for new notices and instructions.
- OVERHEAD LINES** particularly span wires, are broken, only too often, when drivers run through special work at excessive speeds. A spearing trolley pole can cause a great deal of damage.
- POWER** should be saved as often as possible. Cut off power as far as possible from stopping places and stop the tram by a steady application of the air brake. Cut off power when your tram is running down grades or when the necessary speed can be maintained while coasting. Cut off power when passing under insulators and frogs.
- QUICK ACTION** may be necessary to avoid an accident, so always be alert and ready for any emergency. The tram must be under proper control at all times.

- RULES AND REGULATIONS** and all other notices must be strictly observed. Read them and make sure you understand them.
- SAFETY** of your passengers is in your hands. Safety when boarding, safety when riding and safety when alighting. Check your step mirror before moving.
- TRAFFIC REGULATIONS** must be observed. Keep yourself conversant with current regulations. These may be perused on application to the Depot Master or officer-in-charge. Always obey traffic signals.
- UNIFORMS** must be used with care and kept clean and free from grease and dirty marks. Take pride in your appearance.
- VEHICLES** on the track must be approached with care. Stop a safe distance away and sound your gong. Should it be impossible for the track to be cleared immediately do not sound the gong unnecessarily. When an emergency vehicle is on the track, wait until you receive an "all clear" signal before proceeding.
- WHEELS** make an intolerable noise when they have bad flats. Correct use of brakes to avoid skidding and safe driving without the need to use emergency braking will prevent the formation of flats.
- 'X'** is the road sign of a Railway Crossing. Always look at the signal and position of the catch points before proceeding across.
- YARD SHEETS** must be inspected every day, both before signing on and after completion of duty.
- 'ZEBRA' CROSSINGS** for pedestrians must be observed. Be sure you know where they are and be prepared to stop if necessary.

POINTS TO REMEMBER

1. ALWAYS remember a driver's first consideration and duty is the safety of the public at all times.
2. ALWAYS make certain that all passengers are safely on or off the tram before starting. Check your step mirror before moving.
3. ALWAYS remember when passing a stationary tram to reduce speed, sound gong loudly and be prepared to stop quickly in case of emergency.

4. ALWAYS when approaching stopping places, where safety zones are not provided, keep a sharp lookout for intending passengers waiting on footpath.
5. ALWAYS obey promptly the signals of traffic constables, or traffic lights at intersections, junctions, pedestrian crossings and the like.
6. ALWAYS extend courtesy to other road users.
7. ALWAYS stop at all compulsory stops (other road users expect you to stop).
8. ALWAYS stop at full (compulsory) track marks.
9. ALWAYS observe half (provisional) track marks as required.
10. ALWAYS observe the speed regulations. Excessive speed is dangerous and causes damage to overhead equipment, trolley poles, rolling stock and permanent way. Reduce speed to a maximum of four (4) m.p.h. at all points, including crossovers, railway and tramway crossings, under railway bridges, on curves and at slow-down discs, when passing workmen on the track or roadway and when entering a depot yard or shed, and to a maximum of three (3) m.p.h. at automatic points. Also reduce speed when passing stationary trams or when passing schools during the hours children are entering or leaving.
11. ALWAYS apply sand for all emergency stops and when starting and stopping on greasy rails. Oil, bitumen, mud or dead leaves, even overnight dew, will make the rails greasy. Incorrect use of sand and increasing the air pressure during stops are the cause of skidding which results in flats and collisions.
12. ALWAYS apply the hand brake before leaving a tram standing on a grade.
13. ALWAYS put the controller key in neutral position before placing the trolley pole on the overhead wire or putting the line breaker control switch to the "on" position.
14. ALWAYS when shunting at a turnout or crossover stop the tram well clear of the points, so that you can see that they are correctly set before starting on the return journey. (Failure to do this may derail the tram).
16. ALWAYS remember when driving on badly lighted roads, or in foggy weather, to reduce speed so that a stop may easily be made in case of emergency.
17. ALWAYS endeavour to arrive at Budy Clocks and connecting points with other routes on proper table time.

18. ALWAYS remember after passengers have safely boarded and alighted and your tram is stationary for any length of time at Busy Clocks, intersections, crossovers and termini, to wave the following traffic to proceed.
19. ALWAYS when crossing line of traffic while running out of or into a depot, give clear and distinct warning to other road users and operate the tram at a slow speed so that it can be stopped immediately in case of emergency.
20. ALWAYS allow tramway breakdown vehicles, ambulances, fire brigade, police cars and the like to pass. Slow down if necessary.
21. ALWAYS remember if you discover anything abnormal in connection with overhead equipment, track conditions, or roadway to advise Radio Centre or Control immediately by phone stating name and street and nearest pole number.
22. ALWAYS place the pole on the overhead wire gently. Allowing the pole to fly up could break the carbon insert and may result in foreign matter lodging in your eyes. After placing the pole on the overhead pull the rope gently into the clip and remove the rope from the clip before pulling the pole down from the overhead.
23. ALWAYS remember if you are in doubt about the running of your tram to notify the first Inspector you meet or the City Mechanic; if no one is available, notify Radio Centre or Control by phone.
24. ALWAYS remember when passing a slow-down disc (yellow with black cross) to reduce speed to four (4) m.p.h.
25. ALWAYS remember that if urgent assistance is required ring Radio Centre by Telecom phone 618-3333 between 6.00 a.m. and 12.00 midnight, Monday to Saturday; or Control at all other times, including all day Sunday.
Control: Telecom phone numbers 618-3466 or 3467 or
Carlton Control: 618.3424.
26. ALWAYS remember that a sudden stop by the tram ahead of you is a common occurrence, and be prepared for it.
27. ALWAYS make allowance for the reckless, careless actions of others. Adjust your driving to meet all hazards of weather, road and traffic conditions. The expert driver is always on the alert and avoids getting into situations that demand emergency action on his part.
28. ALWAYS hold sand punch down firmly during the whole of emergency braking period, until the stop is completed. Quick stops with high air pressure for late bells,

approaching intersections and bundy clocks are not normally necessary, and do not give credit to a driver's ability.

29. ALWAYS keep your right heel near the sand punch, and in greasy rail conditions apply a series of intermittent pressures to deposit sand on rails and use a longer approach to stops with lighter brake pressure.