

20th July, 1961.

State Electricity Commission of Victoria

BALLARAT TRAMWAYS

TRAMCAR EMERGENCY BRAKING

The following is a brief description of the air-brake system and advice regarding all air brake trams owned by the Commission.

- (1) An electric motor compressor pumps air into two reservoirs where it is stored for use by the motorman as required.
- (2) The governor, which is actually an electric switch, is automatically controlled for the "on" and "off" positions by the amount of air pressure in the reservoirs, so that when the pressure drops to the predetermined minimum the switch closes and the compressor motor starts up and when the predetermined maximum figure is reached, the switch opens and the motor ceases to pump. This governor, therefore, maintains the required pressure in the reservoirs under normal conditions.
- (3) By the use of the motorman's brake valve handle (which can be likened to a tap) the motorman can, by turning the handle to the right, allow air to pass from the reservoirs to the brake cylinder, the piston of which through a system of levers forces the brake shoes on to the wheels.
- (4) The gauge in each motorman's cabin indicates the air pressure in the reservoirs which is always the same in each, being connected by an equalising pipe. The importance of the motorman watching the gauge should be obvious and should the pressure drop below 50 lbs. the hand brake must be used until the tram is taken from service. It is important that motormen be familiar with details of the compressor electrical circuit so that they may rectify minor faults, such as replacement of fuse, &c.
- (5) The hand brake is a manual means of applying the shoes to the wheel, and, although thoroughly reliable, it is slower and not so easy to apply as the air-brake.
- (6) The maximum braking effect is obtained when the pressure on the shoes will almost skid the wheels under conditions that give the greatest grip between the wheels and the rails and our air-brake has been so designed as to give this required effect. This fact cannot be too strongly emphasised as some motormen have resorted to other means of stopping their trams with results which have been far from satisfactory.
- (7) Continual daily practice in the intelligent use of the brake should fit motormen to deal with each situation of varying conditions that arise such as speed, load, and rail condition, but one outstanding feature may be stated with profit and we will treat the subject on the assumption that the rail condition is good at the time.
- (8) The greater the speed the less risk of skidding the wheels; therefore, at high speed a heavier application of the brake can be made than when travelling at lower speed, and, as the speed decreases, the pressure on the shoes must be reduced by allowing some of the air to be exhausted from the brake cylinder through the brake valve by turning the handle to the left.

- (9) From the foregoing paragraph it will be seen that, in an emergency, in order to stop the tram as quickly as possible, the handle should be instantly turned to the right to an extent in proportion to the speed, that is, at full speed it should be turned to the full extent, which is the full emergency position.
- (10) In case of emergency when the rails are slippery, a brake application must be instantly made to the maximum extent consistent with the rail condition. Should the wheels lock and skid, release the brake momentarily and instantly re-apply but to a lesser extent than previously, and repeat if necessary until the tram is brought to a standstill or the danger is past. Sand must be applied throughout the period of braking.

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In the event of the failure of the air brake, and there being insufficient time to bring the tram to a standstill with the hand brake, it is possible to stop the tram electrically.

Should such a case arise proceed as follows:-

Pull the reversing key back so that it is pointing in the opposite direction to that in which the tram is travelling and apply power on the first notch in series, and, in any case, not beyond the second notch. Should the retarding effect not be sufficient through the wheels spinning too fast, cut the power off and apply again, and repeat this process, if necessary, until the tram stops.

Should the circuit breaker open through the reversal of the motors, throw the power handle round to the last parallel position and leave it there until the tram is brought to a standstill. Remember! This operation is useless when a motor has been cut out.

In each of these two cases sand should be applied until the tram comes to rest. It is important to note that in each of these two cases the reversing key must be pointing in the opposite direction to that in which the tram is travelling and neither of these two means will hold the tram in a stationary position, so that, having been brought to rest when the wheel brake is useless, it would be necessary to put something in front of the wheels to prevent the vehicle from moving unless on level track.