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No. (E)CD. 1-1942

(Superseding No. (E)CD. 1-1941)

STANDARDS ASSOCIATION OF AUSTRALIA  
Headquarters:  
Science House, Gloucester and Essex Streets, Sydney.

AUSTRALIAN STANDARD SPECIFICATION  
(Emergency Series)

for

## CHARCOAL GAS PRODUCERS FOR MOTOR VEHICLES

together with

AUSTRALIAN STANDARD RULES  
(Emergency Series)

for the

## TESTING OF CHARCOAL GAS PRODUCERS FOR MOTOR VEHICLES

First Issued - - - April, 1941.  
Revised - - - December, 1942.

### PREFACE

*This specification and test code for charcoal gas producers for motor vehicles were first issued in April, 1941, as part of a series of emergency standards issued by the Standards Association of Australia to meet the emergency created by the international situation.*

*The specification was drawn up to meet emergency conditions in Australia for the conversion of petrol vehicles to producer gas, and certain clauses covering power output and test do not apply to those cases where the engine compression ratio has been raised or where the vehicle has been designed specifically for use with producer gas.*

*The revised specification and code now issued are the result of a comprehensive review by all sections interested in producer gas for motor vehicles, after eighteen months' experience of the original specification and code throughout the Commonwealth.*

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*These standards, prepared by the Committee on Producer Gas for Motor Vehicles, were approved on behalf of the Council of the Association on 3rd December, 1942.*

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NOTE.

In order to keep abreast of progress in the industries concerned, Australian standards are subject to periodical review. Suggestions for improvement, addressed to the Headquarters of the Association, will be welcomed.

Standards Association of Australia  
Headquarters:  
Science House, Gloucester and Essex Streets, Sydney.

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AUSTRALIAN STANDARD SPECIFICATION  
(Emergency Series)  
for  
CHARCOAL GAS PRODUCERS FOR MOTOR VEHICLES  
—

GENERAL.

1. **Scope.** This specification applies to wood charcoal gas producers installed on motor vehicles other than tractors.
2. **Definitions.** Throughout this specification the following terms shall have the meanings given to them in this clause:
  - (a) **Producer.** The term "producer" shall mean the whole of the equipment necessary for the generation of producer gas and its delivery to the intake manifold of the engine of a motor vehicle.
  - (b) **Generator.** The term "generator" shall mean the vessel containing the fuel and the fire in which the gas is generated.
  - (c) **Security Filter.** The term "security filter" shall mean a filter whose function is to provide protection for the engine in the event of failure of the ordinary cleaning system of the producer. It shall not be regarded as part of the cleaning system.

MATERIALS OF CONSTRUCTION.

3. **Materials to Comply with Standards.** All materials shall comply with the relevant Australian standards, or in their absence, with appropriate British standards, where such exist. Where it is necessary to use materials for which no Australian or British standards exist, or where it is desired to use new or unusual materials, the general properties thereof shall be suited to the conditions under which they are employed.

All screw threads on the generator, cooler and cleaners shall be B.S. Whit. or B.S. Pipe and shall comply with Australian Standard NoB47, "Screw Threads of Whitworth Form" (B.S. No. 84 endorsed without amendment).

DESIGN AND CONSTRUCTION.

4. **Design—General.** The design of the producer shall comply with the requirements of this specification and shall be such that there will be no mechanical break-down, fire risk or similar hazard when the producer is operated in a normal manner, taking into account ordinary wear and tear and other depreciating factors that can reasonably be expected.
5. **New or Unusual Designs and New Methods of Construction.** Any design which contemplates departures from ordinary practice, the employment of any new or unusual methods of construction, or the use of methods of construction and processes not in conformity with this specification, shall be submitted for approval to the Approving Authority.
6. **Accessibility.** The producer shall be designed with a view to accessibility, for ease of charging, ash removal, cleaning and maintenance. The time for complete servicing by one man should not normally exceed two hours.

All drain cocks shall be readily accessible.

Where a grate is used to prevent the fuel entering the gas off-take, provision shall be made to enable the grate to be cleaned.

Cleaners shall be constructed and installed on the vehicle in such a manner as to allow efficient and convenient cleaning, packing or renewal of the filtering material.

7. Generators.

(a) Generators in which the depth of fuel in any direction between the edge of the air inlet in the generator and the shell of the generator is greater than 5 in., constructed of mild steel, shall have a thickness not less than that shown below for the whole of the lower portion of the generator, including the bottom and sides, to a height not less than 12 in. above the centre line of the air inlet :

	Up to 20 h.p. (R.A.C. rating) ....	0.063 in. (16 B.G.)
Over 20 and	" " 30 " " " " ....	0.079 in. (14 B.G.)
	Over 30 " " " " " " ....	0.099 in. (12 B.G.)

(b) Generators other than those specified in Clause 7 (a) above, constructed of mild steel, shall have a thickness not less than that shown below for the whole of the lower portion of the generator, including the bottom and sides, to a height not less than 12 in. above the centre line of the air inlet :

	Up to 20 h.p. (R.A.C. rating) ....	0.099 in. (12 B.G.)
Over 20	" " " " " " " " ....	$\frac{1}{4}$ in.

(c) Generators constructed of mild steel and having a refractory lining at the bottom and sides to a height not less than 12 in. above the centre line of the air inlet, shall have the minimum thicknesses set out in Clause 7 (a) above.

(d) When not specified elsewhere, the minimum thickness of metal used in the construction of any generator shall be :

	Up to 20 h.p. (R.A.C. rating) ....	0.050 in. (18 B.G.)
Over 20 and	" " 30 " " " " " " ....	0.063 in. (16 B.G.)
	Over 30 " " " " " " " " ....	0.079 in. (14 B.G.)

(e) *Supports and Openings.* The generator shell shall be reinforced at supports and at all points where attachments are made for lid fastenings, tuyeres, gas off-takes, etc. The reinforcement shall be arranged to distribute the load over an adequate area of the shell.

Flanges directly connected to the shell for the attachment of the tuyere and/or gas off-take shall be not less than  $\frac{1}{4}$  in. thick. Where bolts or studs are used they shall be not less than  $\frac{3}{8}$  in. diameter. Where sheet packing is used, flanges shall provide a sealing surface not less than  $\frac{1}{2}$  in. wide between the inner diameter of the flange and the bolts or studs.

(f) *Filling Opening.* The filling opening shall have an effective area not less than 75 sq. in.

The lid may be a casting, or made of mild steel in dished or stiffened form, not less than 0.079 in. (14 B.G.) thick. Dished lids suitably protected against corrosion, where specially approved, may be not less than 0.063 in. (16 B.G.) thick. The lid and packing shall register with the sealing ring to provide an effective gas-tight seal. The sealing ring shall be not less than  $\frac{1}{2}$  in. wide and not less than 1 in. deep, and the sealing edge shall not show any warping or irregularity when tested against a flat plate.

Pressure for sealing the lid shall be applied by an approved device, which should be of such a nature that it can be manipulated by hand without the use of tools. The pressure shall be applied evenly to the joint and suitable adjustment shall be provided to permit compensation for changes in thickness of the gasket. When a hand wheel and bolt are used, the bolt shall be not less than  $\frac{1}{2}$  in. diameter.

(g) *Cleaning Opening.* An opening shall be provided at or near the bottom of the generator so that the whole of the fuel can be readily removed. The opening shall have an effective area not less than 28 sq. in., and all door supports shall be on the outside of the generator. Where the cleaning door opens directly into the generator it may be a casting or made of mild steel in dished or stiffened form, not less than  $\frac{1}{2}$  in. thick.

The door and packing shall register with the sealing ring to provide an effective gas-tight seal. The sealing ring shall be not less than  $\frac{1}{2}$  in. wide and not less than 1 in. deep, and the sealing edge shall not show any warping or irregularity when tested against a flat plate.

Where springs are employed to effect closure of apertures in the generator they shall be so arranged that, when the vehicle is operating, they cannot release the part held or become hot enough to lose their temper.

Laid off  
 and  
 the

(k) *Tuyeres.* In water-cooled tuyeres ample waterways shall be provided, together with means to direct the flow of water to the tip of the tuyere. Pipes conveying cooling water to and from the tuyere shall have an internal diameter not less than  $\frac{3}{8}$  in.

(j) *Gas Off-takes.* Approved means shall be provided to prevent the fuel entering the gas off-take. Where a grating is used for this purpose it shall be constructed of approved heat-resisting material not less than  $\frac{1}{4}$  in. thick.

Where the gas off-take is at the top of the generator the thickness of the material used may be reduced to 0.063 in. (16 B.G.).

(k) *Grates.* Grates through which air is admitted to the generator shall be of heavy section approved heat-resisting material.

(l) *Air Inlets.* Each point at which air is admitted to the generator shall be completely covered by an effective flame trap so arranged that any gas passing back from the generator shall pass through the trap. The design of the lighting door and flame trap shall be such as to render it unlikely that either will be left open or become ineffective in service. To ensure efficient cooling the flame trap shall not be nearer to the fire than 15 in., measured along the air path. Provision should be made to prevent the admission of air at any point between the flame trap and the air inlet in the generator.

Where gauze or metal-wool is used for a flame trap it shall be of copper or other approved material. The gauze shall have not less than 30 meshes per linear inch of wire not less than 0.014 in. (29 S.W.G.) diameter.

(m) *Generator Capacity.* The effective fuel capacity of the generator shall be such as to give the vehicle an operating distance of not less than 50 miles without recharging.

## 8. Cleaners.

(a) *Primary Cleaners.* Primary cleaners shall consist of effective dust traps of the dry type. Provision shall be made for the ready removal of collected dust. The opening for the removal of dust shall be not less than 2 in. diameter, and shall be sealed by a screwed plug or a lid.

Where guide vanes are used in primary cleaners, provision shall be made for access to them to enable wet dust to be removed.

(b) *Secondary or Final Cleaners.* Secondary or final cleaners shall be designed in such a manner that their filtering capacity will not be affected by likely variations in the packing of the filtering medium. Where loose filtering material is used, the weight required for renewal shall be stated in the operating instructions. Where the following filtering materials are used, the temperature of the gas at entry to the filter during the road test shall not exceed the ambient temperature by more than the following amounts:

Wool, wool felt	....	....	....	....	....	70°C.
Woven materials and wood-wool	....	....	....	....	....	90°C.
Sisal, flax, cotton waste	....	....	....	....	....	100°C.

Provision shall be made for the ready removal of collected dust.

(c) *Security Filters.* A security filter of suitable filtering material, having an area not less than 60 sq. in. for vehicles up to 20 h.p., and 100 sq. in. for vehicles over 20 h.p., shall be provided and installed in such a manner that no gas can by-pass the filtering material even if the filter is carelessly assembled and installed. It shall be so arranged that it will not be disturbed when servicing the secondary or final cleaners, and should be in an entirely separate housing as close to the mixing valve as practicable, but in no case more than 7 ft. 6 in. from the mixing valve, measured along the gas line.

Suitable filtering material is defined as either hard, first quality all-wool felt not less than  $\frac{1}{4}$  in. thick; firm, first quality all-wool felt not less than  $\frac{1}{4}$  in. thick; or other material which can be shown to be equivalent.

(d) *Capacity of Cleaners.* The cleaning system shall be so designed that it will operate for the whole period required by the standard tests without requiring attention.

NOTE.—In practice this is roughly equivalent to 150 to 200 miles or 5 to 6 hours' running.

(e) *Construction of Cleaners.* Cleaner casings and internal parts shall be not less than 0.050 in. (18 B.G.) thick. They shall be so constructed that the gas cannot by-pass the filtering material, and due allowance shall be made for shrinkage.

All openings shall be reinforced to ensure effective joints. The lid may be a casting or made of mild steel in dished or stiffened form, and shall make an effective gas-tight seal on a round or square edge not less than  $\frac{1}{8}$  in. wide.

Where it is necessary to remove a cleaning lid for normal servicing of a producer at intervals of less than 400 miles, pressure for sealing the lid shall be applied by an approved device which shall be of such a nature that it can be manipulated by hand without the use of tools. Where a hand wheel and bolt are used the bolt shall be not less than  $\frac{3}{8}$  in. diameter.

9. **Water Tanks.** Water tanks shall be made of mild steel or copper not less than 0.039 in. (20 B.G.) thick and shall be adequately braced. If made of mild steel, the interior and exterior surfaces shall be coated with an anti-rust compound.

Tanks required for cooling essential parts such as tuyere or grate shall have sufficient capacity for a range at least 50% in excess of the generator fuel range. Where a drip feed is supplied from the cooling tank, the water drip connection shall be such that it cannot reduce this range.

Each tank shall be fitted with a gauge glass or other approved means of determining the water level and shall be adequately vented to prevent building up pressure within the tank.

10. **Coolers.** Coolers shall be constructed of material not less than 0.050 in. (18 B.G.) thick, and tubes, when used, shall be not less than 0.039 in. (20 B.G.) thick, and not less than  $\frac{3}{8}$  in. internal diameter. If flattened tubes are used, they shall have an internal cross-section not less than  $\frac{3}{8}$  sq. in., and a minimum internal dimension not less than  $\frac{1}{4}$  in.

All openings shall be reinforced to ensure effective joints. The lid may be a casting or made of mild steel in dished or stiffened form, and shall make an effective gas-tight seal on a round or square edge not less than  $\frac{1}{8}$  in. wide.

A drain cock shall be provided in a readily accessible position, and the cooler shall be so arranged that the water condensed while running on one filling of charcoal can accumulate without interfering with the free flow of gas.

Means shall be provided for cleaning the cooler tubes and headers.

11. **Mixing Valves.** The mixing valve shall be capable of providing automatically the air-gas ratio which gives satisfactory idling and maximum power at all gas speeds. It shall also provide easy restarting on gas alone. The air-gas ratio shall be readily adjustable from the driving position. The fitting of mixing or change-over valves shall be such that full petrol power is not seriously impaired, and should allow the use of any desired gas-petrol mixture. Substantial controls of approved type shall be provided.

All air for the mixing valve shall be drawn through an approved air cleaner.

A tap controlled from the driving position should be fitted to the petrol pipe near the carburettor to enable the petrol supply to be turned off. It shall be of such a type and so mounted that it will not leak when under the pressure built up by the fuel pump.

12. **Jointing Material.** All jointing material used in making joints on or between the generator and the first cleaner or cooler shall be fire-proof. Where two dry cleaners are used adjacent to the generator, jointing material used on the second cleaner shall also be fire-proof. Rubber jointing may be used provided that the temperature of the gas at entry to such portion of the producer does not exceed 120°C. above ambient temperature during the road test.

13. **Piping.** All piping shall be of durable and gas-tight construction, and shall be provided with such joints as are necessary for the effective maintenance and repair of the producer. Inter-connecting pipes shall be solid drawn or welded and not less than 0.050 in. (18 B.G.) thick. All piping shall be as straight as possible. Rounded elbows or bends shall be used, except that a square elbow may be fitted at the entrance to the mixing valve.

Pipe connections up to and including the cooler connection shall be made with flanges or screwed unions. Flanges shall be not less than  $\frac{3}{8}$  in. thick, and shall have flat surfaces with an effective sealing width of not less than  $\frac{1}{2}$  in. between the inner edge of the flange and the bolts or studs.

Heat-resisting rubber hose and clips may be used for pipe joints after the cooler, provided that the temperature of gas at entry to such joint does not exceed 120°C. above ambient temperature during the road test. Long lengths of flexible hose shall be of the reinforced heat-resisting type.

Hose clips and fittings shall be of robust construction and such as to maintain gas-tight joints under all conditions of service.

A drain cock shall be provided, in a readily accessible position, and the piping shall be so arranged that the water condensed while running on one filling of charcoal can accumulate without interfering with the free flow of gas.

14. **Safety.** Precautions shall be taken by the manufacturer to ensure safety, with special regard to fire hazard, gas poisoning and blow-back. Exposed surfaces which attain a temperature of 185° C. or more at any time during the road test shall be screened in such a manner as to prevent accidental contact with persons passing or standing near the producer, or with inflammable material such as might be encountered when driving through bush or grassland.

Screens shall be placed not less than 1 in. from the surface to be screened, and shall be constructed either of sheet metal not less than 0.031 in. (22 B.G.) thick or of wire mesh having not less than two meshes per linear inch of wire not less than 0.048 in. (18 S.W.G.) diameter.

15. **Operating Instructions.** Operating instructions shall be issued to purchasers by vendors of producers and shall draw attention to the following:

- (i) The necessity for providing ample ventilation in all garages and buildings in which producer gas vehicles may be housed.
- (ii) The fire hazards likely to result from careless handling and maintenance of producers, especially in the country.
- (iii) The necessity for igniting the gas in the generator by throwing in a lighted match, immediately after opening the filling lid.
- (iv) The necessity for avoiding opening any part of the gas circuit while the generator is alight and the filling lid open.
- (v) The necessity for draining off, by the taps provided, any water condensed in the gas circuit.
- (vi) The necessity for using the type and weight of loose filtering material specified for cleaner renewals.
- (vii) The necessity for maintaining effective gas-tight joints.
- (viii) The importance of operating blowers only when the vehicle is in the open air or a properly ventilated space.

16. **Welding.** All electric arc welding shall comply with the Australian Standard Rules for the Design and Application of Metallic Arc Welding (Hand or Machine) to Mild Steel Construction (Code No. C.A.S. known as the S.A.A. Welding Code). All oxy-acetylene welding shall be in accordance with the provisions of B.S. No. 693, "Oxy-Acetylene Welding as Applied to Steel Structures."

Brazing shall not be used in the construction of the generator.

Solder shall not be relied on to take any stress, and shall not be used where the temperature of the gas can exceed 120°C. above ambient temperature during the road test.

17. **Painting, Enamelling, Plating.** All parts shall be painted, enamelled, plated or so treated as to provide a suitable protective coating; in particular, parts exposed to high temperatures should be specially treated.

The piping between the security filter and the engine shall be internally coated as a protection against corrosion.

18. **Workmanship.** All construction, installation and fitting to the vehicle shall be carried out in accordance with the best industrial trade practice.

19. **Nameplate.** All producers shall have fitted in a conspicuous place a nameplate having the following information marked thereon in a legible manner. With the exception of the serial number, this information shall agree with the certificate of approval which has been issued for the equipment.

(*Manufacturer's Name and Address.*)

Trade Name .....	*R.A.C. Rating .....
Model .....	†Duty (Light or Heavy) .....
Serial No. ....	Certificate of Approval No. ....

\*The R.A.C. rating of the producer shall be specified as the maximum R.A.C. rating of the engine for the operation of which the producer is suitable, in one of the following classes:

10 h.p., 20 h.p., 30 h.p., 40 h.p.

†*Light Duty* is defined as suitable for the operation of ordinary cars and light utilities within their h.p. classes.

*Heavy duty* is defined as suitable for the operation of vehicles having a carrying capacity in excess of the following:

10 h.p. ... ..	15 cwt.
20 h.p. ... ..	20 "
30 h.p. ... ..	25 "
40 h.p. ... ..	30 "

or a passenger vehicle having a carrying capacity in excess of the following:

20 h.p. ... ..	5 passengers
30 h.p. ... ..	7 "
40 h.p. ... ..	10 "

20. Danger Plate. All producers shall have fitted in a conspicuous place a metal plate headed "Danger," giving the following safety instructions :

**DANGER.**  
DO NOT INHALE GAS.  
LEAVE VEHICLE WINDOWS OPEN.  
DO NOT LIGHT FIRE NOR LEAVE ALIGHT IN CLOSED GARAGE.  
CLOSE AIR INLET TO GAS MIXING VALVE BEFORE LEAVING VEHICLE.  
THROW LIGHTED MATCH INTO GENERATOR BEFORE REFUELLING OR TENDING FIRE FROM ABOVE. DO THIS IN OPEN AIR.  
SEE THAT FLAME TRAPS ARE IN PLACE.  
STAND CLEAR WHEN OPENING OR INSPECTING GENERATOR OR TUYERE WHILST FIRE IS ALIGHT.  
WHILST FIRE IS ALIGHT NEVER OPEN GENERATOR IN VICINITY OF PETROL PUMP NOR WHERE NAKED FLAMES ARE NOT PERMITTED.  
NEVER FILL PETROL TANK WHILST FIRE IS ALIGHT AND VEHICLE GARAGED.  
EXTINGUISH ALL ASHES REMOVED FROM PRODUCER.

INSTALLATION.

21. Mounting. The generator shall be mounted on substantial supports or on a trailer of approved design. Coolers, cleaners and water tanks shall be mounted on rigid brackets in accessible positions.

The entire equipment shall be fitted in such a manner that it complies with statutory regulations and that :

- (a) the stability of the vehicle is not seriously impaired ;
- (b) there is no interference with the driver's field of vision at a point more than 50 ft. from the nearest part of the vehicle ;
- (c) no part of a unit has less clearance than that given by a line drawn from the point of contact of the tyre with the road to a height of 1 ft. 5 in. above the road at a distance of 6 ft. from such point, measured directly forwards or backwards as shown in Fig. 1.
- (d) the installation of the producer does not interfere with the minimum ground clearance of the vehicle.

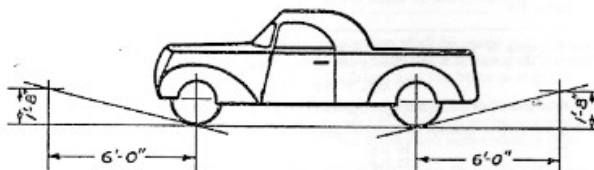


Fig. 1.

Where a trailer is used, the trailer coupling should permit a vertical movement about the pivot point of 30° in either direction from the normal position.



22. Overall Dimensions. The overall dimensions of the vehicle, with the producer installed, shall not exceed those permitted under statutory regulations.

23. Controls. All controls shall be adequately identified.

Where two accelerator pedals are used, the gas accelerator shall be to the right of the petrol accelerator.

All controls shall be substantially constructed and shall be clearly marked as to function and method of operation.

Where a drip feed is provided which requires manual adjustment while the vehicle is in motion, its controls shall be so placed that the driver can make the necessary adjustments without changing his normal driving position.

NOTE.—The fitting of a spark advance control for gas operation is recommended.

24. Prevention of Fire. Flame traps and openings to the generator shall be so arranged that any gas passing back from the generator will escape into the atmosphere in a direction away from the filling hole of the petrol tank.

The gas producer shall be so installed that any vertical line passing through any opening in the generator is at least 2 ft. horizontally from any vertical line passing through the filling hole of the petrol tank.

Any woodwork or other inflammable material, which is less than 2 ft. vertically above the top of the generator, or which is within 3 in. of any part of the generator, shall be protected by a metal shield not less than 0.039 in. (20 B.G.) thick, of adequate stiffness, having on each side a space at least 1 in. wide through which air can circulate freely.

Where inflammable material is within 1½ in. of any part of the gas producer, other than the generator, that is traversed by the gas before it has passed through the cooler, or before it has travelled 6 ft. from the generator, it shall be protected by a similar shield having on each side a space at least ½ in. wide through which air can circulate freely.

A metal shield not less than 0.033 in. (16 B.G.) thick and adequately stiffened, shall be provided, where necessary, to prevent the load coming into contact with the generator.

25. Prevention of Gas Poisoning. Every gas producer shall be so constructed and installed that no gas can escape therefrom into the atmosphere within 2 ft. horizontally of any window or other opening of the driver's or passengers' compartments of the vehicle. No part of the gas circuit shall be located inside the driver's or passengers' compartments of the vehicle.

When other than a totally enclosed drip feed is employed the bell-mouth shall be located outside the driver's compartment, in an exposed position.

A gas producer shall not be installed wholly or partly in the boot or the rear luggage compartment of a motor vehicle unless the following conditions are observed:

- (a) adequate ventilation is provided underneath the generator and for this purpose the bottom of the boot or compartment is removed;
- (b) there is a ventilation area of at least 12 sq. in. at the highest part of the boot or compartment;
- (c) the boot or compartment is sealed against the possibility of leakage of gas to the interior of the vehicle. For this purpose a bulkhead consisting of fireproof material not less than ½ in. thick, backed by sheet metal not less than 0.019 in. (26 B.G.) thick shall be erected between the gas producer and the interior of the vehicle and sealed on all edges.

If a blower or other device is used for forcing or inducing a draught through the generator, a valve shall be so arranged that any gas generated while such device is in use will be diverted into a waste pipe.

The gas shall be discharged from the waste pipe either

- (a) above the top of the vehicle and in any case not less than 7 ft. above the ground, or
- (b) parallel to the ground, outside the projected area of the vehicle, and below the level of the under side of the frame.

The gas shall be directed away from any door or opening to the interior of the vehicle.

Provision shall be made to prevent road dust entering the engine through the blower circuit.

PERFORMANCE.

26. **Standards of Performance.** The standards of performance specified in Clauses 27, 28 and 29 below shall be attained by the producer when fitted to an approved vehicle and tested in accordance with A.S. No. (E)CD.1, "Australian Standard Rules for the Testing of Charcoal Gas Producers for Motor Vehicles."

27. **Road Performance.** The performance of the producer when the vehicle is driven on gas alone over the test course specified in Section II of the standard rules for testing, shall comply with the following requirements:

- (a) *Starting Time.* The time required for lighting-up the generator and starting the vehicle on a level road in accordance with Section II, Rule 14 of the standard rules for testing shall not exceed four minutes, except as further provided in Rule 14.
- (b) *Gas Temperature.* The temperature of the gas at entry to the mixing chamber, measured in accordance with Section II, Rule 17, of the standard rules for testing, shall be not more than 30°C, above the ambient temperature.
- (c) *Gas Pressure.* The total pressure drop across the producer, measured in accordance with Section II, Rule 17 of the standard rules for testing, shall at no time exceed 3 in. mercury. The increase in total pressure drop over the producer at 30 m.p.h. in top gear at full throttle, during the first 100 miles of the road test, shall not exceed  $\frac{1}{2}$  in. mercury.
- (d) *Generator Capacity.* The effective fuel capacity of the generator shall give the vehicle the operating distance specified in Clause 7 (m) of this specification (50 miles without recharging) measured under the conditions stated in Section II, Rule 18 of the standard rules for testing.
- (e) *Operating Attention.* The producer shall be so designed that it will operate for the whole period required for the standard tests without requiring attention other than for charging with fuel or water, or draining of condensed moisture as set out in Clauses 10 and 13 above.
- (f) *General Performance.* The general performance of the producer shall be such that it gives satisfactory idling, manoeuvrability, restarting on gas, and flexibility.

28. **Power Output.** The ratio of the power developed on producer gas to that developed on petrol, on the converted petrol vehicle, when measured at the driving wheels of the vehicle in accordance with Section III of the standard rules for testing, shall be not less than an average of 50%.

NOTE.—For the purpose of this requirement a converted petrol vehicle is one on which no major engine modifications have been made as part of the conversion.

29. **Gas Cleanness.** The net dust concentration, measured in accordance with Section IV of the standard rules for testing, shall not exceed 10 mg. per cubic metre of gas in either of the dust tests.

REJECTION.

30. **Causes for Rejection.** A producer may be rejected if it does not comply with the requirements of this specification as to materials, design, construction and installation; if it fails to comply with the performance requirements specified herein; or if in the opinion of the Approving Authority it is, or is likely to become, unsatisfactory or dangerous in use.

Standards Association of Australia  
Headquarters :  
Science House, Gloucester and Essex Streets, Sydney.

AUSTRALIAN STANDARD RULES  
(Emergency Series)  
for the  
TESTING OF CHARCOAL GAS PRODUCERS FOR MOTOR VEHICLES

SECTION I. GENERAL CONDITIONS.

1. **Scope.** These rules shall apply to the testing of charcoal gas producers for motor vehicles other than tractors.
2. **Definitions.** Throughout these rules the following terms shall have the meanings given to them in this rule, as follows:
  - (a) *Approving Authority.* The term "Approving Authority" shall mean the body authorised to issue certificates to the effect that a producer complies with the requirements of Australian Standard No. (E) 2D. 3001, "Charcoal Gas Producers for Motor Vehicles," when tested in accordance with these rules.
  - (b) *Producer Equipment.* The terms "producer" and "producer equipment" shall mean the whole of the equipment, including generator, coolers, cleaners, filters, mixing valve and all connecting piping, necessary for the generation of producer gas and its delivery to the intake manifold of the engine of a motor vehicle.
  - (c) *Generator.* The term "generator" shall mean the vessel containing the fuel and the fire, in which the gas is generated.
  - (d) *Security Filter.* The term "security filter" shall mean a filter whose function is to provide protection for the engine in the event of failure of the ordinary cleaning system of the producer. It shall not be regarded as part of the cleaning system.
  - (e) *Testing Authority.* The term "Testing Authority" shall mean any independent testing authority authorised by the Approving Authority to conduct tests on producers in accordance with these rules.
  - (f) *Testing Officer.* The term "Testing Officer" shall mean the person appointed by the Testing Authority and approved by the Approving Authority to conduct tests on producers in accordance with these rules.
3. **Testing Authority.** The tests shall be carried out by an authorised Testing Authority. A list of authorised testing authorities is given in Appendix A.
4. **Application for Test.** The manufacturer of a producer who desires to have his equipment tested for approval shall apply to the Approving Authority in the manner set out in Clause A-3 of Appendix A.
5. **Submission of Equipment to Test.** The applicant shall submit his producer to the Testing Authority in the manner set out in Clause A-4 of Appendix A.
6. **Operation During Tests.**
  - (a) *Operation, Cleaning, etc.* The plant, where possible, shall be operated throughout the tests in accordance with the manufacturer's approved instructions. The cleaning system shall be attended to and cleaned at the beginning and end of the whole series of tests and at no other time.  
Before beginning and after finishing the tests the Testing Officer shall inspect the interior of the generator and report on its condition at both times. Wherever practicable he shall similarly inspect and report on the condition of filters and filtering material.

Where loose filtering material is used its weight when new shall be checked and recorded, and in filters of the liquid type the approximate quantity of liquid consumed during the test shall be recorded.

Where oiled coke is used in cleaners, the oiling of the cooke and charging of the cleaner before the test shall be done in the presence of the Testing Officer, and the weight of coke and quantity of oil used shall be recorded.

The condition of the generator and cleaners shall be recorded in Test Schedule 4.

(b) *Manufacturer's Representative.* A representative of the manufacturer may be present during the tests.

(c) *Charcoal to be Used.* For the tests described herein standard testing charcoal\* shall be used, except that for the Road Test (Section II) and Second Dust Test (Section IV) sub-standard testing charcoal shall be used.

Quantities of these testing charcoals sufficient for the purpose of the tests shall be supplied by the Approving Authority to the Testing Authority.

(d) *Order of Tests.* When producers are tested for compliance with the Australian Standard Specification for Charcoal Gas Producers for Motor Vehicles (A.S. No. (E) 2 D. 3001) the tests described herein shall be carried out in the following order :

- (i) Examination of the equipment.
- (ii) First Dust Test. After cleaning in accordance with the manufacturer's instructions (Sec. IV, 36 (i)), using standard testing charcoal.
- (iii) Power Measurement Test. Section IV.A. Using standard testing charcoal. Section IV.B. Using sub-standard testing charcoal during the Road Test.
- (iv) Road Test. Section II. Using sub-standard testing charcoal.
- (v) Second Dust Test. After completion of the Power and Road Tests (Sec. IV, 36 (ii)), using the charcoal remaining in the generator after the Road Test.

7. *Certificate of Approval.* The conditions under which certificates of approval relating to their equipment will be issued to applicants are set out in Clause A-6 of Appendix A.

8. *Particulars of Equipment.* The Testing Authority shall examine the producer and vehicle and shall fill in the particulars required in Schedule I and Appendix A.

## SECTION II. ROAD TESTS.

9. *General.* The vehicle shall be run over a specified test course on producer gas alone. Observations taken during the run shall include starting the producer, road performance, hill-climbing, gas temperature and pressure, fuel consumption and ability to restart on gas alone, as detailed below. Where petrol is used for starting, care shall be taken to see that the engine is running on gas alone. The petrol throttle, if a separate throttle is provided, shall be fully closed, and the supply of petrol to the carburettor shall be cut off by disconnecting the petrol pipe from the carburettor. After every test in which petrol is used, the petrol pipe shall be again disconnected from the carburettor. When a change-over valve is used, its effectiveness in blocking off the petrol system shall be tested by filling the carburettor with petrol, disconnecting the petrol pipe, and travelling a distance of 30 miles on gas, after which an examination shall be made to determine whether petrol is still in the carburettor.

Before each hill-climb test on gas, the Testing Officer shall take steps to ensure that there is no petrol in the carburettor, and that no petrol can reach the engine in any other way. The Testing Officer shall also take steps to ensure that no lighting fluid can reach the generator, either immediately before or during the hill-climbing tests.

10. *Test Course.* Each Testing Authority shall select an appropriate test course over which all producers submitted for test shall be tested. The test course shall be approximately 100 miles long when the power test is carried out in the laboratory, and approximately 130 miles long when the power test is carried out during the road tests, and should be for the most part on State highways.

The test course shall include a section of about 10 miles with uphill gradients, and approximately two miles of a continuous uphill gradient of about 1 in 10. A few miles in city traffic, with frequent stops and starts, should also be included. The test course shall also contain a length of reasonably straight and level road so located as to be suitable for making measurements of gas pressures and temperatures under the conditions set out in Section II, Rule 17.

\*Standard testing charcoal is a particular charcoal produced by a particular method under the supervision of the Council for Scientific and Industrial Research from river red gum timber grown at Mathoura, New South Wales. It is washed and graded  $\frac{1}{4}$  in. to 1 in. in size. Sub-standard testing charcoal is a particular charcoal produced by the same method as that used in the production of standard testing charcoal, from river red gum timber grown at Mathoura, New South Wales. It is washed and graded  $\frac{1}{4}$  in. to 1 in. in size.

For details, reference should be made to the Council for Scientific and Industrial Research. The reference sample of this charcoal is held by the Standards Association of Australia.

A full description of the test course shall be sent to the Approving Authority before any tests are conducted. It shall include particulars of mileage, nature of road surfaces and approximate gradients, length and total rise on the hill-climbing section, and maximum gradient.

#### 11. Driver and Load.

(a) *Driver.* During the tests on gas, the vehicle may be driven by a representative of the manufacturer, or by a representative of the Testing Authority, as directed by the Testing Officer. During the tests on petrol, the vehicle shall be driven by a representative of the Testing Authority.

(b) *Load.* The vehicle shall be loaded to its gross vehicle weight as defined by the vehicle manufacturer, and the weight of the driver and observer shall be included in that gross vehicle weight.

For cars and utilities, if this load is found to be so great that the vehicle cannot climb hills having a grade in excess of 1 in 10, the load may be reduced sufficiently to enable the vehicle to climb such hills. Any such reduction shall be recorded in Schedule 2.

12. *Speedometer.* Observations of speed and distance shall be made from the vehicle's speedometer, which shall be checked over a measured mile at 30 m.p.h. or by means of a standard speedometer testing machine.

13. *Normal Test Speed.* For the whole of the test course, with the exception of hill-climbing and city traffic sections, the speed shall be maintained at approximately the normal test speed. The normal test speed shall generally be 30 m.p.h., but for very heavy vehicles a lower normal speed may be adopted at the discretion of the Testing Authority or to comply with legal requirements. For light vehicles the test speed may be increased, provided this does not contravene legal requirements.

14. *Starting Test.* With the producer and fuel cold and the engine at its normal running temperature, the producer shall be lit in accordance with the operating instructions. The time from the beginning of the lighting process until the engine operates satisfactorily on producer gas alone shall be observed, all operations being carried out by one man. This time shall include the time required to open the lighting aperture, and the preparation of the wick or other means of lighting. Should the engine subsequently stop through failure of gas or otherwise, the starting test shall be repeated on another occasion. If the starting time is excessive the test may be repeated on another occasion.

Where a blower only is used for starting, the engine shall be started from cold and the allowable time of starting extended from four to six minutes.

15. *Restarting Test.* The producer shall be tested for restarting on gas alone after a brief engine stop in the first 20 miles, and after an engine stop of 15 minutes' duration after the vehicle has been running for not less than one hour. Before the engine is stopped for the purpose of this test the Testing Officer shall take steps to ensure that all petrol has been exhausted from the carburettor and that no lighting fluid can reach the generator.

16. *Hill-Climbing Test.* On the hill-climbing sections, the speed shall be as high as conditions permit. The time taken to cover this section shall be recorded.

#### 17. Pressure and Temperature Measurements.

(a) *Gas Pressure.* Before measurements of pressure are made, the mixture shall be adjusted to give maximum power, and shall not be altered while any one group of pressure measurements is being carried out.

The gas pressure at entry to the mixing valve shall be measured as near to the beginning and end of the road test as practicable, while the vehicle is travelling at 30 m.p.h. in top gear at full throttle, and at such other times during the road test as are considered necessary by the Testing Officer.

Pressures shall be measured by a U-tube gauge to the nearest 0.1 in. mercury.

(b) *Gas Temperatures.* At a stage of the test when the vehicle has travelled not less than 20 miles after fuelling, and has travelled at approximately 30 miles per hour in top gear for not less than 15 minutes on a reasonably level road, the temperature of the gas shall be measured at the following points, with the engine running:

- (i) at entry to the mixing valve;
- (ii) at entry to any cleaner which contains material likely to be damaged by heat;
- (iii) at entry to the first rubber hose or portion of the equipment in which rubber gaskets are used;
- (iv) at entry to any cleaner containing fluid.

Two sets of temperature measurements shall be made, one as near as practicable to the beginning of the test, and the other as near as practicable to the end of the test. Similar measurements of temperature shall also be made at the end of hill climbs and before refuelling.

The temperature shall be measured to the nearest degree centigrade with mercury or dial thermometer, which shall be placed in the gas stream; a simultaneous reading of the air shade temperature shall be made.

NOTE.—Certain of the above temperature measurements, other than the measurement at entry to the mixing valve, may be omitted at the discretion of the Testing Officer if he is satisfied that sufficient information can be obtained from the remaining measurements to determine that the gas temperature is within safe limits for the material which is likely to be affected by heat.

(c) *External Temperature of Producer.* The external temperatures of the exposed surfaces of the producer shall be tested immediately before refuelling, after hill climbs and at other times considered necessary by the Testing Officer.

These temperatures may be tested by means of solder consisting of 50% lead and 50% tin. If this solder melts when applied to any portion of the producer, the temperature of such portion of the producer shall be regarded as being at least 185°C.

18. *Fuel Consumption and Generator Capacity.* The generator shall be filled with a weighed amount of charcoal before beginning the test. A sample of the charcoal shall be taken and its moisture content determined in the usual way. On the test run, the generator shall be refilled when falling-off in power or over-heating of the generator indicates that the fuel is too low, or in accordance with the approved instructions of the manufacturer, whichever is the earlier. The distance covered without refuelling shall be observed. The weight of charcoal added during the run shall be recorded. On completion of the tests and after the generator has cooled, the remaining charcoal shall be weighed.

19. *Alteration of Procedure.* It is suggested that the test be conducted at such a time that heavy traffic is not likely to be encountered except in the city section. The Testing Officer may, on account of adverse traffic or weather conditions, or on account of peculiarities of the producer cleaning system or vehicle under test, depart from the procedure laid down. Any such departure from the standard procedure shall be recorded in the schedule, and the reason therefor shall be explained. The Testing Authority may require the test to be repeated in whole or in part on a later occasion.

20. *Results of Road Tests.* The results of the road tests shall be recorded in Schedules 2, 3, 4 and 5.

### SECTION III. POWER MEASUREMENT.

The power output shall be measured either by dynamometer or by road tests, as set out in sub-sections A and B.

#### A. Power Measurement by Dynamometer.

21. *General.* When tested under this sub-section the power available at the driving wheels of the vehicle shall be measured by a suitable vehicle dynamometer.

22. *Test on Petrol.* The engine shall first be run on commercial petrol at a speed of 1,000, 1,500 and 2,000 r.p.m. at full throttle in top gear, and the power at the driving wheels observed. Mixture strength and ignition timing shall be adjusted for maximum power, and readings shall not be taken until the engine has reached the normal running temperature and has been running under the specified conditions for at least three minutes. The gas mixing chamber shall be removed, and the original petrol induction system replaced in its normal position.

The test may be repeated after the tyres have cooled.

NOTE.—For engines of unusual design such as those which reach peak output at very low engine speed, the speed range may be varied. Any such alteration in procedure shall be recorded in the schedule.

The attention of testing officers is drawn to the possibility of power loss owing to incomplete opening of the throttle, partly blocked air cleaners, undersized carburettor jets or choke tubes, kerosene in the fuel, or unofficial restrictor plates under the carburettor. Should the inlet manifold heating system have been removed or modified for gas operation, it shall, if practicable, be replaced for the petrol test as originally fitted for petrol running. Such alterations and any departures from this procedure shall be recorded under "Remarks" in the schedule.

23. **Test on Producer Gas.** The engine shall be run on gas, care being taken, as in the road test, to see that no petrol is being consumed. After warming-up in neutral gear, top gear shall be engaged and the vehicle run on full throttle at a speed corresponding to 20 m.p.h. for at least 10 minutes. At the end of this period, the engine speed shall be adjusted to 1,000, 1,500 and 2,000 r.p.m. and the power at the driving wheels observed after at least three minutes' running at each speed. The mixture strength and ignition timing shall be adjusted for maximum power, at each speed.

The test shall be repeated after the tyres have cooled.

24. **Gas Cooling.** Arrangements may be made, if necessary, to cool the gas during the dynamometer test. The temperature of the gas reaching the engine shall be regulated to approximately 30°C. above the ambient temperature during the petrol test.

25. **Dynamometer Zero Setting.** The zero error of the dynamometer shall be checked before and after each test.

26. **Results of Power Test.** The results shall be recorded in Schedule 3-A.

#### B. Power Measurement by Hill Climb.

27. **General.** For the purpose of ascertaining the ratio of power developed on gas compared to that on petrol when measured by the hill-climb method, two hills shall be selected, as portions of the road test. One hill should be approximately  $\frac{1}{4}$  mile long and of an average gradient of approximately 1 in 10. The other should be approximately 1 to  $1\frac{1}{2}$  miles long and of an average gradient of approximately 1 in 20. Each hill should be as straight as possible.

In the event of unsatisfactory times being obtained on gas with full load, the hill-climb test may be made with a reduced load at the discretion of the Testing Officer. Any such reduction shall be recorded in Schedule 3-B.

28. **Timing of Test.** The time taken for the vehicle to travel between two selected marks on these hills shall be measured with a stop watch, and recorded in Schedule 3-B. The vehicle shall start from rest at the lower mark in each case and the best use of the gears shall be made. The times shall be measured on both gas and petrol on each hill, and particular tests may be repeated at the discretion of the Testing Officer. The tests shall be made on the same day with the same gross weight of vehicle.

The fastest time on gas and the fastest time on petrol for any group of tests taken at approximately the same time shall be official times and shall be used for power comparison.

29. **Power Ratios.** Power ratios shall be considered as the inverse of the ratio of the times on each hill, and the mean of the two ratios shall be considered as the test figure.

30. **Ignition Adjustments.** Adjustment to the ignition timing for best performance shall be made before the petrol and the gas tests.

**NOTE.**—The attention of testing officers is drawn to the possibility of power loss should the mixing chamber introduce any obstruction into the induction system; the possibility of air leakage into the induction system through the gas mixing chamber should also be examined. Should the inlet manifold heating system have been removed or modified for gas operation, it shall if practicable be replaced for the petrol test as originally fitted for petrol running. Such alterations and any departure from this procedure shall be recorded under "Remarks" in the schedule.

#### SECTION IV. TESTING OF GAS CLEANERS.

31. **General.** The effectiveness of the gas cleaners shall be determined by passing the cleaned gas through a filter paper and weighing the deposited solid matter.\*

32. **Arrangement of Apparatus.** The test equipment shall consist of a filter unit, a valve, a pump, an expansion chamber, an orifice meter and a burner arranged in series in that order.

33. **Filter Unit.** A grey crinkled filter paper 20 in. in diameter having a pore size when dry of three to five microns shall be placed in a holder of the type shown in Fig. 1. An electrical heating coil of about 1000 watts rating should be fitted around the inlet pipe of the holder to warm the gas.

\*This method of test is described in an article entitled "The Testing of Cleaners and Scrubbers on Gas Producer Vehicles" by H. Beresinsky, published in "The Modern Engineer," Feb. 20th, 1940.

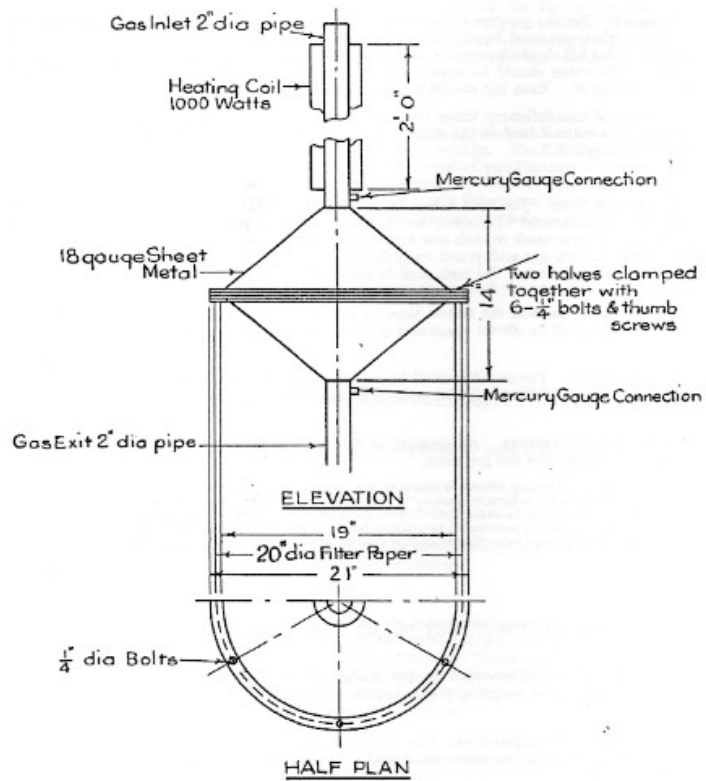
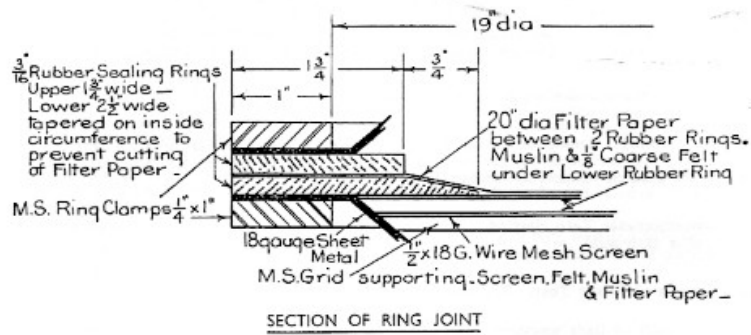
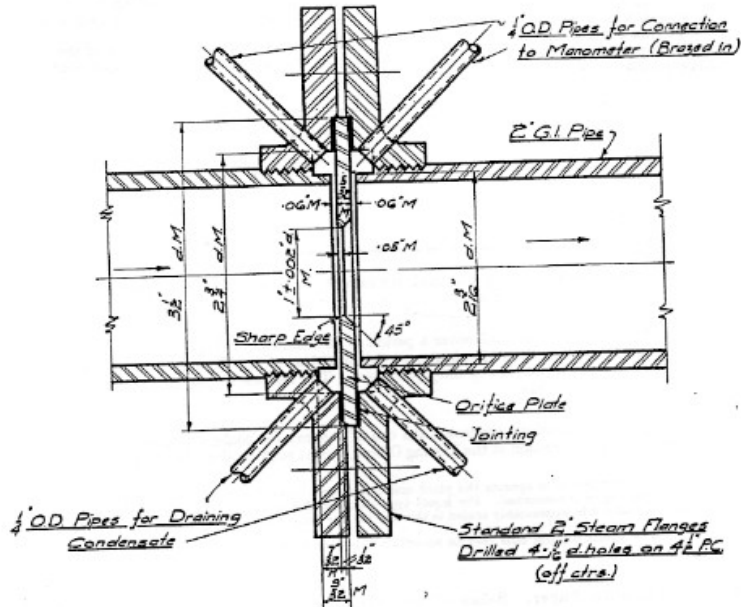


Fig. 1. Testing Filter.



34. **Pump.** Any pump capable of delivering 70 cu. ft. of free air per min. against a suction of 7 ft. per sq. in. may be used; a rotary pump of the positive displacement type will probably be found most suitable. An expansion chamber should be placed between the pump and the orifice, to minimise errors in measurement of the gas flow consequent on pulsating flow through the orifice.

35. **Orifice Meter.** The gas flow shall be measured by a standard orifice, details of which are given in Fig. 2, or by other suitable means.



HEAD ACROSS ORIFICE.

Temp. °C.	Gas rate cu. ft. per min.			
	20	35	50	70
	Inches Water Gauge.			
15	1.9	5.8	11.9	23.3
20	1.9	5.9	12.1	23.7
25	2.0	6.0	12.3	24.1
30	2.0	6.2	12.6	24.7
35	2.0	6.3	12.8	25.1
40	2.1	6.4	13.1	25.7
45	2.1	6.6	13.4	26.3
50	2.2	6.7	13.7	26.8
55	2.2	6.9	14.0	27.4
60	2.3	7.1	14.4	28.2

FIG. 2. Standard Orifice.

36. **Condition of Cleaners.** Tests shall be carried out with the cleaner in the following conditions:

- (i) new, or immediately after cleaning the filters and scrubbers in accordance with the manufacturer's instructions;
- (ii) after completion of the road and power tests specified above, and without further cleaning.

37. **Conduct of Tests.** The pipe from the final cleaner to the engine shall be disconnected and the final cleaner connected to the filter test unit in such a position that the gas from the final cleaner reaches the filter paper without passing through the security filter of the producer.

The conditions under which the producer is operated shall be as nearly normal as possible. The water feed shall be at the normal rate.

Before the test begins, the apparatus should be run under test conditions for about ten minutes to warm the whole plant.

NOTE.—When the pump is switched off at the end of the preliminary run, observations shall be made of the effectiveness of the flame trap(s) on the generator air inlet(s).

38. **Rate of Gas Flow.** The rate of gas flow shall be determined by the R.A.C. rating of the engine for which the producer is designed, as shown on the producer nameplate. The corresponding figures are given in the following table.

R.A.C. Rating On Nameplate h.p.	Gas Rate for Dust Test cu. ft. per min.
10	20
20	35
30	50
40	70

Where the orifice plate described in Fig. 2 is used, the rate of gas flow shall be measured and adjusted as indicated in the table given in Fig. 2.

39. **Duration of Test.** The test shall cover a period of 30 minutes. If this is impracticable, the time may be reduced to not less than 15 minutes at the discretion of the Testing Authority, but no such reduction shall be made for heavy duty producers. The reasons for any such departure shall be recorded in the test schedule.

40. **Gas Cooling.** For light duty producers the use of a spray for cooling primary cleaners and coolers is permissible at the discretion of the Testing Officer, but no such cooling shall be permitted for heavy duty producers.

NOTE.—The purpose of the test is to operate the plant under the worst conditions encountered on the road as far as passing dust to the engine is concerned. For liquid type cleaners, this condition appears to occur when the liquid is hot. The gas shall not be appreciably cooled in this test for this type of cleaner.

Observations shall be made during this test to ascertain whether exposed surfaces of the producer become dangerously hot.

41. **Treatment of Filter Paper.** Before a filter paper is used in the test, extraction shall be carried out on it in a Soxhlet apparatus using a solvent similar to that to be used for the final extraction.

The following technique is recommended for the drying of the filter paper :

(a) *Before the Dust Test.*

- (i) Fold the filter paper so that it may readily be placed in a weighing bottle.
- (ii)\* Dry the paper in an oven at 105°C. for at least one hour.
- (iii)\* Place the dried paper in a weighing bottle of known weight with the lid open, and place in the oven for at least one hour, preferably three to four hours.
- (iv) Close the bottle while still in the oven, remove and allow to cool in a desiccator.
- (v) Weigh the bottle and contents to the nearest milligram and so obtain the weight of the paper.
- (vi) Return the paper to the drying oven.
- (vii)\* Repeat daily until constant weight is obtained, the paper being kept in the oven at 105°C. when not in the weighing bottle.
- (viii) Allow the paper to reach equilibrium in the atmosphere before unfolding.
- (ix) The paper is now ready for use in the dust test.

(b) *After the Dust Test.*

- (i)\* Dry and weigh the filter paper as before, in order to determine the gross weight of deposited material.

NOTE.—If an oil filter has been under test an appreciable quantity of oil may be removed at 105°C. Repeat weighings are therefore not desirable, and readings should be taken as in (a) (v) above.

- (ii) Where extractable material may be present on the filter paper, it shall be extracted in a Soxhlet apparatus using a suitable solvent. Dry and weigh the paper.

42. **Results of Cleaner Tests.** The results of the cleaner tests shall be recorded in Schedule 4.

\*NOTE.—The temperature of the oven should not vary from that specified by more than plus or minus 2°C.

SECTION V. RECORDING TEST RESULTS.

43. **Measurements and Derived Results.** The individual measurements and the results derived from them shall be recorded in the appropriate places in the following schedules.
44. **Order of Accuracy.** Derived results shall not be stated to a higher order of accuracy than is warranted by the measurements from which the results are derived. In general, the order of accuracy appropriate to the observations and measurements is shown in the test schedules.
45. **Summary.** The results of the whole series of tests shall be summarised on a single page, as shown in Schedule 5.

SCHEDULE A. OBSERVATIONS MADE AT THE DISCRETION OF THE TESTING AUTHORITY.

Testing Authority..... Test of..... Gas Producer  
 (make of producer)  
 Model..... R.A.C. rating..... Tested on.....  
 (make and type of vehicle)  
 Test Series No..... Testing Officer..... Date.....

ROAD TEST.

1. Acceleration Tests.

Type of instrument used.....

	GAS			PETROL		
	E to F	F to E	Average	E to F	F to E	Average
(a) Using an accelerometer						
Max. accel. in 1st gear	.....	.....	.....	.....	.....	.....
" " " 2nd "	.....	.....	.....	.....	.....	.....
" " " 3rd "	.....	.....	.....	.....	.....	.....
" " " 4th "	.....	.....	.....	.....	.....	.....
Top gear pulling power at 30 m.p.h.	..... lb. per ton average.					
Drag at 30 m.p.h.	..... lb. per ton average.					

	GAS			PETROL		
	E to F	F to E	Average	E to F	F to E	Average
(b) Using stop watch and speedometer						
Time to reach 30 m.p.h. from standing through the gears	.....	.....	..... Sec.	.....	.....	..... Sec.

Remarks .....

2. Gas Pressures.

	Beginning of Road Test After Approx.		After Approx.	End of Road Test After Approx.	
	miles	in. merc.		miles	in. merc.
(a) At full throttle at 30 m.p.h. in top gear	.....	.....	.....	.....	.....
Immediately after generator	.....	.....	.....	.....	.....
Immediately after.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
Immediately after.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....
Immediately before security filter	.....	.....	.....	.....	.....
Immediately before mixing valve	.....	.....	.....	.....	.....

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(b) Engine speed and gas pressure drop during test of power by hill climb method :

	VEHICLE m.p.h.	GEAR USED	ENGINE r.p.m.
Approx. steady climbing speed, and gear used	A-B { Gas	.....	.....
		C-D { Gas	.....
	Petrol		.....
		Petrol	.....
Pressure drop across producer at full throttle corresponding to above speeds and gears	A-B		.....
	C-D	.....	..... in. merc.

Remarks .....

.....

.....

3. Temperatures.

(a) Gas	After first .....miles (30 m.p.h.)	After hill climb A-B	After first .....miles and before refuelling (.....m.p.h.)	After first .....miles and before climb up (..... m.p.h.)	After climb up .....	End of road test after .....miles Approx. (30 m.p.h.)
.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....
.....	.....	.....	.....	.....	.....	.....
Before mixing valve	.....	.....	.....	.....	.....	.....
(b) Ambient	.....	.....	.....	.....	.....	.....
(c) External surfaces of producer	.....	.....	.....	.....	.....	.....
At 30 m.p.h.	.....	.....	.....	Generator	Take-off	Cleaners
At end of hill climb	.....	.....	.....	.....	.....	.....

Remarks .....

.....

.....

4. Generator Capacity.

Distance from centre of tuyere to top of generator	.....	in.
Level of charcoal below top of generator when refuelling was necessary	.....	in.
Level of charcoal above centre of tuyere when refuelling was necessary	.....	in.
Capacity of generator above level of charcoal at which refuelling was necessary (nearest 0.1 cu. ft.)	.....	cu. ft.
Time spent refuelling	.....	min.

Remarks .....

.....

.....