

AUSTRALIAN MOTOR VEHICLE CERTIFICATION BOARD

Comprising Commonwealth, State and Territory Authorities

CIRCULAR NO. 38-1-1  
APPLICATION PROCEDURES FOR APPROVAL TO ADR 38 - HEAVY  
TRAILER BRAKING SYSTEMS

INTRODUCTION

1. The Australian Transport Advisory Council has recommended to Commonwealth, State, and Territory Governments that all trailers specified below, except those designed for use behind a tractor with a maximum speed less than 50 km/h, or trailers which are otherwise specially exempted by the Administrator, shall comply with Australian Design Rule No. 38 - Heavy Trailer Braking Systems.

- (i) All Semi-trailers manufactured on or after 1 July 1984 with an individual Gross Trailer Mass Rating greater than 20 tonne and less than 60 tonne.
- (ii) All Trailers, other than Semi-trailers, manufactured on or after 1 July 1985 with an individual Gross Trailer Mass Rating greater than 15 tonne and less than 60 tonne.
- (iii) All Trailers manufactured on or after 1 July 1986 with an individual Gross Trailer Mass Rating of 4.5 tonne or more and less than 60 tonne.

DEMONSTRATION OF COMPLIANCE

2. Compliance can be demonstrated by any one of four methods.

These are:

- (i) By performing physical tests, mostly road tests, in accordance with procedures in ADR 38
- (ii) By performing calculations based on data from approved sub-assemblies, in accordance with procedures in ADR 38
- (iii) By comparison with a previously approved trailer
- (iv) By demonstrating that the trailer has been certified to ECE 13 - the United Nations agreement for uniform provisions concerning the approval of vehicles with regard to braking.

3. The sub-assemblies for which approval can be granted are:
- (i) The control system (ie. a combination of the air lines, valves, tanks etc.)
  - (ii) The suspension system (ie. a combination of springs, hangers, radius rods, equiliser beams etc.)
  - (iii) The foundation brakes (ie. a combination of drums, linings, S-cam, back plate, etc.)
  - (iv) The total trailer brake system (a combination of the previous 3 sub-assemblies or the equivalent components).

Because sub-assembly approvals are based on tests conducted by the sub-assembly manufacturer, which are basically the same as the physical tests conducted for the trailer road test procedures, these tests will not need repeating by trailer manufacturers demonstrating compliance using the calculation procedures.

4. A trailer manufacturer will need to demonstrate compliance with ADR 38, and any other ADRs applicable to trailers, for a Trailer Make and Model before a Compliance Plate Approval will be issued for that Trailer Make-Model. Refer to Circular No. 0-3-6 for details on Compliance Plate Approvals.

5. A submission of evidence of compliance with ADR 38 shall be completed, using Form CB 38, for each Trailer Make-Model for which a Compliance Plate is required. Variants of a Model can be included in one application. Refer to Circular No.0-3-5 for details of Trailer Make and Model designations and the use of Variants.

6. Demonstration of compliance of a Variant may be made by comparing it to the base Model, stating the differences between the Variant and the base Model and justifying the compliance of the Variant with regard to those differences. For example, with a change in a relay valve, it would be sufficient to demonstrate that the pressure drop across the valve is the same as for the corresponding relay valve on the base Model and the time response of the system using the replacement valve is within the limits specified in ADR 38.

#### TRAILERS PRODUCED IN LOW VOLUMES

7. As an alternative to demonstrating compliance with ADR 38 a trailer manufacturer may use the low volume assessment scheme which is limited to three trailers per year per manufacturer. This assessment will provide reasonable assurance that the trailer complies with ADR 38 but requires a minimum of testing. The low volume scheme is only applicable to trailers using compressed air braking systems. Further details can be found in Circular No.38-1-4.

FORM CB38 - SUBMISSION OF EVIDENCE OF COMPLIANCE WITH ADR 38.

8. This form has Annexes A to M attached. Only those Annexes applicable to the particular application require completing and returning. The table on sheet 2 of CB38 shows which Annexes are required for each case.

9. Annex A This identifies and describes the trailer Make-Model for which approval is sought. One completed Annex A is required for each Variant.

Annex A is not required where the approval is based on certification to ECE 13.

10. Annex B This lists results of performance tests where physical tests (road tests) have been conducted. Provision is made for demonstrating Service Brake Effectiveness by computer simulation.

It will be noticed that many of the questions in Part B are common to Annex H Part B. Therefore such questions in Annex B can be answered 'Yes' if an approved Control System Sub-assembly is used and installed as per the sub-assembly approval.

11. Annex C This lists results of calculations to demonstrate Compliance with the performance requirements. Provision is made for the use of brake booster sizes and slack adjuster lengths which are different from those in the foundation brake system sub-assembly approval. All other data in Annex C must be obtained from the sub-assembly approvals.

Approved sub-assemblies shall be used only in their complete form as described in the Application for Compliance Mark Approval. They shall comprise of designated parts, identified by a parts list. Each sub-assembly shall be made available with a copy of the approved data, installation instructions and a parts list. The Compliance Mark Approval is only valid if the sub-assembly is in its complete form, installed according to the manufacturer's instructions and all the conditions of Compliance Mark Approval are complied with.

It is important that the sub-assembly manufacturer identifies which Variant is being supplied to the trailer manufacturer and supplies the appropriate parts list and installation instructions.

The sub-assembly manufacturer will be responsible for ensuring that the sub-assembly is supplied exactly as per the Compliance Mark Approval Application. The trailer manufacturer will be responsible for ensuring that the sub-assembly is installed exactly as per the sub-assembly manufacturer's instructions.

If an approved Total Trailer Brake System Sub-assembly is used only part A of Annex C needs to be completed and returned.

When completing the Suspension System Sub-assembly data (Annex C, Part B, Section 1 (i)) the full range of Service Skid Limits shown on the approved data should be stated. The Emergency/Parking Skid Limits stated should be those for the combination of axles fitted with Emergency and Parking brakes respectively.

For example: If axles 1 and 2 have Parking brakes, and axles 2 and 3 have Emergency Brakes, and the Skid Limits in the approved data are:

Service Skid Limit values

	Axle 1		Axle 2		Axle 3		Axle 4	
	From	To	From	To	From	To	From	To
Skid Limit	0.81	1.0	0.87	1.0	0.94	1.0	-	-

Emergency or Parking Skid Limit values

Axle 1	Axle 2	Axle 3	Axle 4
11.77	11.77	0	0
0	10.30	10.30	0

The Skid Limit data stated in Annex C will then be;

Skid Limits (Brake reactive suspensions only)	AXLE							
	1		2		3		4	
Emergency	0		10.30		10.30		0	
Parking	11.77		11.77		0		0	
Service	From	To	From	To	From	To	From	To
	0.81	1.0	0.87	1.0	0.94	1.0	-	

When completing the Control System Sub-assembly data in Annex C, Part B, Section 1(ii), corrections to the approved data may be required to allow for brake actuator area changes and/or brake actuator stroke.

The value of A, the input to the Emergency or Parking Brakes, will need correcting if:

- (i) the Service brake actuator area is different from the areas stated in the approved data for the Emergency or Parking brakes.

and/or

- (ii) the value of A stated in the approved data is dependent on brake actuator stroke, S, which is to be measured in mm.

For example: The Control System's approved data shows the input to the Emergency brakes as 0.32E for a 193 cm<sup>2</sup> actuator.

The Service brake actuator has an area of 155 cm<sup>2</sup>.

The corrected value of A will be obtained from:

Equivalent Control Signal x  $\frac{\text{Actuator area approved}}{\text{Actuator area used}}$

$$= 0.32 \times \frac{193}{155} E$$

$$= 0.40E \text{ for } 155 \text{ cm}^2$$

The Control System's approved data shows the input to the Parking brakes as (0.32 - 0.004xS) E for a service actuator area of 129 cm<sup>2</sup>

The Foundation Brake's approved data contains a graph of stroke against control signal. From this the stroke, S, to be used is found to be 30 mm (refer to Circular 38-2-5). The trailer is using a service brake actuator with an area of 155 cm<sup>2</sup>

The corrected value of A will be obtained from;

Equivalent Control Signal x  $\frac{\text{Actuator area approved}}{\text{Actuator area used}}$

$$=(0.32 - 0.004 \times 30) \times \frac{129}{155} E$$

$$=0.17 E \text{ for } 155 \text{ cm}^2$$

Thus the table in Annex C would be completed as follows for a triaxle semi-trailer:

Input to Emergency/Parking Brakes (A)

		Emergency			Parking		
		A	Service actuator	Stroke (mm)	A	Service actuator	Stroke (mm)
Axle Group 1	Axle 1	-	-	-	0.17E	155 cm <sup>2</sup>	30
	Axle 2	0.40E	155 cm <sup>2</sup>	-	0.17E	155cm <sup>2</sup>	30
	Axle 3	0.40E	155 cm <sup>2</sup>	-	-	-	-
	Axle 4	-	-	-	-	-	-

Similarly if the Emergency cut-in level, L, is dependent on brake actuator stroke a correction must be made.

For example: The Emergency cut-in level, L, from the approved data is  $(0.58 - 0.0062 \times S)E$  and the brake actuator stroke is 20 mm with the brakes correctly adjusted. The corrected cut-in level will be:

$$(0.58 - 0.0062 \times 20)E \\ = 0.456E$$

Thus the Emergency cut-in level would be stated as;

L: 0.456E at stroke 30 mm.

When completing the Foundation Brake Sub-assembly data in Annex C, Part B, Section 1 (iii) corrections to the approved data may be required for changes in brake actuator area and/or actuator arm length.

For example: The Foundation Brake Sub-assembly's approved data shows the value of T, the output torque per unit input signal, as 16,000 Nm per 1.0E for 193 cm<sup>2</sup> 152 mm (ie. a 193 m<sup>2</sup> (Type 30) actuator with a 152 mm actuator arm length).

The actuator used on the trailer has an area of 155 cm<sup>2</sup> and operates a 140 mm arm.

The corrected value of T will be obtained from;

$$\text{Approved torque} \times \frac{\text{actuator area used}}{\text{approved actuator area}} \times \frac{\text{arm length used}}{\text{approved arm length}} \\ = 16,000 \times \frac{155}{193} \times \frac{140}{152} = 11,835 \text{ Nm per 1.0E}$$

Thus the table in Annex C would be completed as follows for a triaxle semi-trailer:

Brakes output torque per unit input signal (T)

		Brake Chamber Model (Type No.)	Nominal Area (or Equivalent) (cm <sup>2</sup> )	Slack Adjuster Length (or Equivalent)	Output Torque Per Unit Input Signal to Brake Actuator: (Nm per 1.0E)	Foundation Brake Compliance Mark Approval Number
Axle Group 1	Axle 1	24	155	140mm	11,835	0472
	Axle 2	24	155	140mm	11,835	0472
	Axle 3	24	155	140mm	11,835	0472
	Axle 4	-	-	-	-	-

When completing the Results table in Annex C, Part B, Section 2 and the Emergency Brake System Calculation in Section 3, the Total Trailer Axle Load used shall be the Total Trailer Axle Load which would be obtained with the Trailer laden to Loaded Test Mass (LTM), i.e. as for a road test. Refer to Circular No. 38-2-3, Trailer Conditions for Road Tests.

In Annex C, Part C, Section 1 questions (iii)(b) and (iii)(c) refer to Friction Utilization Factors for Dog Trailers. These are calculated using the expression in Clause 38.4.1.3.1 of ADR 38. The values to be used in that expression are as follows :

- z, the deceleration, which is equal to the ERC in the Results table in Section 2 of Annex C
- T<sub>1</sub>, T<sub>2</sub> the tangential force at the wheel for axles 1 and 2 respectively, will be the brake torque for each axle, in Newton-metre at the ERC level used for z, divided by the static loaded tyre radius in metre as stated in Annex A.
- P<sub>1</sub>, P<sub>2</sub> the static axle load on axles 1 and 2 respectively, will be the axle loading in tonne obtained with the Trailer laden to Loaded Test Mass (i.e. as for a road test. Refer to Circular No. 38-2-3) multiplied by 9810.
- P the total static axle load, will be the sum of P<sub>1</sub> and P<sub>2</sub>.
- h the height of the trailer and load centre of mass, will be the centre of mass height, in metre, stated in Annex A.
- L the wheelbase, will be the value in metre as stated in Annex A.

12. Annex D This provides a means of demonstrating compliance of a trailer by comparison with a previously approved trailer. This is particularly relevant to the use of Variants. The approved trailer must always have been approved on the basis of a complete submission of either: road test or calculation results, or because that trailer is certified as meeting ECE 13.

Comparison of a Variant with the base Model may be made at the same time as the application for approval for the base Model. In this case only one VSB34/3 will be required covering the base Model and the Variants.

Whenever a question in Part C is answered 'No' evidence must be submitted showing that the trailer still complies with ADR38. Some physical tests or additional calculations may be necessary to demonstrate this.

It is important to note that if a change is made to trailer category, Make, Gross Trailer Mass Rating or number of axles then a new Model designation and a new application is required.

13. Annex E This lists results of water performance tests. Physical tests are not required where the foundation brakes are the same as used on an approved sub-assembly or one of the manufacturer's previously approved trailers. In this case the results for that approval are used.

As Annex E is used for sub-assembly approvals it does not need to be completed for trailer approvals where compliance is demonstrated by calculation.

It is important to note that any change in friction materials requires an additional physical test.

The results from one physical test may be referred to in several applications providing that: either the results have been submitted previously; or that all the applications, including the one containing those results, are submitted together.

If a water performance laboratory test is to be made it must be approved prior to submitting test results. Refer to Circular No.38-1-6.

14. Annex F This lists results of time response tests. Time response tests are not required for full hydraulic brake systems. Physical tests are not required where the control system (either as a sub-assembly or as part of a trailer) to be approved is considered to be the same as the previously approved control system (either as a sub-assembly or as part of one of the manufacturer's trailers). Refer to Annex F, Part B. In this case test results for the approved control system are referred to in the same manner as described for Annex E above.



Where the control system is of a modular construction it is permissible (for time response purposes) to remove a complete module providing all the questions in Annex F Part B can still be answered 'Yes'. However it is important to bear in mind the other design requirements for the control system which are covered in other Annexes. In certain circumstances an answer of 'No' to a question in Part B may not require additional tests to be performed providing it is still possible to demonstrate that the modified system complies with respect to time response. For example, an answer of 'No' to question (ii) and an answer of 'Yes' to question (iii) indicates that the time response is unaltered or improved. In these cases a new Variant, at least, will be required.

As Annex F is used for sub-assembly approvals it does not need to be completed for trailer approvals where compliance is demonstrated by calculation:

15. Annex K Provides for trailers which are certified as meeting the requirements of ECE 13. If these trailers are fitted with variable proportioning valves (load proportioning) then, in addition to complying with ECE 13 it must be possible to hold these valves in the position corresponding to a laden trailer.
16. Annex M This lists details and calibration procedures for all test equipment used to perform tests. Laboratory generally includes test tracks.

Only one Annex M is required where several applications are submitted at the same time.