

Australian Motor Vehicle Certification Board

Comprising Commonwealth and State Authorities

CIRCULAR NO. 35A-2-1 **ADR 35A COMMERCIAL VEHICLE BRAKING SYSTEMS**

INTRODUCTION

1. ADR35A - Commercial Vehicle Braking Systems - requires that all motor vehicles, except passenger cars, motor cycles and vehicles in combination comply with the requirements of the Rule. The level of testing needed to establish compliance of every possible vehicle variant could be most extensive. Therefore, the Board has decided to accept braking tests based on grouping of vehicles and braking systems for the purpose of demonstrating compliance with ADR35A and the issue of Compliance Plate Approvals.
2. An implementation procedure is defined in the following which details the requirements for selection and testing of test vehicles for the purpose of demonstrating compliance of a range of vehicles. Also, limited additional tests are provided for the purpose of demonstrating compliance in the case of vehicles with minor variations in the braking system.
3. It will be the responsibility of vehicle manufacturers to ensure that every vehicle to which a Compliance Plate is affixed complies with the Design Rule.
4. The Australian Motor Vehicle Certification Board wishes to advise manufacturers that the vehicle selection procedure delineated in this Circular will be kept under review and may be amended. Any such amendments will be applicable to passenger car derivatives certified after 31 December 1980 and other vehicles certified after 30 June, 1980.

IMPLEMENTATION PROCEDURE

5. The Board requires that each unique braking system be demonstrated as complying with the requirements of the Design Rule.
6. Vehicles should be selected for testing purposes in accordance with the following criteria:
 - a. (i) Where the maximum laden vehicle speeds of all the vehicles in the range are less than 100 km/h, at least one test vehicle shall have the power train giving the highest maximum laden vehicle speed of all vehicles within the range.
 - (ii) Where the maximum laden vehicle speed of any vehicle in the range is 100 km/h or greater, at least one test vehicle shall have a power train giving a maximum laden vehicle speed of 100 km/h or greater.

(iii) Where the maximum interval between brake applications specified for the service brake fade test cannot be maintained by any vehicle within the range, at least one test vehicle shall have the power train which most nearly permits the specified maximum interval to be maintained.

(iv) Where the maximum interval between applications specified for the service brake fade test can be maintained by one or more vehicles within the range, at least one test vehicle shall have the power train giving the acceleration which most closely maintains the maximum interval between brake applications specified in Clause 35A.5.9.1 of the Design Rule.

Note: As an alternative to the application of the criterion specified in paragraph 6 (a) (iv) above, the test vehicle may be driven during the service brake fade test in such a way that the stabilising time at initial speed does not substantially exceed 10 seconds and the other provisions of Clause 35A.5.9 of the Rule are complied with.

- b. For tests conducted at maximum loaded test mass, each test vehicle shall have a test mass not less than the maximum loaded test mass of any vehicle within the range.
- c. Each test vehicle shall have tyres having nominal section width not exceeding the minimum nominal section width specified by the vehicle manufacturer relative to the gross vehicle mass rating of the test vehicle.
- d. For tests conducted at lightly loaded test mass, each test vehicle shall have a test mass not exceeding the lightly loaded test mass of any vehicle within the range.
- e. (i) Each test vehicle shall have a wheelbase not exceeding that of any vehicle within the range which satisfies the conditions of paragraph 10.1 (a),(b) and (d) above, except as in 10.1 (e) (ii) below.

(ii) In cases where the application of paragraph 10.1(e)(i) leads to the selection of test vehicles having the shortest wheelbase within the entire vehicle range, it shall be permissible to select instead, test vehicles having wheelbases which do not exceed the wheelbase of any vehicle in the entire vehicle range by more than 15%.

(iii) When the application of paragraph 6 (e) (i) above leads to the selection of test vehicles such that the wheelbases of all test vehicles exceed, by more than 15%, the wheelbase of the vehicle in the range having the shortest wheelbase, unless the Board otherwise agrees, an additional test vehicle shall be selected in accordance with paragraph 6 (e)(iii), and subjected to the tests specified therein.

(iv) Where the provisions of paragraph 6 (e) (ii) above require selection of an additional test vehicle, a test vehicle shall be selected which
 - has a wheelbase not exceeding the wheelbase of the vehicle in the range having the shortest wheelbase;
 - has a power train selected in accordance with the provisions of paragraph 6(a);
 - has a test mass not exceeding the lightly loaded test mass of each vehicle within the range when fitted with the engine selected for that test vehicle; and

- complies with paragraphs 6(c) and 11.1(c).

This vehicle shall be tested to Items 1, 2, 3, 4 and 5 of Tests and Procedures in accordance with the requirements of the Clause 35A.3.3 of the Rule.

7. To be considered as members of the same unique braking system, systems must have the same combination of components with similar physical and dimensional properties.
8. Any variation to the components of the braking system will constitute a different unique braking system, except for variations in:
 - a. length, diameter, material or routing of hydraulic, vacuum, or-air exhaust lines of electrical wiring included in the system;
 - b. location within the hydraulic, vacuum or air exhaust line of valves, fittings or other devices;
 - c. routing of air pressure lines included in the system;
 - d. the metallurgical constitution of the disc or drum material.
9. Each unique braking system shall be shown to comply with the requirements of the Design Rule for each relevant range of vehicles.
10. A vehicle will be considered to be representative of the one range of vehicles of the same category for the purpose of dynamic testing in accordance with the Design Rule if it is fitted with:
- 10.1 The body style with the most critical demonstrated influence on cooling air flow around the vehicle brakes, i.e. for
 - a. Passenger car derivatives: utility, panel van and cab chassis may be regarded as equivalent in influence on brake cooling air flow, except that items which may restrict brake cooling air flow may require separate testing to determine their effect on brake performance. Such items may include:
 - i. front air dams or spoilers;
 - ii. wheel opening flares;
 - iii. air ducts;
 - iv. functional louvres; and
 - v. wheel houses providing for less air flow area around the brake than those on the vehicle selected for test.

b. Other Vehicles:

Conventional cab, forward control cab, island cab, crew cab, van and bus bodies can be regarded as equivalent in influence on brake cooling air flow, except that items which may restrict brake cooling air flow may be fitted to the test vehicle or may be tested separately to determine their effect on brake performance. Such items may include:

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- i. Wheel house envelope configurations with minimum clearances as specified by the initial vehicle manufacturer; and
- ii. air ducts.

10.2 The same suspension configuration.

Note: It is apparent that in some instances the provision of this paragraph might not be sufficiently specific to meet the requirements of individual manufacturers. When such circumstances arise, it is recommended that the manufacturer should approach the Board for advice.

11. Testing of braking systems for the purposes of demonstration of compliance with the Design Rule shall be conducted on vehicles representative of the least favoured members of a vehicle range.

11.1 In addition to the above requirements, each test vehicle shall have:

- a. Wheels having a vent area not exceeding that of any other wheels:
 - i. available within the range specified by the initial vehicle manufacturer relative to the gross vehicle mass rating of the test vehicle, and
 - ii. fitted with ornamentation, if applicable.
- b. Wheel house envelope configurations with the minimum wheel and tyre clearances specified by the initial vehicle manufacturer using the wheel and tyres selected by the application of paragraphs 6 (c) and 11.1 (a) above, unless information can be provided in accordance with paragraph 10.1 (b) which demonstrates that wheel house configuration does not affect braking performance.
- c. An energy reservoir capacity, where applicable, not exceeding that of any other vehicle within the range.
- d. In the case of passenger car derivatives, automatic transmission, when available, subject to the requirements of paragraph 6 (a) (d) and (e) above. In the case of other vehicles, subject to the requirements of paragraph 6(a), (b), (d) and (e), the transmission shall be selected by the manufacturer from those available.

11.2 For static actuating time and energy reservoir recovery tests, the test vehicle or installation shall have:

- a. Brake pipe lengths not less than those of the longest wheel base vehicle within the range;
- b. Brake pipe internal diameters not greater than those of the corresponding pipes having the smallest internal diameters of each vehicle in the range;
- c. An energy generating device which generates energy at a rate and to a level not exceeding those of the lowest rated device specified by the vehicle manufacturer for each vehicle in the range; and
- d. An energy reservoir capacity not less than that of each other vehicle within the range.

Variant of a Unique Braking System

12. Where a braking system differs from another, it may, under the circumstances set out below, be regarded as a variant for the purposes of testing, and shall be tested as detailed in the following paragraphs.

A variant of a braking system is one which differs only in one or more of the following components:

- a. The parking brake system;
- b. The brake power unit or brake power assist unit;
- c. The anti-lock system, variable proportioning components or pressure proportioning components;
- d. The length and/or internal diameter of air pressure lines from the reservoir nearest the control, to the brake chamber furthest from the control, and provision within such an air pressure line of valves, fittings or other devices; and
- e. The suspension configuration where it is not possible to demonstrate to the Board's satisfaction that the most critical suspension system can be identified.

Where a manufacturer considers that a braking system is a variant of another braking system, but the case is not covered by the above provisions, it is recommended that he approach the Board for advice.

13. Each variation from the unique braking system tested shall be subject to those Design Rule tests which are relevant to the particular portion of the braking system changed.

Tests to be conducted on the variant of a unique braking system shall be as follows:

- a. In the case of a different parking brake system – Items 1, 2, and 16, as specified in the Tests and Procedures of Clause 35A.3.3 of the Rule;
- b. In the case of a variation in the brake, power unit, or brake power assist unit, the test vehicle shall be tested to Items 1, 2, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, 15 and 17, as specified in the Tests and Procedures of Clause 35A.3.3 of the Rule.

Note:

Notwithstanding the foregoing, if it can be demonstrated to the satisfaction of the Board that a variation in the brake power unit or brake power assist unit will not adversely affect the braking performance of the variant in comparison to that of the vehicle fitted with the original system so far as any of the Items 9, 10, 11, 12, 13, 14 and 15 are concerned, then tests may not be required on those Items for which such demonstration is made.

- c. In the case of a change in an anti-lock system, variable proportioning system or pressure proportioning system, the test vehicle shall be tested to Items 1, 2, 3, 4, 5, 6, 7, 8 and 17, as specified in the Tests and Procedures of Clause 35A.3.3 of the Rule;
- d. In the case of variation in the air pressure lines as described in paragraph 12(d), the test vehicle or installation shall be tested to Items 1, 2 and 17 as specified in the Tests and Procedures of Clause 35A.3.3 of the Rule.

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14. For other unique braking systems where it can be proved to the satisfaction of the Board by engineering analysis, laboratory testing or vehicle testing, that a particular braking system will give the most adverse braking performance, the only that unique braking system need be tested.
15. Each vehicle manufacturer shall submit, as part of his ADR 35A Submissions, specifications and performance data of his range of vehicles and his test vehicle fleet which represent that range. It will be the responsibility of the manufacturer to demonstrate that compliance with the requirements of this Circular has been achieved and that the test vehicles are representative within the terms of the foregoing criteria for those vehicles for which approval is sought. Prior approval of the test vehicle fleet will not normally be given.
16. The Board reserves the right to include any vehicle or group of vehicles into the test fleet which it considers requires testing, to demonstrate compliance of the range of vehicles-and its braking system. It is appreciated that in some instances the provisions of this Circular may not be sufficiently specific to meet the needs of the manufacturer. Where such circumstances arise, it is recommended that the manufacturer should approach the Board for advice.