23rd February 2026

Vehicle Standards Section, Vehicle Safety Policy and Partnerships Branch
Department of Infrastructure, Transport, Regional Development, Communication, Sport and the Arts
GPO Box 594 Canberra 2601
VIA EMAIL

Re: Supplementary Information - ADR 38/05 – further harmonization of system requirements with UN ECE R-13

To the Department of Infrastructure, Transport, Regional Development, Communication, Sport and the Arts

In support of our previous submission(s) dated the 6th November 2025 and 8th November 2024 (See Appendix B and C) regarding the request for further ADR harmonisation with UNECE R13; we have prepared some additional information. This information provides assurance that this change will not further widen the gap between ADR and UNECE or create an unintended consequence elsewhere in the ADR or to existing trailers in the field. The request is essentially to change the current ADR 38/05 wording in clause 6.6 from:

Current
6.6 The *'Brake System'* must be designed so that no single failure in a *'Brake Device'* in the *'Service Brake System'*, except of a *'Supply Line'* or *'Control Line'*, shall cause the *'Brakes'* to apply without a *'Control Signal'* provided by the towing vehicle.

Proposed
6.6. The *'Brake System'* must be designed so that no single failure in a *'Brake Device'* in the *'Service Brake System'*, except of a *'Supply Line', 'Control Line'* **or a failure of the *'Stored Energy'***, shall cause the *'Brakes'* to apply without a *'Control Signal'* provided by the towing vehicle.
6.6.1. In the event of a failure of the 'Stored Energy', an automatic application of the 'Brakes' must not occur before the service tank pressure falls below 0.49 'E' (318.5 kPa).

Please refer to Table 1 (Appendix A) which constitutes a gap analysis between ADR 38/05 and UNECE R13 Requirements regarding Braking Reservoirs.

I note that this request has unilateral support of the three largest heavy vehicle brake system suppliers in Australia, being SAF-Holland Haldex, Knorr-Bremse, and ZF Wabco, as well as Australia's leading brake system installers, certifiers and engineers (Air Brake Systems, Air Brake Corporation, and Transport Engineering Solutions, BPW Transpec and Transport Equipment Australia).

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We are keen to see a timely resolution as the matter has now been standing for several years. This resolution will save industry and end-users unnecessary cost and allow additional features of the trailer electronic brake systems (such as the park brake function) to be used.

Following your reading of this letter and associated supporting information, we request a meeting to discuss this topic further and what the next steps are to resolve this. Thank you for considering this proposal and continuing to engage with us on this topic.

Yours Sincerely,

RACHEL MICHAUD
CHIEF ENGINEER

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Appendix A

Table 1. Gap analysis of UN Regulation vs Australian Design Rules with respect to requirements regarding Braking Reservoirs

Concept	Requirements ADR 38/05	UNECE R13 (Rev?)
1. Pressure protection for the service braking system	ADR 38/05 clause 6.15 - requires brake system to be prioritized over auxiliary systems *6.15. The first call on the 'Stored Energy' must be that of the 'Brake System'. Any other demand for 'Stored Energy' must be disconnected automatically if the 'Stored Energy' level falls below 0.69 'E' (450 kPa).* (very similar - ADR says 4.5bar, ECE says 5.2 bar)	The pressure protection concept ensures priority of the service braking system over the supply of auxiliary systems on the Trailer. *Where the auxiliary equipment is supplied with energy from the service braking system, the service braking system shall be protected to ensure that the sum of the braking forces exerted at the periphery of the wheels shall be at least 80 percent of the value prescribed for the relevant trailer as defined in Paragraph 3.1.2.1. of Annex 4 to this Regulation. This requirement shall be fulfilled under both of the following operating conditions: During operation of the auxiliary equipment, and in the event of breakage or leakage from the auxiliary equipment, unless such breakage or leakage affects the control signal referred to in Paragraph 6. to Annex 10 to this Regulation, in which case the performance requirements of that Paragraph shall apply*. Ie. 6.5 * 0.8 = 5.2 Bar
2. Energy consumption requirements	ADR 38/05 clause 7.1.3 – ADR requires minimum system tank capacity *7.1.3. The combined total energy capacity of energy storage devices incorporated into the 'Service Brake System' must be not less than 8 times the combined maximum energy capacity of the service brakes actuating devices.* Note: Future work is recommended to review the ADR requirement which essentially mandates 24L per axle and does not explicitly state the auxiliary systems must have own air supply. In Europe rather than a static figure being used, an	The ECE R13 then defines different energy consumption tests for the evaluation of the sufficient energy storage capacity of the Trailer. • Anti-lock energy consumption • Spring brake energy consumption • Application of the spring brakes after the application of the service brake system • Capacity of service braking reservoir The Anti-lock energy consumption (Annex 20, §7.3)(See Appendix C) simulates a 15s ABS event which would draw significant amount of energy from the energy storage. At the end the remaining pressure level needs to be

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	energy consumption test is carried out to factor in the Anti-lock braking system air usage. It is known that many TEBS fault reports show low air pressure whilst moving faults which requires further investigation to determine. 1. Is there enough air storage for braking on trailers and 2. Is more explicit direction required to specify a minimum additional air requirement for auxiliaries' systems such as suspensions. This work will be looked at by HVIA in future submissions and should not delay the progress of this request.	sufficient to still produce 22.5% braking rate. In addition no automatic application of any braking system would be allowed (spring brakes). The spring brake energy consumption (Annex 8, §2.4) covers the requirement that it needs to be possible to release the spring brakes at least three times after the Trailer has been uncoupled. After the third release it still needs to be possible to rotate the wheels equipped with spring brakes. With the test of the *"Application of the spring brakes after the application of the service brake system"* (Annex 8, §2.5) it shall be ensured that some extensive usage of the service braking system by the driver will not end up in an unwanted brake application of the spring brakes. The last point regarding the Capacity of the service braking reservoir (Annex 7, §1.3) compares the pressure in the reservoir at the first brake application with the available remaining pressure at the ninth brake application and at the pressure at the end shall not be less than 50% of the pressure at the first application.
Concept 3. Low Energy warnings	ADR 38/05 Appendix 4 - requires warning light wiring (PIN5) to warn driver of low air pressure on ABS and RSP equipped trailer. *Appendix 4, 1.2 Each ISO 7638 connector[2] must be wired to have the following functions:* *Contact 1 +ve high current trailer solenoid valve supply;* *Contact 2 +ve low current trailer electronic unit supply;* *Contact 3 -ve low current trailer electronic unit supply;* *Contact 4 -ve high current trailer solenoid valve supply; and* *Contact 5 trailer warning signal, switched to -ve (e.g. contact 3 or contact 4) upon fault detection as well as for the signal check required by clause 1.4 below.* All TEBS modules in Australia have capability to detect and send a low air pressure warning via PIN 5 to the towing vehicle to alert the driver.	The next topic relates to a drop of the reservoir pressure during driving: ECE R13 sets out the following requirements in 5.2.2.16: *5.2.2.16 When the stored energy in any part of the service braking system of a trailer equipped with an electric control line and electrically connected to a towing vehicle with an electronic control line falls to the value determined in accordance with Paragraph 5.2.2.16.1. below, a warning shall be provided to the driver of the towing vehicle. The warning shall be provided by activation of the red signal specified in Paragraph 5.2.1.29.2.1. and the trailer shall provide the failure information via the data communication part of the electric control line. The separate yellow warning signal specified in Paragraph 5.2.1.29.2. shall also be activated via pin 5 of the electrical connector conforming to ISO 7638:2003 [14]/, to indicate to the driver that the low-energy situation is on the trailer.* *5.2.2.16.1. The low energy value referred to in Paragraph 5.2.2.16. above shall be that at which, without re-charging of the energy reservoir and irrespective of the load condition of the trailer, it is not possible to apply the*

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	Existing conventional trailers would require an SR-2 anyway, so this is irrelevant to trailers which are exempt to Appendix 4. Conventional trailers will not provide low air warnings to the towing unit. All current trailers meeting ADR 38/05 as it will meet the following requirement: *'6.6.1. In the event of a failure of the 'Stored Energy', an automatic application of the 'Brakes' must not occur before the service tank pressure falls below 0.435 'E' (283 kPa)'* as they will not automatically apply the brakes in the event of a tank failure at all.	*service braking control a fifth time after four full-stroke actuations and obtain at least 50 per cent of the prescribed performance of the service braking system of the relevant trailer*. The respective pressure level that is being used to cover the above requirement is 4,5bar for all braking system suppliers (ZF Wabco, Haldex and Knorr-Bremse). All the points so far have had the purpose to secure a certain pressure level in the service braking reservoir so that no unwanted brake application would occur during extensive usage of the braking system. At the same time the remaining pressure level, even in the case of no pressure supply from the Truck, shall be sufficient to support a reasonable stopping distance.
Concept 4. Supply Line failure	ADR 38/05 clause 9.4 – Both ADR and ECE allow the trailer brakes to apply in the event of a supply line failure, typically indicating a trailer break away scenario. *9.4. The parking brake must operate when the 'Supply Line' energy level drops below 0.24 'E' (155 kPa). The provisions of clause 9.3 do not apply to the auxiliary release mechanism required by clause 8.4 but the other provisions of clause 8.4 must apply.* *8.4. 'Emergency Brake Systems' that employ 'Stored Fluid Energy' to hold them in the release position must be provided with an auxiliary release mechanism. The auxiliary device, control or tool, may rely on fluid energy stored within the trailer brake system, and must be attached to the trailer chassis rail, or equivalent structure, forward of the forward most 'Axle' on the rear 'Axle Group' on the right hand side of the trailer.* *8.4.1 If the auxiliary device utilises stored energy then, with the energy storage devices initially charged to 1.0 'E' the release system must have sufficient reserve to provide at least*	The first relevant requirements can be found in the Motor vehicle section of the ECE R13, as follows: *5.2.1.18.3. in the event of a failure (e.g. breakage of or leak) in one of the pneumatic connecting lines, interruption or defect in the electric control line, it shall nevertheless be possible for the driver, fully or partially, to actuate the brakes of the trailer by means either of the service braking control or of the secondary braking control or of the parking braking control, unless the failure automatically causes the trailer to be braked with the performance prescribed in Paragraph 3.3. of Annex 4 to this Regulation.* *5.2.1.18.4. the automatic braking in Paragraph 5.2.1.18.3. above shall be considered to be met when the following conditions are fulfilled:* *5.2.1.18.4.1. when the designated brake control of the controls mentioned in Paragraph 5.2.1.18.3. above, is fully actuated, the pressure in the supply line must fall to 150 kPa (1.5 bar) within the following two seconds; in addition, when the brake control is released, the supply line shall be re-pressurised.* *5.2.1.18.4.2. when the supply line is evacuated at the rate of at least 100 kPa (1 bar) per second the automatic braking of the trailer must start to operate before the pressure in the supply line falls to 200 kPa (2 bar).*

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	3 applications and releases of the 'Emergency Brake System' when the towing vehicle is disconnected.	The §§ 5.2.1.18.3 & 4 introduce a requirement that shall ensure the Trailer to be braked in case of a failure in one of the connecting lines. The state-of-the-art implementation uses a functionality within the Trailer Control Valve that dumps the supply line to the Trailer in case of a breakage or leak in the Trailer control line. Within the Trailer section of the ECE R13 another paragraph is using the same logic: *5.2.2.9. The braking systems must be such that the trailer is stopped automatically if the coupling separates while the trailer is in motion.* For a standard setup of a Trailer in Europe. The park & shunt valve (Pos 1) ensures that when the supply line is uncoupled or evacuated that the port "43" of the TEBS is evacuated. The valve behind that port (Pos 2) will then switch and therefore exhaust the spring brake (connected to port "23") internally. Inside the park & shunt valve there is a single check valve which ensures that when the Trailer gets uncoupled or the supply line evacuated to protect the tank from getting drained. In case of a tank failure the connecting line between the park & shunt valve and the TEBS port "43" will also get exhausted so that the vehicle will automatically be braked.
Concept 5. Reservoir Failure	<u>Current</u> 6.6 The *'Brake System'* must be designed so that no single failure in a *'Brake Device'* in the *'Service Brake System'*, except of a *'Supply Line'* or *'Control Line'*, shall cause the *'Brakes'* to apply without a *'Control Signal'* provided by the towing vehicle. <u>Proposed</u> 6.6. The *'Brake System'* must be designed so that no single failure in a *'Brake Device'* in the *'Service Brake System'*, except of a *'Supply Line', 'Control Line'* **or a failure of the *'Stored***	This request aims to further align with EU, by making an ADR 38 requirement which is not found in ECE R13 optional. We can't align with EU 100%, as there is no like-for-like clause in R13. ECE R13 does not prohibit automatic brake application after tank failure like ADR38 does, however it does not mandate this behaviour either. As extra valving is required in the system to prevent the automatic application of spring brakes when you lose tank pressure, by default the European systems will exhaust the supply line and therefore the spring brakes when the tanks are failed as there is no requirement for them to do otherwise, and this setup results in less valves/parts in the system.

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	Energy', shall cause the *'Brakes'* to apply without a *'Control Signal'* provided by the towing vehicle. **6.6.1. In the event of a failure of the 'Stored Energy', an automatic application of the 'Brakes' must not occur before the service tank pressure falls below 0.49 'E' (318.5 kPa).** To align with ECE R13 Annex 8. Pressure has been increased by ≈40kPa to allow for valve switching pressure tolerance. Ie. A valve designed to 2.8Bar, may still deliver 3.1 Bar switching pressure due to typical manufacturing tolerance.	The proposal is worded such that automatic application of brakes is allowed if the tank fails but not required. Therefore, existing systems will remain compliant, as are trailers imported from Europe which have R13 compliance. *ECE R13 Annex 8* *2.8. Trailers which utilise the service braking system energy reserves to fulfil the requirements for the automatic brake as defined in paragraph 3.3 of Annex 4 shall also fulfil one of the following requirements when the trailer is uncoupled from the towing vehicle and the trailer park brake control is in the released position (spring brakes not applied):* *(a) When the energy reserves of the service braking system reduce to a pressure no lower than 280 kPa the pressure in the spring brake compression chamber shall reduce to 0 kPa to fully apply the spring brakes. This requirement shall be verified with a constant service braking system energy reserve pressure of 280 kPa;* *(b) A reduction in the pressure within the service braking system energy reserve results in a corresponding reduction in the pressure in the spring compression chamber.*

Note: The ECE vs ADR analysis information utilised in this table was provided by Technical Expert Stefan Pahl, Knorr-Bremse AG, Germany (Concept 1 – 4). Information regarding a proposed spring brake 'do not' apply zone (Clause 6.6.1) to further align with ECE was provided by Graham Borthwick, Air Brake Systems Australia. Wording for final ADR amendments as well as explanation around why we cannot simply use ECE clauses directly, provided by Alex Biviano & Brett Nicoll, Knorr-Bremse Australia. (Concept 5) and HVIA thanks all these braking experts, as well as all members for their contribution to this submission.

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Appendix B – Previous Submission 2025 Re: ADR 38/05 – further harmonization of system requirements with UN ECE R-13

6th November 2025

Vehicle Standards Section, Vehicle Safety Policy and Partnerships Branch
Department of Infrastructure, Transport, Regional Development, Communication, Sport and the Arts
GPO Box 594 Canberra 2601
VIA EMAIL

RE: ADR 38/05 – further harmonization of testing requirements with UN ECE R-13

This letter continues earlier discussions between HVIA and the Department regarding changes to ADR 38/05, which were initiated via HVIA in a letter to Timothy Hicks, on 8 November 2024. That original letter is attached here, for reference.

Following that letter, an online meeting with the Department and some of HVIA's members was held on 28 March 2025. In that meeting, the Department outlined additional information that it sought, which included:

1. *an explanation of the need for the change, encompassing what has changed on the technology side, and why compliance with the ECE in full isn't the right pathway*
2. *an outline of the unintended impacts of the proposed change to the ADR (i.e. the addition of an extra clause)*
3. *an outline of the cost/impacts of not making the change*
4. *an explanation of the specific benefits that the change will allow.*

HVIA is pleased to offer the following notes relevant to the Department's questions:

1. It is noted that UN ECE R-13 is already an acceptable alternative standard as per Clause 23.1 of ADR 38/05. Notwithstanding, a local pathway to comply with the requirements of the ADR 'in full' is required, hence the need to add the ECE clause as an alternative to the ADR clause. It is not clear why most of a control system CTA application should be fully compliant to ADR 38/05 but for a single reference to compliance with ECE R-13. HVIA recommends the Department accept the requested change to primarily take full advantage of the safety benefits provided by the latest-generation brake system technology available alongside the other points originally listed. The latest generation braking systems include features that render the ADR mandate to fit additional pressure valves obsolete, while simultaneously adding additional functions that improve safety in emergency braking scenarios.
2. Given that an imported ECE compliant trailer can enter the Australian market under the current regulations, and operate with the same functional characteristics in the case of an air pressure tank failure, HVIA and its members do not believe there are any unintended impacts of the proposed changes.
3. Under current regulations, compliant trailers built to meet ADR 38/05 suffer a cost impact due to the need to fit an additional valve and air line plumbing. Specifically, Knorr-Bremse

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(Bendix) are an original equipment manufacturer of that valve, which is made specifically for Australia. Due to the smaller Australian market and the valve reaching its end of life, the cost of the valve is significant. Under the proposal, the valve could be eliminated, saving industry and end-users unnecessary cost, and allowing additional features of the trailer electronic brake systems (such as the park brake function) to be used.

4. As above, the proposal will allow the full use the electronic brake system valves with its intended functions, alongside elimination of cost brought about by additional valving/plumbing. The safety benefits include elimination of the potential for an unexpected loss of trailer air system pressure being un-noticed by the driver, until the service brakes are applied.

I would also like to offer a clarification to the original request, which may have caused some confusion. HVIA originally requested an alternative to Clause 6.6, however on review, an amendment to it will achieve the desired outcome. That amendment is to allow a failure of the stored energy to cause an automatic application of the brakes. Currently, Clause 6.6 prohibits automatic application of the brakes, except following failures in the supply or control lines.

The suggested wording could appear as follows: ADR 38/0X

6.6. The *'Brake System'* must be designed so that no single failure in a *'Brake Device'* in the *'Service Brake System'*, except of a *'Supply Line'*, *'Control Line'* or a failure of the *'Stored Energy'*, shall cause the *'Brakes'* to apply without a *'Control Signal'* provided by the towing vehicle.

6.6.1. In the event of a failure of the '*Stored Energy*', an automatic application of the '*Brakes*' must not occur before the service tank pressure falls below 0.435 *'E'* (283 kPa).

I note that this request has unilateral support of the three largest heavy vehicle brake system suppliers in Australia, being SAF-Holland Haldex, Knorr-Bremse, and ZF Wabco, as well as Australia's leading brake system installers, certifiers and engineers (Air Brake Systems, Air Brake Corporation, and Transport Engineering Solutions, BPW Transpec and Transport Equipment Australia).

I welcome the opportunity to discuss this further, please do not hesitate to contact me.

Yours sincerely,

Adam Ritzinger

Adam Ritzinger
CHIEF TECHNICAL OFFICER

Encl.

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Appendix C – Previous Submission 2024 - ADR 38/05 – further harmonization of system requirements with UN ECE R-13

8 November 2024

Department of Infrastructure, Transport, Regional Development, Communication, and the Arts
GPO Box 594 Canberra 2601
VIA EMAIL

RE: ADR 38/05 – further harmonization of testing requirements with UN ECE R-13

I write to bring an important issue regarding Australian Design Rule 38/05 to your attention. One of its clauses is not well-aligned to its international regulatory equivalent, and it does not suit the next generation of trailer Electronic Braking Systems (EBS) that will be supplied to our local market.

The clause in question is Clause 6.6. It states that: *"the 'Brake System' must be designed so that no single failure in a 'Brake Device' in the 'Service Brake System', except of a 'Supply Line' or 'Control Line', shall cause the 'Brakes' to apply without a 'Control Signal' provided by the towing vehicle."*

The clause is a 'brake application prevention' clause. It prevents the brakes from applying in some circumstances of brake system pressure loss, unless applied by the driver. It is currently met via the addition of a pressure valve to the brake system.

An equivalent clause appears in UN ECE R-13, attached for reference. The ECE clause is a 'brake application requirement' clause. It ensures that the brake system automatically applies when the system pressure falls below 40 psi (280 kPa).

The requirements of the ECE are considered to deliver a superior level of safety when compared against the ADR. Principally, an ADR compliant trailer can lose all stored air required to apply the service brakes, and the driver can be unaware of this until needing to apply the brakes. Additionally, an ADR compliant trailer could demonstrate wheel lock-up on application of the brakes in some loss of pressure scenarios.

Despite this, systems complying with the ECE would need an additional pressure valve added to comply with the ADR. This includes the next generation of trailer (EBS that will be supplied to our local market. Fitment of that valve is considered unnecessary, as the other functions of ECE compliant systems ensure safety in loss of pressure scenarios. Those new systems also include additional functions that improve safety in emergency braking scenarios.

As such, HVIA requests that compliance with Paragraph 2.8 of Annex 8 of UN ECE R-13 be considered as a 'fully compliant' alternative to Clause 6.6 of ADR 38/05, and a formal change to ADR 38/05 be enacted.

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It is noted that UN ECE R-13 is already an acceptable alternative standard as per Clause 23.1 of ADR 38/05. Trailers complying with the ECE are already available in the market. Notwithstanding, a local pathway to comply with the requirements of the ADR 'in full' is required, hence the need to add the ECE clause as an alternative to the ADR clause.

I note that this request has unilateral support of the three largest heavy vehicle brake system suppliers in Australia, being SAF-Holland Haldex, Knorr-Bremse, and ZF Wabco, as well as Australia's leading brake system installers, certifiers and engineers (Air Brake Systems, Air Brake Corporation, Transport Engineering Solutions, and Bisiteknics).

Yours sincerely,

Adam Ritzinger
CHIEF TECHNICAL OFFICER

Encl.

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Appendix C – Clauses from UNECE R13 Revision 9 (2023) relating to Table 1. Concept 2.

Annex 20, 7.3 - 9.1.9

7.3. Verification of reservoir capacity

7.3.1. As the range of braking systems and auxiliary equipment used on trailers is diverse it is not possible to have a table of recommended reservoir capacities. To verify that adequate storage capacity is installed, testing may be conducted according to paragraph 6.1. of Annex 13 to this Regulation or by the procedure defined below:

7.3.1.1. In the case of brakes with non-integrated brake wear adjustment the brakes on the subject trailer shall be set to a condition where the relationship (R_l) of brake chamber push rod travel (S_T) against lever length (l_T) is 0.2.

Example:

l_t = 130 mm

R_e = $S_T/l_T = s_T/130 = 0.2$

S_T = Push rod travel at 650 kPa brake chamber pressure

= 130 x 0.2 = 26 mm

7.3.1.2. In the case of brakes with integrated automatic brake wear adjustment the brakes shall be set to a normal running clearance.

7.3.1.3. Setting of the brakes as defined above shall be carried out when the brakes are cold (≤ 100 °C).

7.3.1.4. With the brakes adjusted according to relevant procedure defined above and the load sensing device(s) set to the laden condition and the initial energy level set in accordance with paragraph 5.4.1.2.4.2. of Annex 19 - Part 1 to

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this Regulation, the energy storage device(s) shall be isolated from further supply. The brakes shall be applied with a control pressure of 650 kPa at the coupling head and then fully released. Further brake applications shall be made up to the number n_e determined from the test conducted in accordance with paragraph 5.4.1.2.4.2. of Annex 19 to this Regulation and defined in paragraph 2.5. of the anti-lock braking system approval report. During this application, the pressure in the operating circuit shall be sufficient to provide a total braking force at the periphery of the wheels equal to not less than 22.5 per cent of the maximum stationary wheel load and without causing automatic application of any braking system not under the control of the anti-lock braking system.

7.4. Trailers with more than 3 axles may utilize the Annex 19 ABS test report provided the following conditions are fulfilled:

7.4.1. Irrespective of trailer type at least one third of the axles in an axle group shall have all wheels directly controlled, with the wheels on the remaining axles being indirectly controlled[1].

7.4.2. Utilization of Adhesion: The minimum utilization of adhesion specified within paragraph 6.2. of Annex 13 to this Regulation is deemed to be achieved when following conditions are fulfilled:

7.4.2.1. The relationship of the number of wheels directly or indirectly controlled by one or more pressure modulators and the location of the directly controlled wheels within the axle group shall correspond to those defined within paragraph 2.2. of the Information Document referred to in paragraph 5.2. of Annex 19 - Part 1 to this Regulation;

7.4.2.2. The utilization of adhesion of the installed configuration is shown in the test report as meeting the requirements of paragraph 6.2. of Annex 13 to this Regulation.

7.4.3. Energy Consumption: The number of equivalent static brake applications defined within paragraph 2.5. of the test report may be used in conjunction with the verification procedure of paragraph 7.3. of this annex . Alternatively the test procedure specified within paragraph 6.1. of Annex 13 to this Regulation may be used;

7.4.4. Low speed performance: Additional verification is not required;

7.4.5. High speed performance: Additional verification is not required;

7.4.6. Category A performance: The split friction requirements specified within paragraph 6.3.2. of Annex 13 to this Regulation are deemed to be fulfilled when the number of wheels which are subject to independent left/right control is equal to or greater than the number of wheels controlled using "select low" axle control;

7.4.7. Surface transition performance: Additional verification not required;

7.4.8. Installation limitations: in all cases the following limitations shall apply:

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[1] When the number of axle(s) in an axle group is divided by 3 and the resulting number is less than 1, at least one axle shall be directly controlled. When the number of axles in the axle group is divided by 3 and the resulting number is not a whole number, a further axle shall be directly controlled in addition to the number of axles indicated by the whole number value.

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7.4.8.1. Any installation limitations defined within items 2.1. to 2.7. of the Information Document referred to in paragraph 5.2. of Annex 19 - Part 1 to this Regulation shall apply;

7.4.8.2. Only products identified and referenced in the information document and test report may be installed;

7.4.8.3. The maximum delivery volume controlled by each pressure modulator shall not exceed the volume specified within paragraph 3.3. of the information document;

7.4.8.4. An axle with directly controlled wheels may only be lifted when any axle which is indirectly controlled from this direct controlled axle is lifted in parallel;

7.4.8.5. All other installation limitations specified within paragraph 4. of the test report shall apply.

8. Alternative procedure for demonstrating the performance of a trailer equipped with a vehicle stability function.

8.1. Evaluation of a trailer in accordance with paragraph 2. of Annex 21 to this Regulation may be waived at the time of trailer type approval provided that the vehicle stability function complies with the relevant requirements of Annex 19 to this Regulation.

8.2. Verification

8.2.1. Verification of components and installation

The specification of the braking system, in which the stability control function is integrated and installed on the trailer to be type approved shall be verified by satisfying each of the following criteria:

	Condition	*Criteria*
8.2.1.1.	(a) Sensor(s)	No change allowed
	(b) Controller(s)	No change allowed
	(c) Modulator(s)	No change allowed
8.2.1.2.	Trailer types as defined in the test report	No change allowed
8.2.1.3.	Installation configurations as defined in the test report	No change allowed
8.2.1.4.	For other limitations refer to paragraph 4. of the test report as described in Appendix 8 to Annex 19 to this Regulation.	No change allowed

9. Functional and installation checks

9.1. The Technical Service/Type Approval Authority shall carry out functional and installation checks covering the following paragraphs:

9.1.1. Anti-lock function

9.1.1.1. This shall be limited to a dynamic check of the anti-lock braking system. To ensure full cycling it may be necessary to adjust the load sensing device or utilize a surface having a low tyre to road adhesion. If the anti-lock system does not have an Annex 19 approval, the trailer shall be tested in accordance

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with Annex 13 and comply with the relevant requirements contained in that annex.

9.1.2. Response time measurement

9.1.2.1. The Technical Service shall verify that the subject trailer conforms to the requirements of Annex 6.

9.1.3. Static energy consumption

9.1.3.1. The Technical Service shall verify that the subject trailer conforms to the requirements of Annex 7 and Annex 8 as appropriate.

9.1.4. Service brake function

9.1.4.1. The Technical Service shall verify that there are no abnormal vibrations during braking.

9.1.5. Parking brake function

9.1.5.1. The Technical Service shall apply and release the park brake to ensure correct function.

9.1.6. Emergency/automatic braking function

9.1.6.1. The Technical Service shall verify that the subject trailer complies with the requirements of paragraph 5.2.1.18.4.2. of this Regulation.

9.1.7. Vehicle and component identification verification

9.1.7.1. The Technical Service shall check the subject trailer against the details contained in the type approval certificate.

9.1.8. Vehicle stability function

9.1.8.1. For practical reasons verification of the vehicle stability function shall be limited to an installation check as defined in paragraph 8.2. above and observation of the correct warning signal sequence to ensure no faults are present.

9.1.9. Additional checks

9.1.9.1. The Technical Service may request additional checks to be carried out, if necessary.

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Annex 8, 2.4 – 2.5

service braking control.

2.4. In power-driven vehicles, the system shall be so designed that it is possible to apply and release the brakes at least three times if the initial pressure in the spring compression chamber is equal to the maximum design pressure. In the case of trailers, it shall be possible to release the brakes at least three times after the trailer has been uncoupled, the pressure in the supply line being 750 kPa before the uncoupling. However, prior to the check the emergency brake shall be released. These conditions shall be satisfied when the brakes are adjusted as closely as possible. In addition, it shall be possible to apply and release the parking braking system as specified in paragraph 5.2.2.10. of this Regulation when the trailer is coupled to the towing vehicle.

2.5. For power-driven vehicles, the pressure in the spring compression chamber beyond which the springs begin to actuate the brakes, the latter being adjusted as closely as possible, shall not be greater than 80 per cent of the minimum level of the normal available pressure.

In the case of trailers, the pressure in the spring compression chamber beyond which the springs begin to actuate the brakes shall not be greater than that obtained after four full-stroke actuations of the service braking system in accordance with paragraph 1.3 of Part A of Annex 7 to this Regulation. The initial pressure is fixed at 700 kPa.

Annex 7, 1.3 – 1.3.3

1.3. Trailers

1.3.1. The energy storage devices (energy reservoirs) with which trailers are equipped shall be such that, after eight full-stroke actuations of the towing vehicle's service braking system, the energy level supplied to the operating members using the energy obtained at the additional (ninth) actuation of the towing vehicle's service braking system, does not fall below a level equivalent to one-half of the figure obtained at the first brake application and without actuating either the automatic or the parking braking system of the trailer.

1.3.2. Testing shall be performed in conformity with the following requirements:

1.3.2.1. The pressure in the energy storage devices at the beginning of each test shall be 850 kPa;

1.3.2.2. The supply line shall be stopped; in addition, any energy storage device(s) for auxiliary equipment shall be isolated;

1.3.2.3. The energy storage devices shall not be replenished during the test;

1.3.2.4. At each brake application, the pressure in the pneumatic control line shall be 750 kPa;

1.3.2.5. At each brake application, the digital demand value in the electric control line shall be corresponding to a pressure of 750 kPa.

1.3.3. In the case of towing trailers, the test defined in paragraph 1.3.2. above shall be carried out with rear supply line stopped and a compressed air reservoir of 0.5 litre capacity shall be connected directly to the rear coupling head of the pneumatic control line. Before each braking operation, the pressure in this compressed-air reservoir shall be completely eliminated. After the test referred to in paragraph 1.3.1. above, the energy level supplied to the rear pneumatic control line shall not fall below a level equivalent to one-half the figure obtained at the first brake application.

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