

PROPOSAL FOR AMENDMENTS TO THE DRAFT OF GLOBAL TECHNICAL
REGULATION ON MOTORCYCLE BRAKE SYSTEMS
(Braking)

Note: The text reproduced below was prepared by the expert from Germany.

This proposal refers to the draft GTR on motorcycle brake systems (ECE/TRANS/WP.29/2006/77) submitted by the Chairman of the GRRF.

Comment "Sidecars" (3-5 category motor cycles)

Germany is of the opinion that an unbraked sidecar (with often two passenger seats) on a heavy motor cycle of category 3-3 should not be permissible.

The requirement of paragraph 3.1.6:

"A brake on the sidecar wheel is not required if the vehicle meets the performance requirements prescribed in section 4"

can be fulfilled by a **skilled test** driver by applying a counter steer moment to compensate for the yaw moment caused by the big unbraked mass.

However, in a dangerous driving situation the unbraked mass can produce such a large yaw moment which the normal driver is unable to cope with.

It is therefore proposed that all wheels of a 3-5 motor cycle have to be braked or as an alternative that 3-5 motor cycle are taken out of the scope of gtr (as it is done with L₅ and L₆ category vehicles).

Thus, if a 3-5 motor cycle is mass produced the manufacturer should fit the sidecar with a brake.

If 3-5 motor cycles are not mass produced then the alternative is also proposed to take this vehicle category out of the scope of gtr. Thus each Contracting Party may apply its national legislation.

Proposal A (3-5)

Paragraph 2.5, amend to read:

2.5. "Combined brake system (CBS)" means:

- (a) For vehicle categories 3-1 and 3-3: a service brake system where at least two brakes on different wheels are actuated by the operation of a single control.
- (b) For vehicle categories 3-2, 3-4 **and 3-5**: a service brake system where the brakes on all wheels are actuated by the operation of a single control.
- ~~(c) For vehicle category 3-5: a service brake system where the brakes on at least the front and rear wheels are actuated by the operation of a single control (if the rear wheel and sidecar wheel are braked by the same brake system, this is regarded as the rear brake).~~

3.1.6. Three-wheeled vehicles of vehicles category 3-5 shall comply with the brake system requirements set out in paragraph 3.1.5. above. ~~A brake on the sidecar wheel is not required if the vehicle meets the performance requirements prescribed in section 4.~~

Proposal B (3-5, deletion of 3-5 motor cycle from the scope of gtr on motorcycle brake systems) as an alternative proposal

Delete in paragraph 1 “Scope” the reference to 3-5

Delete the last two sentences of paragraph 2.5)

Delete paragraph 3.1.6 and renumber the following paragraphs

Delete in **paragraph 4.1.1.4.** the reference to 3-5

Delete in **paragraph 4.2.5. c (i) and e (i)** the reference to 3-5

Delete in **paragraph 4.3.2. (b) and 3.2. (d)** the reference to 3-5

Delete in **paragraph 4.3.3.** the three lines of the table which refer to 3-5

Delete in **paragraph 4.4.1.** the reference to 3-5

Delete in **paragraph 4.4.2. (d)** the reference to 3-5

Delete in **paragraph 4.5.1. (a)** the reference to 3-5

Delete in **paragraph 4.5.2. (d)** the reference to 3-5

Delete in **paragraph 4.7.1. (b)** the reference to 3-5

Delete in **paragraph 4.7.2.2. (e)** the reference to 3-5

Delete in **paragraph 4.8.1. (a)** the reference to 3-5

Delete in **paragraph 4.10.2. (a)** the reference to 3-5

Delete in **paragraph 4.11.3.** the line of the table which refer to 3-5

Comment “P B C”

GTR on motorcycle brake systems as an agreed **international** regulation should not refer to individual different **national** regulations.

Paragraph 2.13, amend to read:

- 2.13. "Peak braking coefficient (PBC)" means the measure of tyre to road surface friction based on the maximum deceleration of a rolling tyre. ~~measured in accordance with the method specified in national legislation.~~

Comment “grad u a b i l i t y”

An essential characteristic of a braking system is that the braking action is graduable.

Paragraph 3.1.2, add at the end the following text:

- 3.1.2. Service brake system control operation:

Vehicles shall have configurations that enable a rider to operate the service brake system control whilst seated in the normal driving position and with both hands on the steering control. **It must be possible to graduate the braking action by easily regulating the braking force with sufficient precision.**

Paragraph 3.1.3, add at the end the following text:

3.1.3. Secondary brake system control operation:

Vehicles shall have configurations that enable a rider to operate the secondary brake system control whilst seated in the normal driving position and with at least one hand on the steering control. **It must be possible to graduate the braking action by easily regulating the braking force with sufficient precision.**

Comment “Visibility”

An essential characteristic of a braking system is that its warnings are visible to the driver under all driving conditions.

Add new paragraph 3.1.13 as follows:

3.1.13. The warning signals shall be visible, even by daylight; the satisfactory condition of the signals shall be easily verifiable by the driver from the driver's seat.

Comment “Single failure”

Any single failure on a braking system which reduces the braking performance of the motor cycles should be such that a certain minimum performance is ensured. Thus, a **general** requirement is added to cover all **possible** mechanical, hydraulic and electrical failures which may not be covered by the specific “failure requirements” of section 4.

Add new paragraph 3.3.4. as follows:

3.3.4. In the case of any single failure on a braking system and when the brakes are tested in accordance with the test procedure set out in paragraphs 4.3.1 and 4.3.2 of section 4 the brake performance shall be at least:

- stopping distance $S \leq 0.0154 V^2$ or
- MFDD $\geq 2,5 \text{ m/s}^2$

This minimum performance requirement does not apply for the specified failure conditions/tests covered by section 4.

Section 4

Comment “High adhesion surface”

On some motor bikes rear wheel lift occurs on a high adhesion surface of 0.9 PBC. In addition, on such a high friction surface ABS cycling may not be attainable for certain motor bikes.

Therefore it is proposed to lower the definition of the high adhesion surface.

In addition, it is seen more reasonable for the nominal peak braking coefficient to lay down a **minimum (≥ 0.8)** rather than a **concrete fixed value (0.9)**. It is unlikely, that the high adhesion surfaces of the different proving grounds have an exact PBC value of 0.9 (**without having even a specified test procedure for the determination this value**). Since the peak braking coefficient depends largely on the actual fitted tyre of the motor cycles a fixed PBC value of 0.9 would exclude the testing of other tyres with a different friction characteristic.

With the above proposed amendment the words “**unless otherwise specified**” may be deleted in paragraph 1.1.1 \Rightarrow compare paragraphs 4.9.7.1 (a) and (c) of section 4 (“>” replaced by “ \geq ”).

Paragraph 4.1.1.1, amend to read:

4.1.1.1. Dynamic brake tests (excluding low friction ABS tests):

The test area is a clean, dry and level surface, with a gradient ≤ 1 per cent.

The surface has a nominal peak braking coefficient (PBC) of ≥ 0.8 , unless otherwise specified.

Comment “CBS-Performance requirements”

With the deletion of M₁ vehicles from the scope of ECE-Regulation No. 13, in the future a MFDD of at least 6.4 m/s² will be required for all passenger cars.

For a heavy motor cycle of category 3-3 at least the old and lower minimum M1-MFDD requirement of 5.8 m/s² should be laid down when the motor cycle driver applies the service braking system which acts on **all wheels**.

The performance requirements laid down in the table of paragraph 4.3.3 for vehicles with CBS or split service brake systems **do not reflect the state of art**. They are only slightly higher than what is already required for only the brakes of the front axle. They are also in stark contrast to the new proposed performance requirements of paragraph 4.4.3 (up to 7.0 m/s²).

If now is not the time to make the necessary amendments in GTR with respect to safety (and to take account of the higher MFDD requirement for passenger cars introduced in ECE-R13 H many years ago) then **when will be the appropriate time?**

Thus, Germany proposes a small increase of the CBS-Performance requirements which should only be a problem for a bad braking system which will present an unnecessary danger in mixed vehicle traffic and should therefore not be allowed.

Paragraph 4.3.3., amend to read:

4.3.3. Performance requirements:

When the brakes are tested in accordance with the test procedure set out in paragraph 4.3.2. above, the stopping distance shall be as specified in column 2 or the MFDD shall be as specified in column 3 of the following table:

Column 1	Column 2	Column 3
Vehicle Category	STOPPING DISTANCE (S) (Where V is the specified test speed in km/h and S is the required stopping distance in metres)	MFDD
Single brake system, front wheel(s) braking only:		
3-1	$S \leq 0.1 V + 0.0111 V^2$	$\geq 3.4 \text{ m/s}^2$
3-2	$S \leq 0.1 V + 0.0143 V^2$	$\geq 2.7 \text{ m/s}^2$
3-3	$S \leq 0.1 V + 0.0087 V^2$	$\geq 4.4 \text{ m/s}^2$
3-4	Not applicable	Not applicable
3-5	$S \leq 0.1 V + 0.0105 V^2$	$\geq 3.6 \text{ m/s}^2$
Single brake system, rear wheel(s) braking only:		
3-1	$S \leq 0.1 V + 0.0143 V^2$	$\geq 2.7 \text{ m/s}^2$
3-2	$S \leq 0.1 V + 0.0143 V^2$	$\geq 2.7 \text{ m/s}^2$
3-3	$S \leq 0.1 V + 0.0133 V^2$	$\geq 2.9 \text{ m/s}^2$
3-4	Not applicable	Not applicable
3-5	$S \leq 0.1 V + 0.0105 V^2$	$\geq 3.6 \text{ m/s}^2$
Vehicles with CBS or split service brake systems: for laden and lightly loaded conditions.		
3-1 and 3-2	$S \leq 0.1 V + 0.0077 V^2$	$\geq 5.0 \text{ m/s}^2$
3-3	$S \leq 0.1 V + 0.0067 V^2$	$\geq 5.8 \text{ m/s}^2$
3-4	$S \leq 0.1 V + 0.0067 V^2$	$\geq 5.8 \text{ m/s}^2$
3-5	$S \leq 0.1 V + 0.0067 V^2$	$\geq 5.8 \text{ m/s}^2$
Vehicles with CBS – secondary service brake systems:		
ALL	$S \leq 0.1 V + 0.0154 V^2$	$\geq 2.5 \text{ m/s}^2$

Comment “MFDD”

Analogue to the other performance requirements in the draft of WP.29/2006/77, MFDD as an alternative requirement was added in paragraph 4.4.3.

Paragraph 4.4.3., amend to read:

4.4.3. Performance requirements:

When the brakes are tested in accordance with the test procedure set out in paragraph 4.4.2. above, **the brake performance** shall be:

- For test speeds < 80.5 km/h, **stopping distance** $S \leq 0.0055 V^2$ or **the MFDD shall be $\geq 7,0 \text{ m/s}^2$**
- For test speeds $\geq 80.5 \text{ km/h}$, **stopping distance** $S \leq 0.0060 V^2$ or **the MFDD shall be $\geq 6,4 \text{ m/s}^2$**

(where V is the specified test speed in km/h and S is the required stopping distance in metres)

Comment “General information”

In a regulation it should be clear what a pure comment is and what a requirement is.

Since the paragraph 4.6.1, 4.7.1, 4.9.1, 4.10.1 and 4.11.1 contain requirements the heading “General information” is very confusing. Thus, it is proposed to delete the word “information” from this heading.

Heading “General information” of paragraphs 4.6.1, 4.7.1, 4.9.1, 4.10.1 and 4.11.1, amend to read:

“General”

Comment “ABS-General”

It is proposed to delete paragraph 4.9.1.c because it is in contradiction to the definition of paragraph 2.23. **“Wheel lock” means the condition that occurs when there is a slip ratio of 1.00.**

When the wheels are still turning the slip ratio is less than 1.00.

Therefore, it is proposed to delete paragraph 4.9.1 (c) and renumber the following paragraphs as (c) and (d).

In addition, the individual requirements that no wheel lock is allowed (see paragraphs 4.9.3.2 (b), 4.9.4.2 (b), 4.9.5.2., 4.9.6.2. and 4.9.7.2.) are eliminated and replaced by the general requirement of paragraph 4.9.1.d.

Comment “Safety Concept”

Before granting an approval, the Approval Authority should have information from the vehicle manufacturer about the safety concept of a complex electronic system (the ABS by definition of Annex 18, ECE-R13 is such a system) when he fits it on the vehicle.

Thus the general requirement (e) is added to the general paragraph 4.9.1.

Paragraph 4.9.1, amend to read:**4.9.1. General:**

- (a) The tests are only applicable to the ABS fitted on vehicle categories 3-1 and 3-3.
- (b) The tests are to confirm the performance of brake systems equipped with ABS and their performance in the event of ABS electrical failure.
- ~~(c) In practice, wheel lock is judged to have occurred when a vehicle's speed exceeds 15 km/h while its wheel speed falls below 5 km/h at the tyre to road interface.~~
- (c) "Fully cycling" means that the anti-lock system is repeatedly modulating the brake force to prevent the directly controlled wheels from locking. Brake applications where modulation only occurs once during the stop shall not be considered to meet this definition.
- (d) **For the tests specified in the following paragraphs 4.9.3 to 4.9.7 there shall be no wheel lock and the vehicle wheels shall stay within the test lane. However, wheel-lock shall be allowed provided that the stability of the vehicle is not affected to the extent that it requires the operator to release the control or that it causes a vehicle wheel to pass outside the applicable test lane.**

- (e) **The vehicle manufacturer shall provide the technical service/authority with documentation in respect to the “Safety Concept” of the ABS. In particular, the documentation shall be supported, by an analysis which shows, in overall terms, how the system will behave on the occurrence of faults which will have a bearing on vehicle control performance or safety.**

Comment “Fully cycling”

On a high friction surface ABS cycling may not be attainable for certain motor bikes even if the control forces may be increased.

Paragraphs 4.9.3.1 (d) 4.9.5.1 (e) 4.9.6.1 (e) and 4.9.7.1 (e), amend to read:

4.9.3.1 (d) Brake actuation force:

Hand control: = 200 N ± 20 per cent

Foot control: = 350 N ± 20 per cent

These forces may be increased in order to ensure that the ABS is fully cycling during the stop.

If the increase of the actuation forces does not ensure that the anti lock system is fully cycling then this test may be carried out on a surface with a PBC of less than 0.8.

For systems where the brake actuation force fluctuates due to ABS operation, the nominal brake actuation force is the mean value applied for the duration of the stop.

4.9.5.1., 4.9.6.1. and 4.9.7.1

(e) Brake actuation force:

Hand control: = 200 N ± 20 per cent

Foot control: = 350 N ± 20 per cent

These forces may be increased in order to ensure that the ABS is fully cycling during the stop.

If the increase of the actuation forces does not ensure that the anti lock system is fully cycling then this test may be carried out on a surface with a PBC of less than 0.8.

For systems where the brake actuation force fluctuates due to ABS operation, the nominal brake actuation force is the mean value applied for the duration of the stop.

Comment “No wheel lock allowed”

In the **general** paragraph 4.9.1 (as amended by this proposal) it is required that no wheel lock is allowed. Thus, this **specific** requirement is eliminated in paragraphs 4.9.3.2 (b), 4.9.4.2 (b), 4.9.5.2., 4.9.6.2. and 4.9.7.2.; see also above comment “ABS-General”.

In paragraph 4.9.7.1 (a) the word “wet” is deleted. The low friction surface is defined in paragraph 4.1.1.2. With respect to the high adhesion surface it will be difficult (if not impossible **???**) to find a test track where a PBC value of > 0.8 can be determined on a **wetted** surface.

In paragraph 4.9.7.2 the sentence “After passing over the transition point between the low and high friction surfaces, the vehicle deceleration shall increase” is replaced by the wording which is used for many years in ECE-Regulation No. 13, 13H and Directive 71/320/EEC. To require “the vehicle deceleration **shall increase**” is more vague and less objective than the requirement “the deceleration of the vehicle must rise to the **appropriate high value** within a **reasonable time**”. Thus the new proposed wording is not seen as an improvement but a worsening.

Paragraphs 4.9.3.2, 4.9.4.2, 4.9.5.2., 4.9.6.2., 4.9.7.1 (a), and 9.7.2, amend to read:

4.9.3.2. Performance requirements

When the brakes are tested in accordance with the test procedures referred to in paragraph 4.9.3.1. above, **the** stopping distance (S) shall be $\leq 0.0063 V^2$ (where V is the specified test speed in km/h and S is the required stopping distance in metres) or the MFDD shall be 6.17 m/s^2

4.9.4.2. Performance requirements

When the brakes are tested in accordance with the test procedures set out in paragraph 4.9.4.1. above, **the** stopping distance (S) shall be $\leq 0.0188 V^2$ (where V is the specified test speed in km/h and S is the required stopping distance in metres) or the MFDD shall be 2.05 m/s^2

4.9.5.2. Performance requirements:

When the brakes are tested in accordance with the test procedures set out in paragraph 4.9.5.1. **it shall fulfil requirement 4.9.1 (d).**

4.9.6.2. Performance requirements:

When the brakes are tested in accordance with the test procedures set out in paragraph 4.9.6.1. **it shall fulfil requirement 4.9.1 (d).**

4.9.7.1. Test conditions and procedure

(a) Test surfaces:

A ~~wet~~ low friction surface immediately followed by a ~~wet~~ high friction surface of ≥ 0.8 PBC

4.9.7.2. Performance requirements

When the brakes are tested in accordance with the test procedures set out in paragraph 4.9.7.1. **the deceleration of the vehicle must rise to the appropriate high value within a reasonable time when the vehicle passes from the low-adhesion surface to the high-adhesion surface.**
