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**(Updated version)**

**UN/ECE/WP29/GRSP INFORMAL GROUP**

**ON**

**DOOR LOCK**

**&**

**DOOR RETENTION COMPONENTS**

**3<sup>RD</sup> PROGRESS REPORT**

Transmitted by GRSP

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## **1. INTRODUCTION**

During the 126<sup>th</sup> session of WP.29 of March 2002, the Executive Committee of the 1998 Global Agreement (1998 Agreement) adopted a Program of Work, which includes the development of a global technical regulation (gtr) to address inadvertent door openings in crashes. The Executive Committee also charged the Working Party on Passive Safety (GRSP) to form an informal working group (working group) to discuss and evaluate relevant issues concerning requirements for door locks and door retention components to make recommendations regarding a potential gtr.

The United States of America volunteered to lead the group's efforts and develop a document detailing the recommended requirements for the gtr. The U.S. presented an informal document WP29/2003/6 in March 2003, formally proposing the work and highlighting the relevant issues to be addressed in the gtr.

The working group met to generally evaluate the likelihood of developing a door retention gtr on September 2 - 3 and on December 9, 2002 in Paris, France and Geneva, Switzerland, respectively. A more thorough evaluation of the U.S. proposal was conducted on April 3 - 4 in London, England, on July 23 - 24 in Paris, France, and on November 19 - 20 of 2003 in Paris, France. A draft version of the gtr was presented for discussion at the December 2003 GRSP meeting. A sixth meeting was held on February 4 - 6, 2004 in Paris, France.

A Preliminary Report was presented at the 33<sup>rd</sup> GRSP meeting (Informal document No. 5). This report summarizes the main issues discussed by the working party in evaluating the proposal to develop a draft global regulation on door lock and door retention components during the first three meetings of the group. It also provides an evaluation of the safety problems associated with door openings and a review of the existing international regulations.

The 2<sup>nd</sup> Progress Report discussed the status of prior issues raised in the Preliminary Report, as well as new issues raised during the drafting of the gtr at the July and November 2003 working group meetings.

This 3<sup>rd</sup> Progress report discusses the outcome of discussions from the December 2003 GRSP meeting and the February 2004 informal group meeting, as well as the outcome of the discussions of the draft gtr of the May 2004 GRSP. A draft version of the gtr was submitted as a formal working document for the May 2004 GRSP meeting.

## **2. PROGRESS ON DRAFTING OF A GTR**

At its December 2003 session, the GRSP considered the draft gtr presented by the informal group. Several issues were discussed and concerns were raised in line with concerns raised by some representatives in the informal group. During the February 2004 meeting of the informal group several issues that were of concern to GRSP were resolved. The group agreed to recommend the deletion of the full door tests from the gtr. They also reached consensus on recommended language on rear door lock requirements. In addition, the U.S. provided justification for the combination tests and Canada provided a summary of their validation of the dynamic inertial tests. While not all issues have been resolved, no issues were sufficiently problematic to prevent the development of a draft regulation. The following table lists the various milestones used in the development of this gtr.

<b>Tasks</b>	<b>Dates</b>
1st Progress Report to GRSP	June 2003
1 <sup>st</sup> Progress Report to AC.3	June 2003
Preparation of 1st Draft gtr	July 2003
4 <sup>th</sup> Informal group Meeting	July 2003
2nd Draft gtr	November 2003
5 <sup>th</sup> Informal group Meeting	November 2003
2 <sup>nd</sup> Progress Report/Draft gtr to GRSP	December 2003
6 <sup>th</sup> Informal Group Meeting	February 2004
2nd Progress Report to AC.3	March 2004
3 <sup>rd</sup> Progress Report/Adoption of Final Draft gtr by GRSP	May 2004
3 <sup>rd</sup> Progress Report to AC.3	June 2004
Submittal of Final Draft gtr to AC.3	November 2004

### **3. DISCUSSION OF ISSUES ADDRESSED IN THE DRAFT GTR**

The following discussions reflect the working group's identification of specific issues, as well as the group's evaluation of those issues.

#### **A. Applicability**

The proposed gtr provides that certain door retention components on any door leading directly into an occupant compartment, i.e., a compartment containing one or more seating accommodations, must comply with the requirements of the gtr. Tractor trailers are excluded because they do not meet this criterion. Likewise, doors leading into cargo compartments that are separated by a barrier would not be regulated since an individual could not access the occupant compartment through those doors. The gtr excludes folding doors, roll-up doors, detachable doors, and doors that provide emergency egress, as these types of doors would require entirely new test procedures and are not in such common use as to justify the development of new requirements and test procedures. Thus, for certain vehicle designs, some, but not all doors would be regulated by the gtr.

The application this gtr uses, to the extent possible, the revised vehicle classification and definitions that the Working Party on General Safety (GRSG) Common Task Group has prepared. Difficulties were encountered in determining which vehicles would be covered. Currently, ECE regulations only apply to M1 and N1 vehicles that have 9 seats or less and weight 3,500 kg or less. Some members illustrated that it would be difficult to apply full door tests, such as the proposed inertial load, to large trucks and specialized vehicles. With the decision not to propose adoption of two full door tests, discussed in greater detail below, these concerns were largely resolved. Likewise, the retention of a calculation for meeting the inertial load requirements would allow a jurisdiction to avoid applying a full-door inertial load test for doors on heavier vehicles. The members concerned about the applicability of door retention requirements on heavier vehicles proposed that the gtr only apply to passenger cars, light commercial vehicles, and vans and that other vehicles be excluded initially, then added in the future after further evaluation of various door designs. Some of those arguing in favor of a more inclusive gtr noted that current U.S., Canadian, and Australian requirements already apply to all vehicles other than buses (M2 and M3

vehicles) and that the applicability of existing requirements to commercial trucks has not proven problematic for vehicle manufacturers. These members preferred the exclusion of specific door types rather than entire classes of vehicles. The longitudinal and transverse load requirements have been applicable to heavy trucks in the U.S. and Canada for over thirty years without imposing any hardship on vehicle manufacturers.

The GRSP agreed on the applicability of this gtr to all Category 1-1 vehicles, or category 2 vehicles.

B. New Definitions in Regulation

The GRSP agreed on the new definitions that the working group has revised, and developed to better reflect the language in the draft gtr.

C. General Requirements

The GRSP agreed on the recommendations of the working group specifying requirements for side and back doors, door retention components and door locks. The group considered all available research and testing done by various jurisdictions and recommended that force levels identified in the current component static tests for latches and hinges be harmonized to eliminate variations due to rounding of unit conversions. New requirements and test procedures for hinged side and sliding doors proposed by North America, as well as inertial load dynamic test and load tests on latches in the vertical direction for inclusion, were evaluated.

1. Hinged Doors Issues

1.1. New hinged full door test requirements

The U.S. and Canada developed a series of new test procedures designed to simulate real world door opening in crashes. These tests consist of door-in-frame quasi-static (full door) tests in both longitudinal and lateral directions, independent from the door system. These tests are discussed in more detail in the Preliminary and 2<sup>nd</sup> Progress Reports.

It was decided against recommending the inclusion of the full door tests into the gtr because the tests raised concerns about unduly restricting door designs, developing a repeatable and enforceable test procedure, and addressing door openings under real world conditions. Because of the current EU requirement for both the component tests and a door closure requirement in dynamic tests, there is some question as to whether a full door test provides any additional value. In an analysis of the proposed tests using its FARS and NASS databases, the United States found only marginal correlation between the proposed tests and door openings in real world.

1.2. Combination Component Test

The GRSP discussed a new combination test procedure for hinged side doors that is representative of the combination of longitudinal compressive and lateral tensile forces that occur in real-world latch failures. Currently, no regulation, directive, or international voluntary standard has such a requirement. The proposed combination test procedure is a static bench test capable of evaluating the strength of the latching systems and designed to

detect fork bolt detent bypass failures. No other test procedure within the gtr simulates these types of latch failure conditions. The U.S. made a presentation at the February 2004 informal group meeting, detailing justification and benefits for the tests. This information is presented below.

In the combination test, the latch is mounted on a flat steel plate that moves horizontally and the striker is mounted on a vertically moving ram device. During the test, the latch and striker, while in their primary coupled position, are simultaneously moved such that lateral tension (i.e., force applied perpendicularly to the coupled latch and striker) and longitudinal compressive forces (i.e., force applied against the latch toward the striker) are applied at their interface.

The required forces for the primary position of the hinged side door latching systems would be simultaneous forces of 16,000 N longitudinal compressive force and 6,650 N lateral tensile force. The longitudinal force application device is moved at a rate of one centimetre per minute until the longitudinal force is achieved.

In 1998 and 2001, the U.S. conducted two more series of tests. In both sets the latches were tested to failure in the longitudinal compressive direction. The average failure load in the 1998 tests was 16,186 N. The average failure load in the 2001 tests was 14,145 N. At present, it is unclear why there was an approximately 2,000 N reduction in the average load level required for latch failure. Whatever the reason, a load level of at least 16,000 N is required to regain the loss in load-bearing capability of latches seen in the 1998 tests. Evaluation of U.S. crash data in 2004 suggests that the minimum average failure load among doors subjected to combination tensile/compressive loading in the real world is approximately 17,000 N, with the maximum average failure load of 19,000 N. Thus, while a 16,000 N load has been proposed, it appears that a greater reduction in door openings would be possible if the longitudinal load were increased to the 17,000 N or 19,000 N level. No evaluation has been conducted as yet regarding the cost and design practicability associated with a longitudinal load greater than 16,000 N. Accordingly, the U.S. is not sufficiently confident that these higher load levels can be justified at this time.

It is anticipated that latch upgrades needed to meet the requirements of the combination tests would be no more than \$0.21 (U.S.). If tested with a longitudinal compressive force of 15,000 N, it is anticipated that 39% of the existing fleet would require some upgrade in order to pass the new test procedure. That failure rate increase to 43% and 67% when the longitudinal forces are increased to 17,00 N and 19,000 N, respectively. At the proposed 16,000 N load, the reduction in door openings is estimated to be between 8.9% and 13.3%. Based on the number of ejections through side hinged doors in the crash modes represented by the combination test, the new requirement would result in an annual reduction of 28 to 41 fatalities and 17 to 27 serious injuries in the United States alone.

There was support for this requirement in general, however the group continued to note technical difficulties in conducting the test. Accordingly, the

GRSP has decided against supporting the adoption of combination test into the gtr at this time. Instead, the GRSP delegates and representatives will work on the modification of the U.S.-based procedure, or the development of a new procedure, to capture the benefits associated with a test addressing door failures due to simultaneous compressive longitudinal and tensile lateral loading of latch systems in real world crashes.

### 1.3. Rear side door locks

Unlike the door lock and door retention component requirements in North America, ECE R11 does not have provisions for rear side door locks. Some of the working group members expressed concerns over including such requirements in the gtr, while others insisted that such requirements are necessary for the protection of children in the rear seat.

The philosophical difference in opinion on how to best address the need for egress from a rear seat against the need to prevent children from opening a locked door precluded a single solution to rear door lock requirements. Instead, it was agreed to recommend that the interior door locking mechanism on a rear door, when engaged, must be releasable by an action other than the simple, single pull on the interior door handle. A jurisdiction may require that the separate action be directly available to either the driver of the vehicle or an occupant immediately adjacent to the locked door, or that the vehicle be equipped with either an automatic or manual child lock system. Currently ECE and Japanese regulations have no requirements for door locks. However, based on comments from working party delegates and representatives, it appears that Japanese manufacturers could meet the first option while European manufacturers could meet the second option without any changes in vehicle design. Neither type of system would be prohibited as a supplemental safety device, and a jurisdiction could determine that either system was acceptable as the primary safety device.

The GRSP agreed to the language recommended by the working group.

## 2. Sliding Door Issues

The requirements and test procedures in both ECE R11 and the North American standards were discussed and the working group agreed to recommend the inclusion of the current requirements for the track and slide combinations of side sliding doors. Further, the group agreed to recommend adding the latch/striker system requirements of ECE R11. However, neither regulation had a detailed full vehicle sliding door test procedure that better simulates real world door openings in crashes. The GRSP discussed and agreed to the new full sliding door procedure developed by North America.

### 2.1. Full vehicle test

The U.S. and Canada have jointly developed a new full vehicle sliding door test procedure to replace the existing door-in-frame test in the North American standards. The procedure specifies that the track and slide combination or other supporting means for each sliding door, while in the closed position, cannot separate more than 100 mm from the door frame when lateral forces of 18 kN are applied.

The GRSP agreed to the above and to a requirement that the total displacement of each of the loading devices to be limited to 300 mm.

Some concerns were voiced as to the level of potential safety risk involved in measuring the 100 mm displacement requirement. The working group agreed to consider modifying the contemplated requirement to retain the original intent behind the requirement, while addressing any potential risk of injury to the test technicians. The GRSP agreed that there are several new measurement technologies that would alleviate this potential risk and agreed to incorporate a statement in the annex of the test procedure to address this concern.

#### 2.2. Requirement for a telltale

The GRSP also agreed to the recommendation of the working group to require either a secondary latch or some type of visual indicator signalling the driver when a sliding door was not fully closed.

### 3. Addition of orthogonal force loading requirements for sliding and hinged doors

The working group has discussed the possibility of adding a force loading requirement in the direction orthogonal to the directions perpendicular and parallel to the latch face for hinged and sliding doors. These load tests, in the vertical direction, were evaluated and ultimately rejected except for back doors. Since a large number of door openings occur during vehicle rollovers, it was suggested that perhaps a load test in the vertical direction would help reduce these types of openings. However, it was ultimately determined that the addition of a load test conducted in a direction orthogonal to the existing tests could not be justified at the present time.

### 4. Dynamic Requirements Issues

#### 4.1. Dynamic inertial test procedure (optional to calculation)

The GRSP agreed to the working group recommendation to adopt the ECE R11 dynamic inertial test requirements to the gtr, as an option to the inertial calculation. In addition to the longitudinal and lateral tests, tests in the vertical direction were also considered. Canada validated these test procedures and presented the results at the February 2004 meeting. The informal group accepted the results, and Canada agreed to provide the clarified test procedure that was included in the draft gtr discussed at the May 2004 GRSP.

## **4. COST EFFECTIVENESS**

The U.S. provided cost analyses for the combination and sliding door tests, as well as for the back door requirements, based on previous U.S. rulemaking.

## **5. REFERENCE DOCUMENTS USED BY THE WORKING GROUP**

A list of informal documents used by this Informal group is listed and available on the UN/ECE website. In addition, test reports and other pertinent documents detailing the U.S. and Canada proposed test procedures are accessible from the **U.S. Department of Transportation Docket Management System (Docket No. NHTSA-1996-3705) Web access at <http://dms.dot.gov/>**



Number of Informal Document**	Title of Informal Document
TRANS/WP.29/GRSP/2001/1	Proposal for Draft Candidate gtr on Door Latches and Door Retention Components (OICA)
TRANS/WP.29/GRSP/2002/15	Comparison Between FMVSS No. 206 and ECE R11 (U.S.)
TRANS/WP29/GRSP/2004/9	Proposal for a Global Technical Regulation on Door Locks and Door Retention Components
INF GR/DL/1/1	Agenda September 2002 Meeting
INF GR/DL/1/2	Summary of Lateral Full Door Test (U.S.)
INF GR/DL/1/3	Summary of Longitudinal Full Door Test (U.S.)
INF GR/DL/1/4	Summary of Combination Test (U.S.)
INF GR/DL/1/5	Summary of Transport Canada Sliding Door Test (Canada)
INF GR/DL/1/6	Transport Canada Test Reports (Canada)
INF GR/DL/2/1	Agenda December 2002 Meeting
INF GR/DL/2/2	Proposal for a Test Procedure Concerning the Resistance against Inertial Loads of Side Door Locks on Motor Vehicles (OICA)
INF GR/DL/2/3	Comparison of Locking Requirements in FMVSS 206 with ECE R11 (OICA)
INF GR/DL/3/1	Agenda April 2003 Meeting
INF GR/DL/3/2	Crash Data on US Door Ejection/Opening (U.S.)
INF GR/DL/3/3	Full Door and Combination Detailed Test Procedures (U.S.)
INF GR/DL/3/4	Dynamic Inertial Sled Test Pulse (France UTAC)
INF GR/DL/4/1	Agenda July 2003 Meeting
INF GR/DL/5/1	Agenda November 2003 Meeting
INF GR/DL/5/2	BMW Presentation, "Proposed Door Test Procedures - Hinged Side Doors"
INF GR/DL/5/3	Photos and acceleration plots of inertial loading in z-direction

\*\* Informal Report (INF), GRSP Informal group (GR), Door Locks and Door Retention Components (DL), Meeting No., and Report Number