

51-2 Door latches and retention components : Effective date from 2018/1/1

Refer to: R11 04

51-2.1 Effective Date and Scope:

51-2.1.1 Effective date from 2018/1/1, the new types of latches and door retention components for category symbols M1 and N1, such as hinges and other supporting means on doors and back doors, which can be used for the entry or exit of the occupants, shall comply with this regulation.

51-2.1.2 Effective date from 2019/1/1, all types of latches and door retention components for category symbols M1 and N1, such as hinges and other supporting means on doors and back doors, which can be used for the entry or exit of the occupants, shall comply with this regulation. Existing types of latches and door retention components which were confirmed to “51-1 Door latches and retention components”, if it fitted a full locking system described in paragraph 51-2.2.5.2, shall comply with 51-2.5.13.1.1 in addition. Existing types of latches and door retention components which were confirmed to “51-1 Door latches and retention components”, if it not fitted a full locking system described in paragraph 51-2.2.5.2, regard as conform to this regulation.

51-2.1.2.1 Effective date from 2019/1/1, all types of latches and door retention components used in back door which can be used for the entry or exit of the occupants and/or can present the risk of occupants being thrown from a vehicle as a result of impact, shall comply with this regulation. Existing types of latches and door retention components which were confirmed to “51-1 Door latches and retention components”, if it fitted a full locking system described in paragraph 51-2.2.5.2, shall comply with 51-2.5.13.1.1 in addition. Existing types of latches and door retention components which were confirmed to “51-1 Door latches and retention components”, if it not fitted a full locking system described in paragraph 51-2.2.5.2, regard as conform to this regulation.

51-2.1.3 The applicants applying for low volume safety approval could exempt from regulation of “door latches and retention components” except child-only vehicle.

51-2.1.4 Applying for vehicle-by-vehicle low volume safety approval, the vehicle could exempt from regulation of “door latches and retention components”.

51-2.2 Definitions

51-2.2.1 "Auxiliary door latch" is a latch equipped with a fully latched position with or without a secondary latch position, and fitted to a door or door system equipped with a primary door latch system.

51-2.2.2 "Auxiliary door latch system" consists, at a minimum, of an auxiliary door latch and a striker.

51-2.2.3 "Back door" is a door or door system on the back end of a motor vehicle through which passengers can gain ingress or egress, and which can present the risk of occupants being thrown from a vehicle as a result of impact, or through which cargo can be loaded or unloaded. It does not include:

(a) a trunk lid; or

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(b) a door or window composed entirely of glazing material and whose latches and/or hinge systems are attached directly to the glazing material.

51-2.2.4 "Body member" is that portion of the hinge normally affixed to the body structure.

51-2.2.5 Additional protections

51-2.2.5.1 "Child safety lock system" is a locking device which can be engaged and released independently of other locking devices and which, when engaged, prevents operation of the interior door handle or other release device. The lock release/engagement device may be manual or electric and may be located anywhere on or in the vehicle;

51-2.2.5.2 "Full locking system" is a system that renders the interior door release handle or any other door interior latch release control of any of the vehicles doors inoperable other than by operation of the systems locks.

51-2.2.6 "Door closure warning system" is a system that will activate a visual signal located where it can be clearly seen by the driver when a door latch system is not in its fully latched position and while the vehicle ignition is activated.

51-2.2.7 "Door Hinge System" is one or more hinges used to support a door.

51-2.2.8 "Door latch system" consists, at a minimum, of a latch and a striker.

51-2.2.9 "Door member" is that portion of the hinge normally affixed to the door structure and constituting the swinging member.

51-2.2.10 "Door system" is the door, latch, striker, hinges, sliding track combinations and other door retention components on a door and its surrounding doorframe. The door system of a double door includes both doors.

51-2.2.11 "Double door" is a system of two doors where the front door or wing door opens first and connects to the rear door or bolted door, which opens second.

51-2.2.12 "Fork-bolt" is the part of the latch that engages and retains the striker when in a latched position.

51-2.2.13 "Fork-bolt opening direction" is the direction opposite to that in which the striker enters the latch to engage the fork-bolt.

51-2.2.14 "Fully latched position" is the coupling condition of the latch that retains the door in a completely closed position.

51-2.2.15 "Hinge" is a device used to position the door relative to the body structure and control the path of the door swing for passenger ingress and egress.

51-2.2.16 "Hinge pin" is that portion of the hinge normally interconnecting the body and door members and establishing the swing axis.

51-2.2.17 "Latch" is a device employed to maintain the door in a closed position relative to the vehicle body with provisions for deliberate release (or operation).

51-2.2.18 "Primary door latch" is a latch equipped with both a fully latched position and a secondary latched position and is designated as a "primary door latch" by the manufacturer. The manufacturer may not thereafter change such designation. Each manufacturer shall, upon request, provide information regarding which latches are "primary door latches" for a particular vehicle or make/model.

51-2.2.19 "Primary door latch system" consists, at a minimum, of a primary door latch and a striker.

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51-2.2.20 "Secondary latched position" refers to the coupling condition of the latch that retains the door in a partially closed position.

51-2.2.21 "Side front door" is a door that, in a side view, has 50 per cent or more of its opening area forward of the rearmost point on the driver's seat back, when the seat back is adjusted to its most vertical and rearward position, providing direct access for passengers to enter or depart the vehicle.

51-2.2.22 "Side rear door" is a door that, in a side view, has 50 per cent or more of its opening area to the rear of the rearmost point on the driver's seat back, when the driver's seat is adjusted to its most vertical and rearward position, providing direct access for passengers to enter or depart the vehicle.

51-2.2.23 "Striker" is a device with which the latch engages to maintain the door in the fully latched or secondary latched position.

51-2.2.24 "Trunk lid" is a movable body panel that provides access from outside the vehicle to a space wholly partitioned from the occupant compartment by a permanently attached partition or fixed or fold-down seat back.

51-2.3 Door latches and retention components shall according to suitable types and range of principle are as below :

51-2.3.1 designation of the vehicle type by the manufacturer;

51-2.3.2 the type of latch;

51-2.3.3 the type of door retention component;

51-2.3.4 the way in which the latches and door retention components are fitted to and retained by the structure of the vehicle;

51-2.3.5 type of sliding doors;

51-2.4 General specification:

51-2.4.1 The requirements apply to all side and back doors and door components except for those on folding doors, roll-up doors, detachable doors, and doors that are designated to provide emergency egress.

51-2.4.2 Door latches

51-2.4.2.1 Each hinged door system shall be equipped with at least one primary door latch system.

51-2.4.2.2 Each sliding door system shall be equipped with either:

(a) a primary door latch system, or

(b) a door latch system with a fully latched position and a door closure warning system.

51-2.5 Test Operation:

51-2.5.1 Latch test for load tests one, two and three, force application

51-2.5.1.1 Load test one (as fig 1)

51-2.5.1.1.1 Fully latched position

51-2.5.1.1.1.1 Adapt the test fixture to the mounting provisions of the latch and striker. Align the direction of engagement parallel to the linkage of the fixture. Mount the latch and striker in the fully latched position to the test fixture.

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51-2.5.1.1.1.2 Locate weights to apply a 900 N load tending to separate the latch and striker in the direction of the door opening.

51-2.5.1.1.1.3 Apply the test load, in the direction specified in paragraph 51-2.5.2.1.1 of this Regulation and Figure 4, at a rate not to exceed 5 mm/min until the required load has been achieved. Record the maximum load achieved.

51-2.5.1.1.2 Secondary Latched Position

51-2.5.1.1.2.1 Adapt the test fixture to the mounting provisions of the latch and striker. Align the direction of engagement parallel to the linkage of the fixture. Mount the latch and striker in the secondary latched position to the test fixture.

51-2.5.1.1.2.2 Locate weights to apply a 900 N load tending to separate the latch and striker in the direction of the door opening.

51-2.5.1.1.2.3 Apply the test load, in the direction specified in paragraph 51-2.5.2.1.1 of this Regulation and Figure 4, at a rate not to exceed 5 mm/min until the required load has been achieved. Record the maximum load achieved.

51-2.5.1.1.2.4 The test plate on which the door latch is mounted will have a striker cut-out configuration similar to the environment in which the door latch will be mounted on normal vehicle doors.

51-2.5.1.2 Load Test Two (as fig 2)

51-2.5.1.2.1 Fully Latched Position

51-2.5.1.2.1.1 Adapt the test fixture to the mounting provisions of the latch and striker. Mount the latch and striker in the fully latched position to the test fixture.

51-2.5.1.2.1.2 Apply the test load, in the direction specified in paragraph 51-2.5.2.2.1 of this Regulation and Figure 4, at a rate not to exceed 5 mm/min until the required load has been achieved. Record the maximum load achieved.

51-2.5.1.2.2 Secondary Latched Position

51-2.5.1.2.2.1 Adapt the test fixture to the mounting provisions of the latch and striker. Mount the latch and striker in the secondary latched position to the test fixture.

51-2.5.1.2.2.2 Apply the test load, in the direction specified in paragraph 51-2.5.2.2.1 of this Regulation and Figure 4, at a rate not to exceed 5 mm/min until the required load has been achieved. Record the maximum load achieved.

51-2.5.1.3 Load Test Three (For doors that open in a vertical direction, as fig 3)

51-2.5.1.3.1 Adapt the test fixture to the mounting provisions of the latch and striker. Mount the latch and striker in the fully latched position to the test fixture.

51-2.5.1.3.2 Apply the test load, in the direction specified in paragraph 51-2.5.2.3. of this Regulation and Figure 4, at a rate not to exceed 5 mm/min until the required load has been achieved. Record the maximum load achieved.

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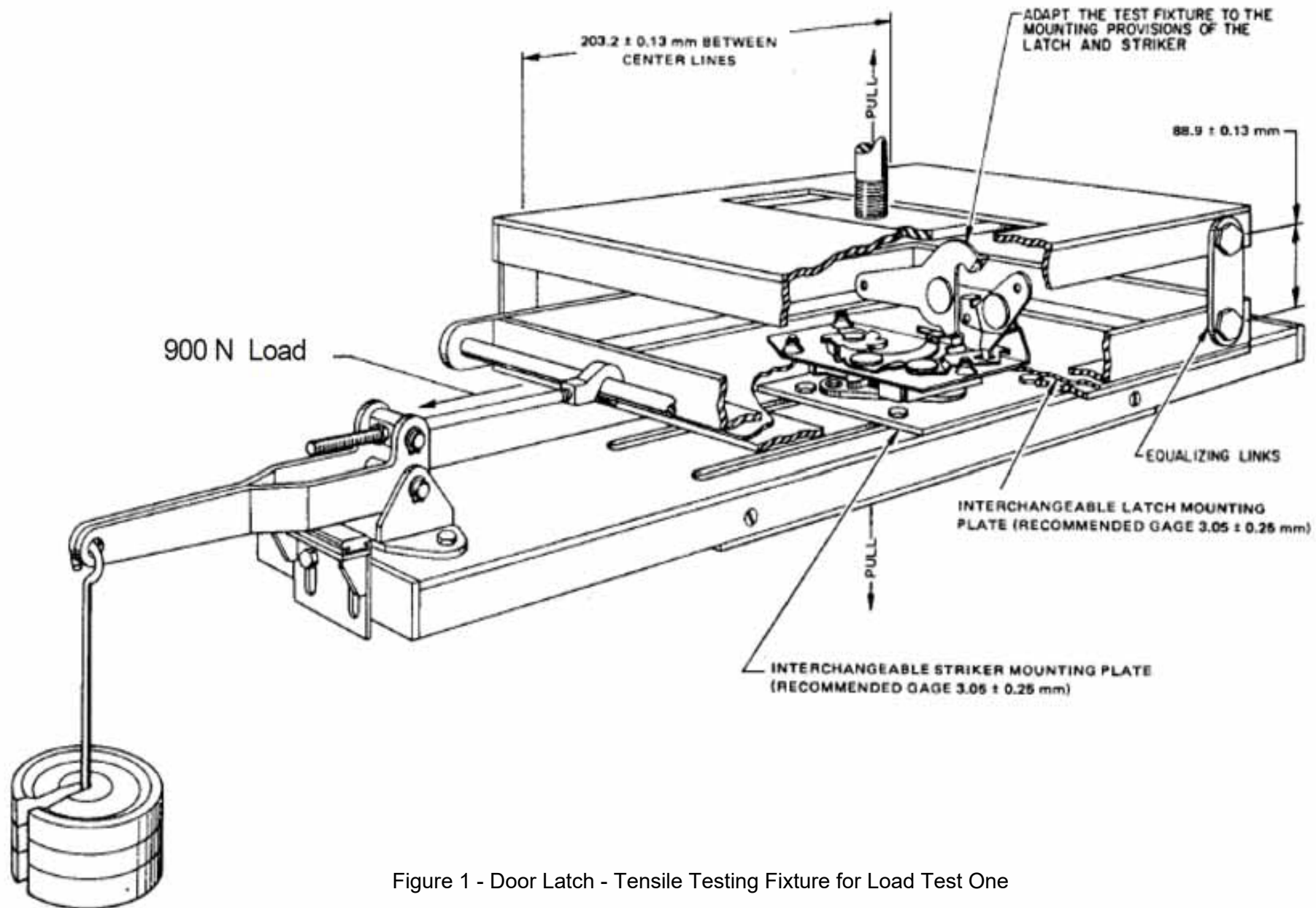


Figure 1 - Door Latch - Tensile Testing Fixture for Load Test One

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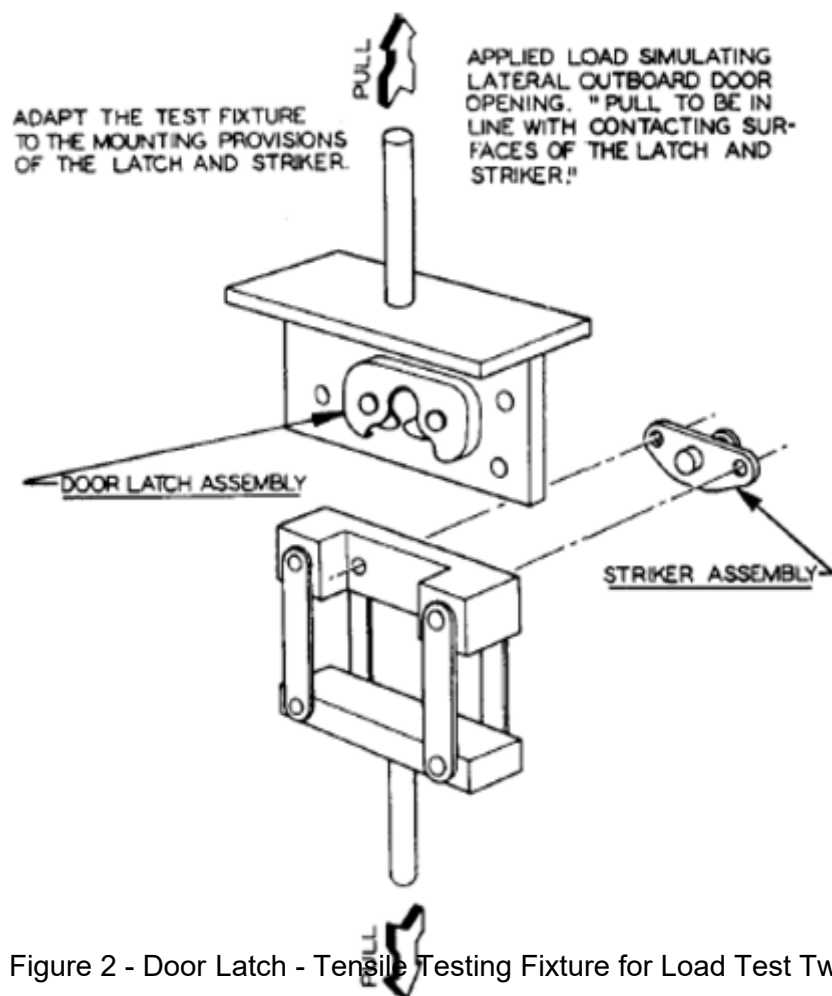


Figure 2 - Door Latch - Tensile Testing Fixture for Load Test Two

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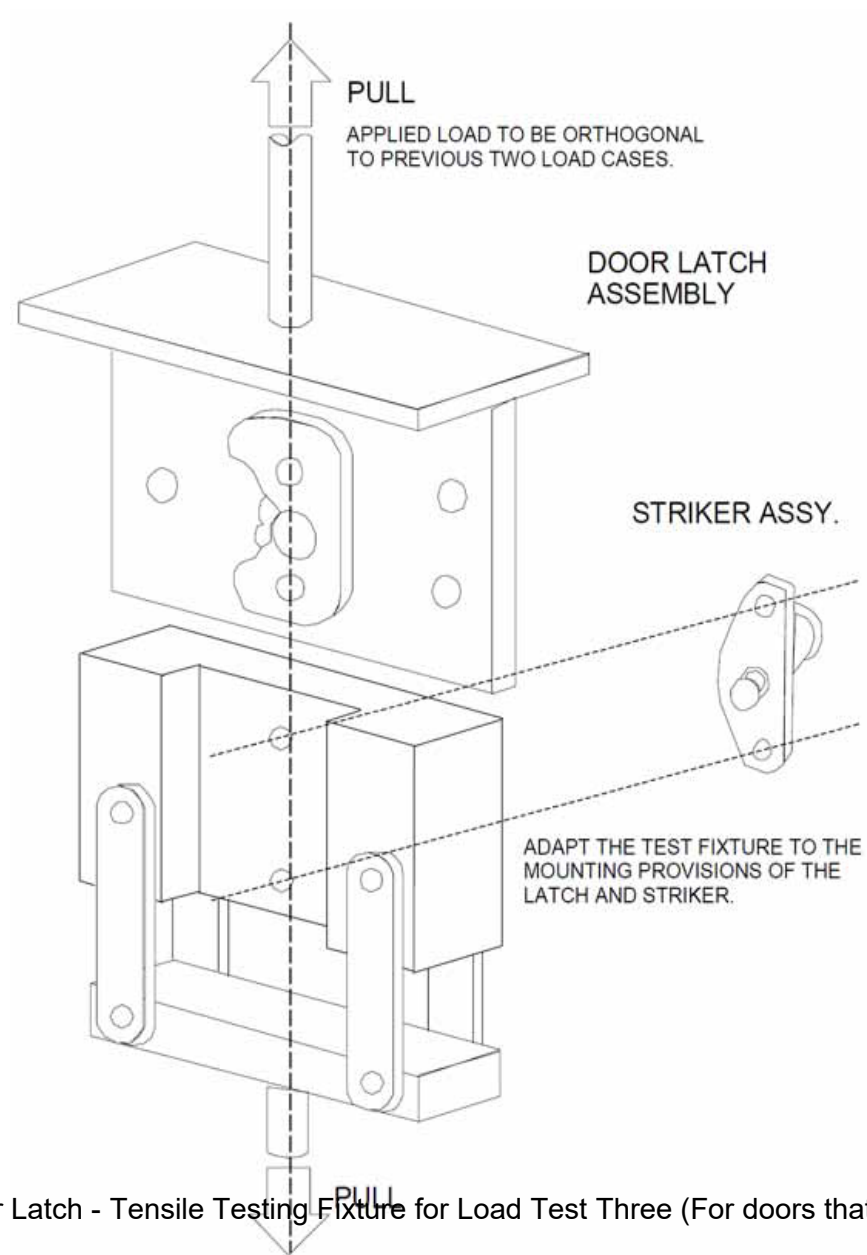


Figure 3 - Door Latch - Tensile Testing Fixture for Load Test Three (For doors that open in a vertical direction)

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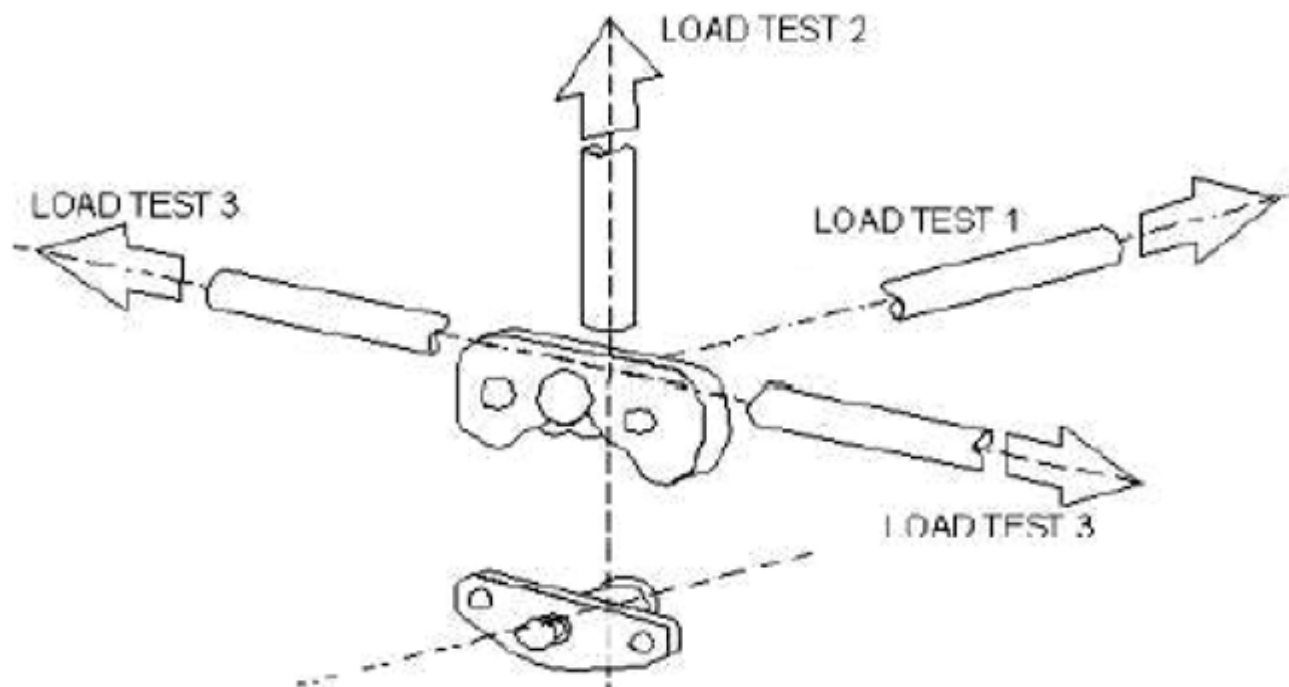


Figure 4 - Door Static Load Test Directions

## 51-2.5.2 Performance Requirements

### 51-2.5.2.1 Load Test One

51-2.5.2.1.1 Each primary door latch system and auxiliary door latch system, when in the fully latched position, shall not separate when a load of 11,000 N is applied in the direction perpendicular to the face of the latch such that the latch and the striker anchorage are not compressed against each other.

51-2.5.2.1.2 When in the secondary latched position, the primary latch system shall not separate when a load of 4,500 N is applied.

### 51-2.5.2.2 Load Test Two

51-2.5.2.2.1 Each primary door latch system and auxiliary door latch system, when in the fully latched position, shall not separate when a load of 9,000 N is applied in the fork-bolt opening direction and parallel to the face of the latch.

51-2.5.2.2.2 When in the secondary latched position, the primary latch system shall not separate when a load of 4,500 N is

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applied.

#### 51-2.5.2.3 Load Test Three (applicable to doors that open in a vertical direction)

51-2.5.2.3.1 Each primary door latch system shall not disengage from the fully latched position when a vertical load of 9,000 N is applied in the direction of the axis of the hinge pin.

#### 51-2.5.3 Inertial test procedures

##### 51-2.5.3.1 Option 1, Calculation

51-2.5.3.1.1 The procedure described in this annex provides a means for analytically determining the ability of a door latch system to withstand inertial loading. Spring forces are the average of the minimum spring output in the installed position and the minimum spring output in the release position. Friction effects and work to be done are not considered in the calculations. Gravitational pull on components may also be omitted if it tends to restrict unlatching. These omissions from the calculations are permissible because they provide additional factors of safety.

51-2.5.3.1.2 Calculation Consideration - Each component or subassembly can be calculated for its minimum inertial load resistance in a particular direction. Their combined resistance to the unlatching operation must assure that the door latch system (when properly assembled in the vehicle door) will remain latched when subjected to an inertial load of 30 g in any direction. Figure 5 is an example of the components and combinations of components to be considered.

##### 51-2.5.3.2 Option 2, Full Vehicle Dynamic Test

###### 51-2.5.3.2.1 Test Setup

51-2.5.3.2.1.1 Rigidly secure the full vehicle or vehicle body in white to a device that when accelerated together will assure that all points on the crash pulse curve are within the corridor defined in Table 1 and Figure 6.

51-2.5.3.2.1.2 The doors may be tethered to avoid damaging the equipment used to record door opening.

51-2.5.3.2.1.3 Install the equipment used to record door opening.

51-2.5.3.2.1.4 Close the door(s) to be tested and ensure that the door latch(es) are in the fully-latched position, that the door(s) are unlocked, and that all windows, if provided, are closed.

###### 51-2.5.3.2.2 Test Directions (see Figure 7)

51-2.5.3.2.2.1 Longitudinal Setup 1. Orient the vehicle or body in white so that its longitudinal axis is aligned with the axis of the acceleration device, simulating a frontal impact.

51-2.5.3.2.2.2 Longitudinal Setup 2. Orient the vehicle or body in white so that its longitudinal axis is aligned with the axis of the acceleration device, simulating a rear impact.

51-2.5.3.2.2.3 Transverse Setup 1. Orient the vehicle or body in white so that its transverse axis is aligned with the axis of the acceleration device, simulating a driver-side impact.

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51-2.5.3.2.2.4 Transverse Setup 2 (Only for vehicles having different door arrangements on each side). Orient the vehicle or body in white so that its transverse axis is aligned with the axis of the acceleration device, simulating a side impact in the direction opposite.

#### 51-2.5.3.3 Option 3, Door Dynamic Test

##### 51-2.5.3.3.1 Test Setup

51-2.5.3.3.1.1 Mount the door assemblies either separately or combined to the test fixture. Each door and striker should be mounted to correspond to its orientation on the vehicle and to the direction required for inertial load tests.

51-2.5.3.3.1.2 Mount the test fixture to the acceleration device.

51-2.5.3.3.1.3 Install the equipment used to record door opening.

51-2.5.3.3.1.4 Ensure that the door latch is in the fully-latched position, that the door is tethered, unlocked, and that the window, if provided, is closed.

##### 51-2.5.3.3.2 Test Directions (see Figure 7)

51-2.5.3.3.2.1 Longitudinal Setup 1. Orient the door subsystem(s) on the acceleration device in the direction of a frontal impact.

51-2.5.3.3.2.2 Longitudinal Setup 2. Orient the door subsystem(s) on the acceleration device in the direction of a rear impact.

51-2.5.3.3.2.3 Transverse Setup 1. Orient the door subsystem(s) on the acceleration device in the direction of a driver-side impact.

51-2.5.3.3.2.4 Transverse Setup 2. Orient the door subsystem(s) on the acceleration device in the direction opposite to that described in paragraph 51-2.5.3.3.2.3.

51-2.5.3.3.2.5 Vertical Setup 1. (Applicable to doors that open in a vertical direction). Orient the door subsystem(s) on the acceleration device so that its vertical axis (when mounted in a vehicle) is aligned with the axis of the acceleration device, simulating a rollover impact where the force is applied in the direction from the top to the bottom of the door (when mounted in a vehicle).

51-2.5.3.3.2.6 Vertical Setup 2. (Applicable to doors that open in a vertical direction). Orient the door subsystem(s) on the acceleration device so that its vertical axis (when mounted in a vehicle) is aligned with the axis of the acceleration device, simulating a rollover impact where the force is applied in the direction opposite.

##### 51-2.5.3.4 Test Operation for Options 2 and 3

51-2.5.3.4.1 A minimum acceleration level of 30 g shall be maintained over a period of at least 30ms, while keeping the acceleration within the pulse corridor as defined in Table 1 and graphically shown in Figure 6.

51-2.5.3.4.2 Accelerate the test fixture(s) in the following directions:

51-2.5.3.4.2.1 For Option 2 tests:

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- 51-2.5.3.4.2.1.1 In the direction specified in paragraph 51-2.5.3.2.2.1.
- 51-2.5.3.4.2.1.2 In the direction specified in paragraph 51-2.5.3.2.2.2.
- 51-2.5.3.4.2.1.3 In the direction specified in paragraph 51-2.5.3.2.2.3.
- 51-2.5.3.4.2.1.4 In the direction specified in paragraph 51-2.5.3.2.2.4.
- 51-2.5.3.4.2.2 For Option 3 tests:
  - 51-2.5.3.4.2.2.1 In the direction specified in paragraph 51-2.5.3.3.2.1.
  - 51-2.5.3.4.2.2.2 In the direction specified in paragraph 51-2.5.3.3.2.2.
  - 51-2.5.3.4.2.2.3 In the direction specified in paragraph 51-2.5.3.3.2.3.
  - 51-2.5.3.4.2.2.4 In the direction specified in paragraph 51-2.5.3.3.2.4.
  - 51-2.5.3.4.2.2.5 In the direction specified in paragraph 51-2.5.3.3.2.5.
  - 51-2.5.3.4.2.2.6 In the direction specified in paragraph 51-2.5.3.3.2.6.
- 51-2.5.3.4.3 If at any point in time the pulse exceeds 36 g and the test requirements are fulfilled, the test shall be considered valid.
- 51-2.5.3.4.4 Ensure that the door did not open and close during the test.

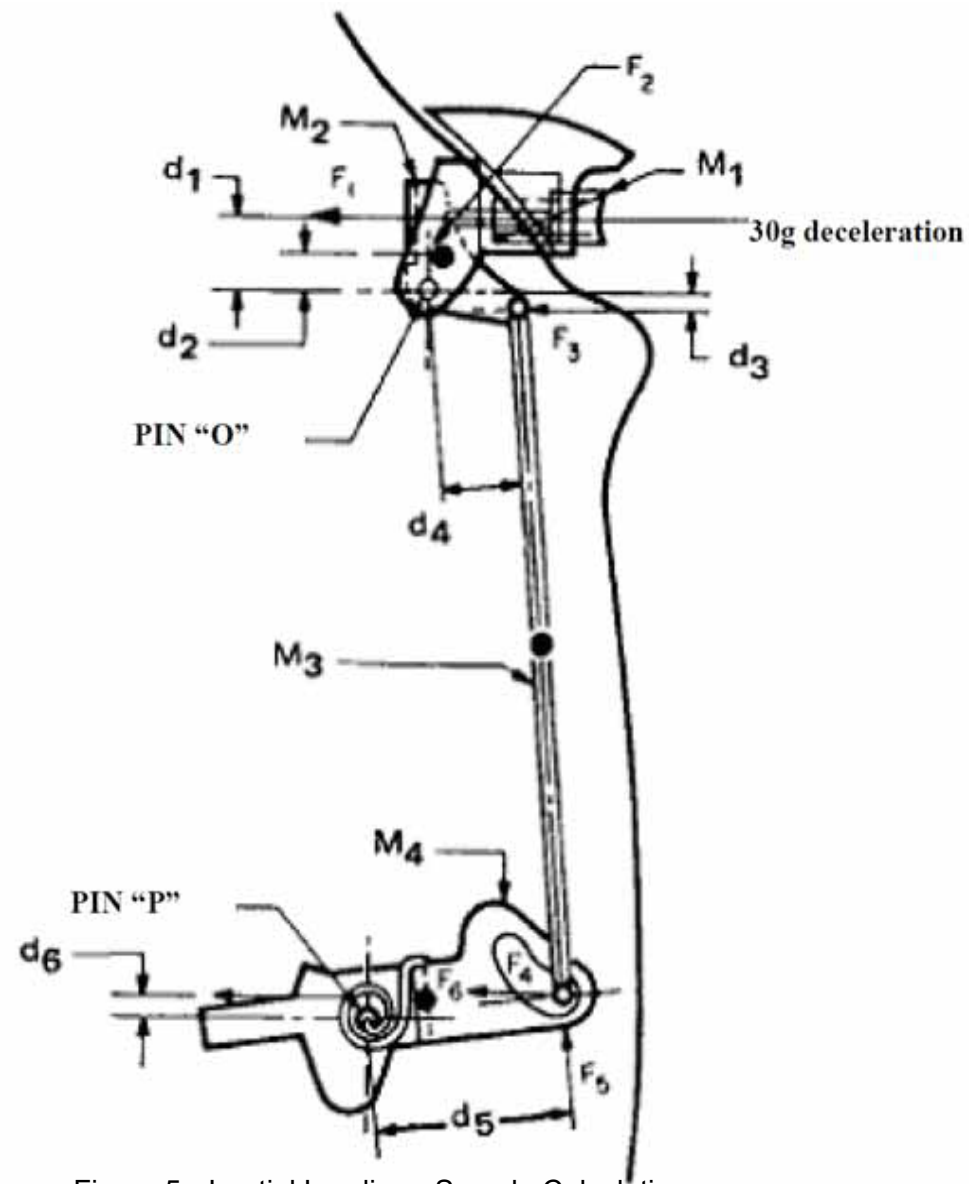


Figure 5 - Inertial Loading - Sample Calculation  
 ● denotes the cg of component

Given:

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Door latch system subjected to a 30g deceleration  
 Average Push-Button Spring Output Force = 0.459kgf  
 Pawl Spring Output Torque = 0.0459kgf m  
 $a = 30g \text{ (m/s}^2\text{)}$   
 $F = ma = m \cdot 30g = m \cdot 294.2$   
 $M1 = 0.0163\text{kg}$   
 $M2 = 0.0227\text{kg}$   
 $M3 = 0.0122\text{kg}$   
 $M4 = 0.0422\text{kg}$   
 $d1 = 31.50\text{mm}$   
 $d2 = 10.67\text{mm}$   
 $d3 = 4.83\text{mm}$   
 $d4 = 31.50\text{mm}$   
 $d5 = 37.59\text{mm}$   
 $d6 = 1.90\text{mm}$   
 $F1 = M1 \times a$  - Average load on knob spring =  $(0.0163\text{kg} \times 30g) - 0.459\text{kgf} = 0.03\text{kgf}$   
 $F2 = M2 \times a = 0.0227\text{kg} \times 30g = 0.681\text{kgf}$   
 $F3 = M3/2 \times a = 0.0122\text{kg}/2 \times 30g = 0.183\text{kgf}$   
 $\text{Sigma Mo} = F1 \times d1 + F2 \times d2 - F3 \times d3$   
 $= 0.03 \times 31.5 + 0.681 \times 10.67 - 0.183 \times 4.83$   
 $= 7.33\text{kgf mm}$   
 $F5 = \text{Mo}/d4 = 7.33/31.5 = 0.2328\text{kgf}$   
 $F6 = M4 \times a = 0.0422\text{kg} \times 30g = 1.266\text{kgf}$   
 $\text{Sigma Mo} = \text{Pawl spring output torque} - (F5 d5 + F6 d6)/1000$   
 $= 0.0459 - (0.2328 \times 37.59 + 1.266 \times 1.9)/1000$   
 $= 0.0347\text{kgf m}$

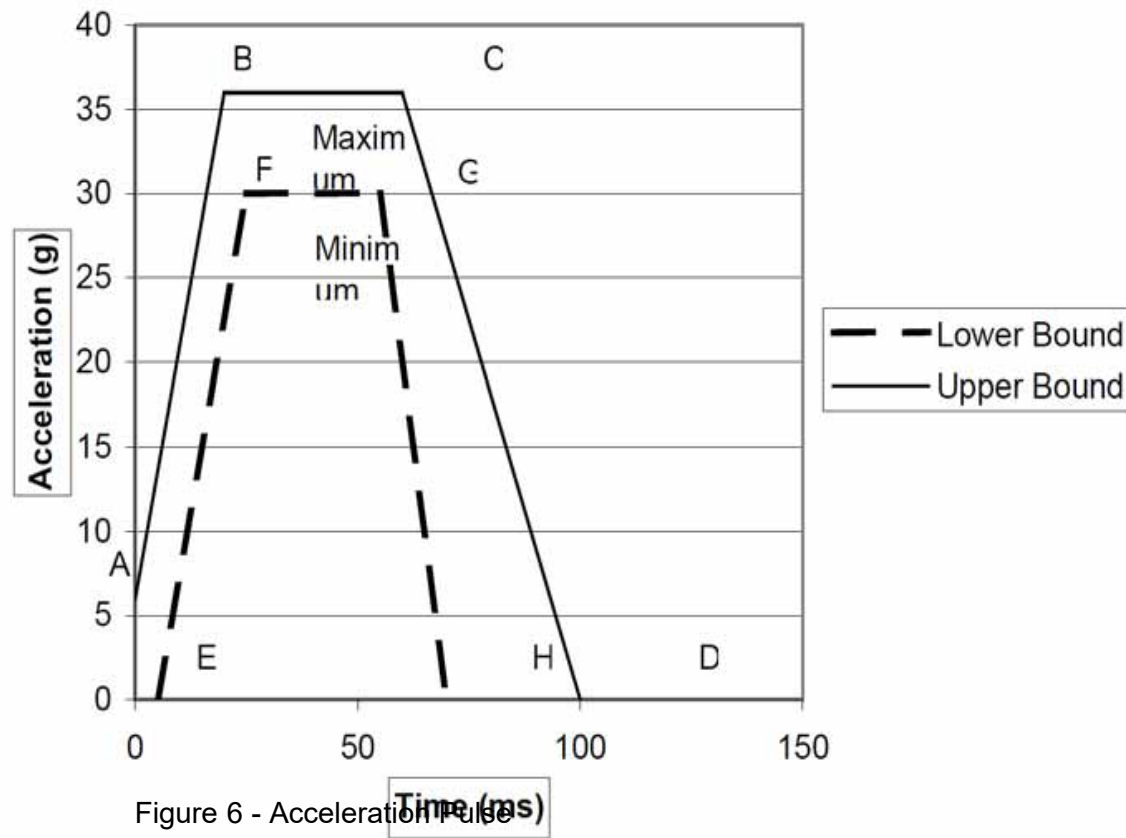
Table 1 - Acceleration Pulse Corridor

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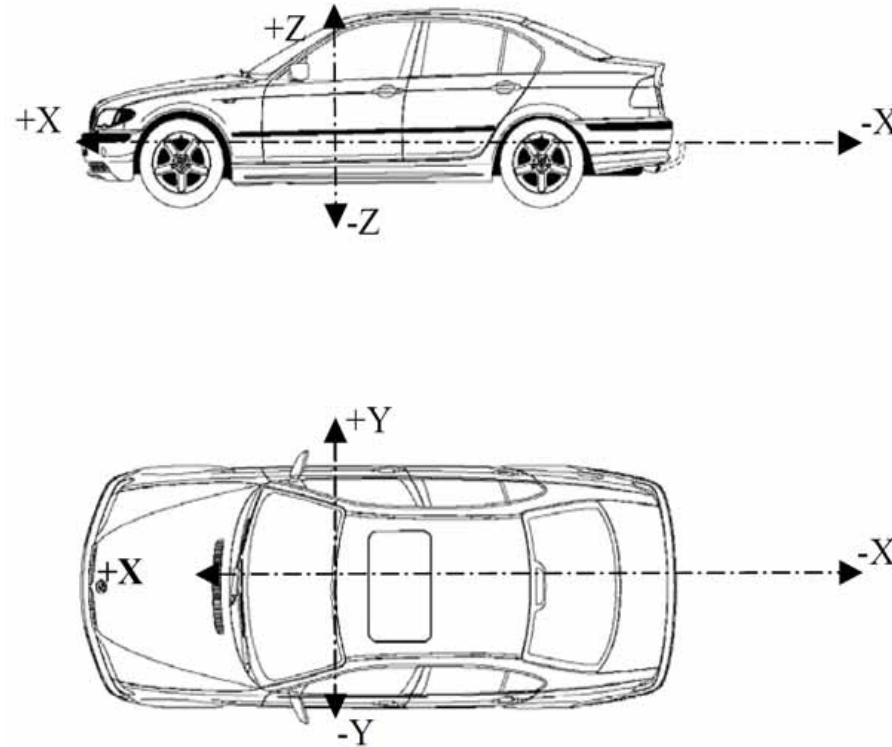
Upper Bound			Lower Bound		
Point	Time (ms)	Acceleration (g)	Point	Time (ms)	Acceleration (g)
A	0	6	E	5	0
B	20	36	F	25	30
C	60	36	G	55	30
D	100	0	H	70	0

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## Acceleration Pulse Corridor



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X = longitudinal direction

Y = transversal direction

Figure Z - Vehicle Coordinate Reference System for Inertial Testing

51-2.5.4 Each primary door latch system and auxiliary door latch system shall meet the dynamic requirements of either paragraphs 51-2.5.4.1. and 51-2.5.4.2. or the calculation of inertial load resistance requirements of paragraph 51-2.5.4.3.

51-2.5.4.1 Each primary door latch system and auxiliary door latch system on each hinged door shall not disengage from the fully latched position when an inertial load of 30 g is applied to the door latch system, including the latch and its activation device, in the directions parallel to the vehicle's longitudinal and transverse axes with the locking device disengaged.

51-2.5.4.2 Each primary door latch system and auxiliary door latch system on each hinged back door shall also not disengage from the

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fully latched position when an inertial load of 30 g is applied to the door latch system, including the latch and its activation device, in the direction parallel to the vehicle's vertical axis, with the locking device disengaged.

51-2.5.4.3 Each component or subassembly can be calculated for its minimum inertial load resistance in a particular direction. The combined resistance to the unlatching operation must assure that the door latch system, when properly assembled in the vehicle door, will remain latched when subjected to an inertial load of 30 g in the vehicle directions specified in paragraphs 51-2.5.4.1. and 51-2.5.4.2.

#### 51-2.5.5 Hinge Test Procedure

##### 51-2.5.5.1 Multiple Hinge System

51-2.5.5.1.1 A typical static test fixture is illustrated in Figure 8.

51-2.5.5.1.1.1 Attach the hinge system to the mounting provision of the test fixture. Hinge attitude must simulate vehicle position (door fully closed) relative to the hinge centreline. For test purposes, the distance between the extreme ends of one hinge in the system to the extreme end of another hinge in the system is to be set at 406 +/- 4 mm. The load is to be applied equidistant between the linear centre of the engaged portions of the hinge pin and through the centreline of the hinge pin in the longitudinal vehicle direction. (see Figure 9).

51-2.5.5.1.1.2 Apply the test load at a rate not to exceed 5 mm/min until the required load has been achieved. Failure consists of a separation of either hinge. Record the maximum load achieved.

##### 51-2.5.5.1.2 Transverse Load Test (as Figure 8)

51-2.5.5.1.2.1 Attach the hinge system to the mounting provisions of the test fixture. Hinge attitude must simulate vehicle position (door fully closed) relative to the hinge centreline. For test purposes, the distance between the extreme ends of one hinge in the system to the extreme opposite end of another hinge in the system is to be set at 406 +/- 4 mm. The load is to be applied equidistant between the linear centre of the engaged portions of the hinge pins and through the centreline of the hinge pin in the transverse vehicle direction. (see Figure 9).

51-2.5.5.1.2.2 Apply the test load at a rate not to exceed 5 mm/min until the required load has been achieved. Failure consists of a separation of either hinge. Record the maximum load achieved.

##### 51-2.5.5.1.3 Vertical Load Test (For doors that open in the vertical direction, as Figure 8)

51-2.5.5.1.3.1 Attach the hinge system to the mounting provisions of the test fixture. Hinge attitude must simulate vehicle position (door fully closed) relative to the hinge centreline. For test purposes, the distance between the extreme ends of one hinge in the system to the extreme opposite end of another hinge in the system is to be set at 406 +/- 4 mm. The load is to be applied through the centreline of the hinge pin in a direction orthogonal to the longitudinal and transverse loads. (see Figure 5-2).

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- 51-2.5.5.1.3.2 Apply the test load at a rate not to exceed 5 mm/min until the required load has been achieved. Failure consists of a separation of either hinge. Record the maximum load achieved.
- 51-2.5.5.2 Single Hinge Evaluation. In some circumstances, it may be necessary to test the individual hinges of a hinge system. In such cases, the results for an individual hinge, when tested in accordance with the procedures below, shall be such as to indicate that system requirements in paragraph 51-2.5.6.1. of this Regulation are met. (For example, an individual hinge in a two-hinge system must be capable of withstanding 50 per cent of the load requirements of the total system.)
- 51-2.5.5.2.1 Longitudinal Load. Attach the hinge system to the mounting provision of the test fixture. Hinge attitude must simulate the vehicle position (door fully closed) relative to the hinge centreline. For test purposes, the load is to be applied equidistant between the linear centre of the engaged portions of the hinge pin and through the centreline of the hinge pin in the longitudinal vehicle direction. Apply the test load at a rate not to exceed 5 mm/ min until the required load has been achieved. Failure consists of a separation of either hinge. Record the maximum load achieved.
- 51-2.5.5.2.2 Transverse Load. Attach the hinge system to the mounting provision of the test fixture. Hinge attitude must simulate the vehicle position (door fully closed) relative to the hinge centreline. For test purposes, the load is to be applied equidistant between the linear centre of the engaged positions of the hinge pin and through the centreline of the hinge pin in the transverse vehicle direction. Apply the test load at a rate not to exceed 5 mm/ min until the required load is achieved. Failure consists of a separation of either hinge. Record the maximum load achieved.
- 51-2.5.5.2.3 Vertical Load. Attach the hinge system to the mounting provision of the test fixture. Hinge attitude must simulate the vehicle position (door fully closed) relative to the hinge centreline. For test purposes, the load is to be applied centreline of the hinge pin in a direction orthogonal to the longitudinal and transverse loads. Apply the test load at a rate not to exceed 5 mm/min until the required load is achieved. Failure consists of a separation of either hinge. Record the maximum load achieved.
- 51-2.5.5.3 For piano-type hinges, the hinge spacing requirements are not applicable and arrangement of the test fixture is altered so that the test forces are applied to the complete hinge.

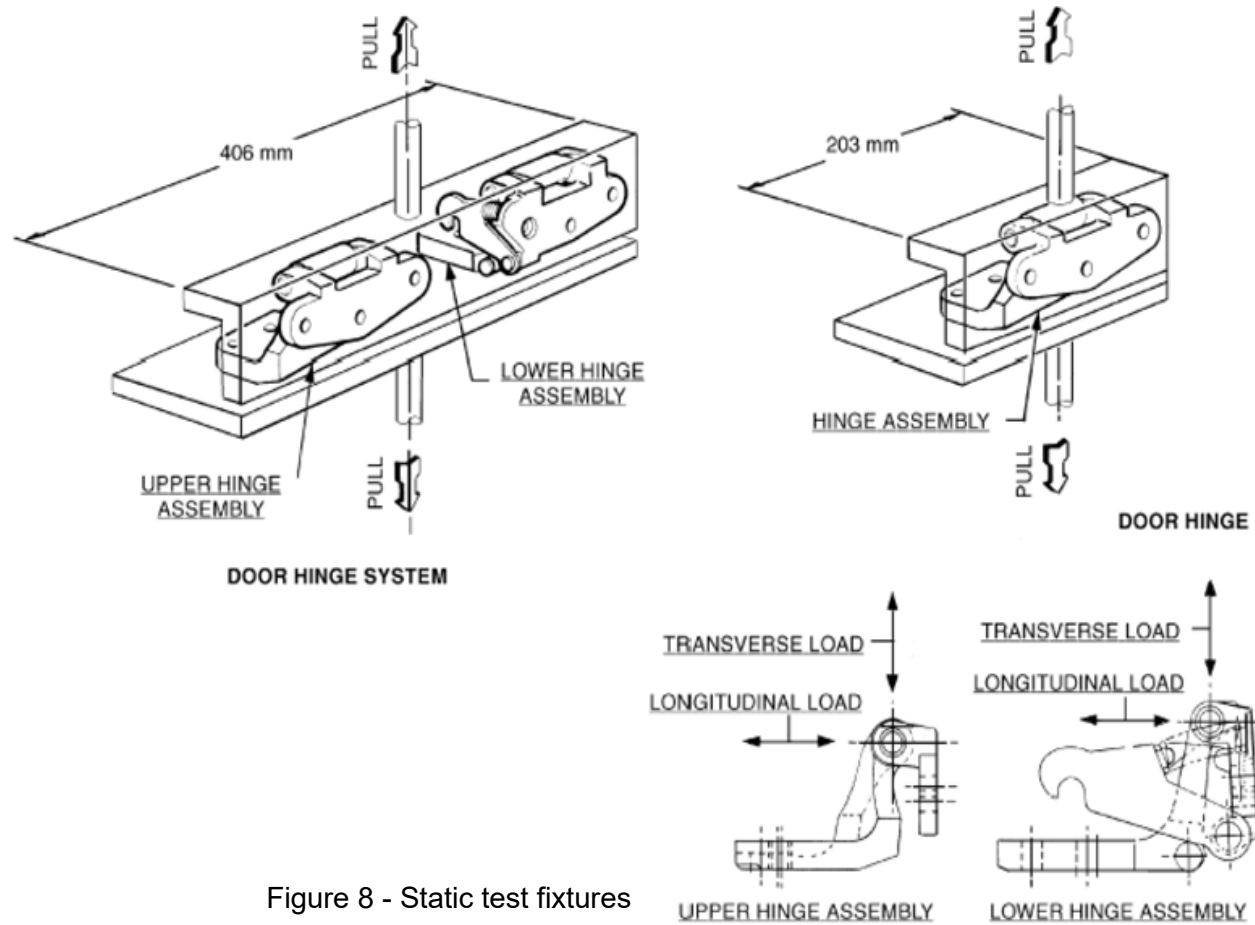


Figure 8 - Static test fixtures

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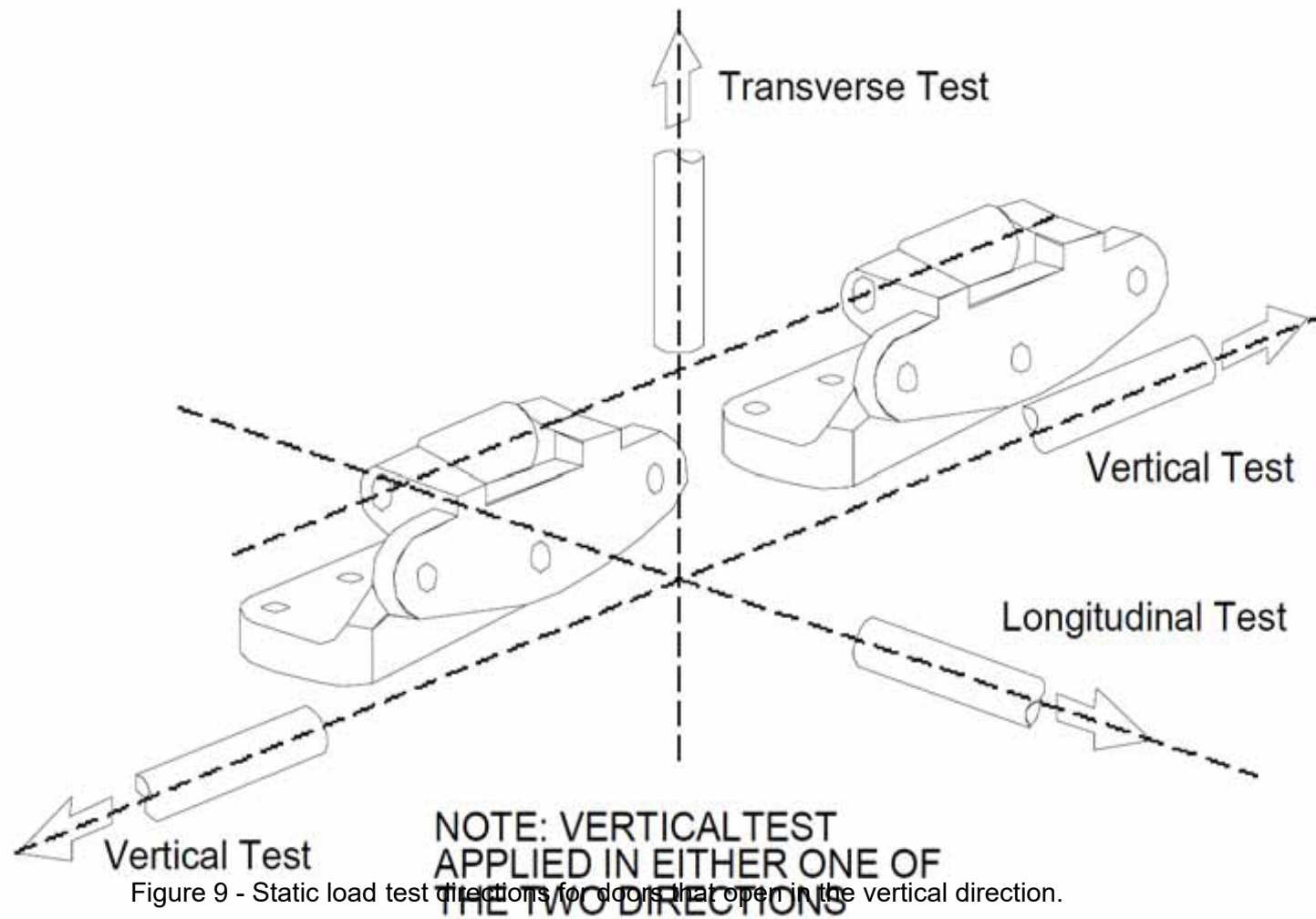


Figure 9 - Static load test directions for doors that open in the vertical direction.

#### 51-2.5.6 Door Hinges Performance Requirements

51-2.5.6.1 Each door hinge system shall:

- (a) support the door,
- (b) not separate when a longitudinal load of 11,000 N is applied,
- (c) not separate when a transverse load of 9,000 N is applied, and

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(d) On doors which open in a vertical direction, not separate when a vertical load of 9,000 N is applied.

51-2.5.6.2 All tests required by paragraph 51-2.5.5.

51-2.5.6.3 If a single hinge within the hinge system is tested instead of the entire hinge system, the hinge must bear a load proportional to the total number of hinges in the hinge system.

51-2.5.6.4 On side doors with rear mounted hinges that can be operated independently of other doors,

(a) the interior door handle shall be inoperative when the speed of the vehicle is greater than or equal to 4 km/h, and

(b) a door closure warning system shall be provided for those doors.

51-2.5.7 Sliding Side Doors Load Test

Load test is in accordance with 51-2.5.1.1 and 51-2.5.1.2.

51-2.5.8 Sliding Side Doors Performance Requirements

51-2.5.8.1 Load Test One

51-2.5.8.1.1 At least one door latch system, when in the fully latched position, shall not separate when a load of 11,000 N is applied in the direction perpendicular to the face of the latch.

51-2.5.8.1.2 In the case of a primary door latch system, when in the secondary latched position, the door latch system shall not separate when a load of 4,500 N.

51-2.5.8.2 Load Test Two

51-2.5.8.2.1 At least one door latch system, when in the fully latched position, shall not separate when a load of 9,000 N is applied in the direction of the fork-bolt opening and parallel to the face of the latch.

51-2.5.8.2.2 In the case of a primary door latch system, when in the secondary latched position, the primary latch system shall not separate when a load of 4,500 N.

51-2.5.9 Sliding Side Door Load Test

Load test is in accordance with 51-2.5.3.

51-2.5.10 Sliding Side Door Performance Requirements

Each door latch system meeting the requirements of paragraphs 51-2.5.8.1. and 51-2.5.8.2. shall meet the dynamic requirements of either paragraph 51-2.5.10.1. or the calculation of inertial requirements of paragraph 51-2.5.10.2.

51-2.5.10.1 The door latch system shall not disengage from the fully latched position when an inertial load of 30 g is applied to the door latch system, including the latch and its activation device, in the directions parallel to the vehicle's longitudinal and transversal axes with the locking device disengaged.

51-2.5.10.2 The minimum inertial load resistance can be calculated for each component or subassembly. Their combined resistance to the unlatching operation must assure that the door latch system, when properly assembled in the vehicle door, will remain

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latched when subjected to an inertial load of 30 g in the direction orthogonal to the longitudinal and transverse of the vehicle.

#### 51-2.5.11 Sliding Side Door: Full Door Test

##### 51-2.5.11.1 General Provisions

51-2.5.11.1.1 Tests are conducted using a full vehicle or a body in white with the sliding door and its retention components.

51-2.5.11.1.2 The test is conducted using two force application devices capable of applying the outward transverse forces specified in paragraph 51-2.5.1.2. of this Regulation. The force application system shall include the following:

51-2.5.11.1.2.1 Two force application plates.

51-2.5.11.1.2.2 Two force application devices capable of applying the outward transverse load requirements for a minimum displacement of 300 mm.

51-2.5.11.1.2.3 Two load cells of sufficient capacity to measure the applied loads.

51-2.5.11.1.2.4 Two linear displacement measurement devices required for measuring force application device displacement during the test.

51-2.5.11.1.2.5 Equipment for measuring at least 100 mm of separation between the interior of the door and the exterior edge of the doorframe, while respecting all relevant safety and health requirements.

##### 51-2.5.11.2 Test Setup

51-2.5.11.2.1 Remove all interior trim and decorative components from the sliding door assembly.

51-2.5.11.2.2 Remove seats and any interior components that may interfere with the mounting and operation of the test equipment and all pillar trim and any non-structural components that overlap the door and cause improper placement of the force application plates.

51-2.5.11.2.3 Mount the force application devices and associated support structure to the floor of the test vehicle. Each force application device and associated support structure is rigidly fixed on a horizontal surface on the vehicle floor, while applying the loads.

51-2.5.11.2.4 Determine the forward and aft edge of the sliding door, or its adjoining vehicle structure, that contains a latch/striker.

51-2.5.11.2.5 Close the sliding door, ensuring that all door retention components are fully engaged.

51-2.5.11.2.6 For any tested door edge that contains one latch/striker, the following setup procedures are used:

51-2.5.11.2.6.1 The force application plate is 150 mm in length, and 50 mm in width, and at least 15 mm in thickness. The plate edges are rounded to a radius of 6 mm +/- 1 mm.

51-2.5.11.2.6.2 Place the force application device and force application plate against the door so that the applied force is horizontal and normal to the vehicle's longitudinal centreline, and vertically centred on the door-mounted portion

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of the latch/striker.

51-2.5.11.2.6.3 The force application plate is positioned such that the long edge of the plate is as close to, and parallel to, the interior edge of the door as possible, but not such that the forward edge of the plate is more than 12.5 mm from the interior edge.

51-2.5.11.2.7 For any tested door edge that contains more than one latch/striker, the following setup procedures are used:

51-2.5.11.2.7.1 The force application plate is 300 mm in length, and 50 mm in width, and at least 15 mm in thickness. The plate edges are rounded to a radius of 6 mm +/- 1 mm.

51-2.5.11.2.7.2 Place the force application device and force application plate against the door so that the applied force is horizontal and normal to the vehicle's longitudinal centreline, and vertically centred on a point mid-way between the outermost edges of the latch/striker assemblies.

51-2.5.11.2.7.3 The force application plate is positioned such that the long edge of the plate is as close to, and parallel to, the interior edge of the door as possible, but not such that the forward edge of the plate is more than 12.5 mm from the interior edge.

51-2.5.11.2.8 For any tested door edge that does not contain at least one latch/striker, the following setup procedures are used:

51-2.5.11.2.8.1 The force application plate is 300 mm in length, 50 mm in width, and at least 15 mm in thickness.

51-2.5.11.2.8.2 Place the force application device and force application plate against the door so that the applied force is horizontal and normal to the vehicle's longitudinal centreline, and vertically centred on a point mid-way along the length of the door edge ensuring that the loading device avoids contact with the window glazing.

51-2.5.11.2.8.3 The force application plate is positioned as close to the edge of the door as possible. It is not necessary for the force application plate to be vertical.

51-2.5.11.2.9 The door is unlocked. No extra fixtures or components may be welded or affixed to the sliding side door or any of its components.

51-2.5.11.2.10 Attach any equipment used for measuring door separation that will be used to determine separation levels during the test procedure.

51-2.5.11.2.11 Place the load application structure so that the force application plates are in contact with the interior of the sliding door.

### 51-2.5.11.3 Test Procedure

51-2.5.11.3.1 Move each force application device at a rate up to 2,000 N per minute, as specified by the manufacturer, until a force of 9,000 N is achieved on each force application device or until either force application device reaches a total displacement of 300 mm.

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- 51-2.5.11.3.2 If one of the force application devices reaches the target force of 9,000 N prior to the other, maintain the 9,000 N force with that force application device until the second force application device reaches the 9,000 N force.
- 51-2.5.11.3.3 Once both force application devices have achieved 9,000 N each, stop forward movement of the force application devices and hold under the resulting load for a minimum of 10 seconds.
- 51-2.5.11.3.4 Maintain the force application device position of paragraph 51-2.4.3., and within 60 seconds, measure the separation between the exterior edge of the doorframe and the interior of the door along the perimeter of the door.



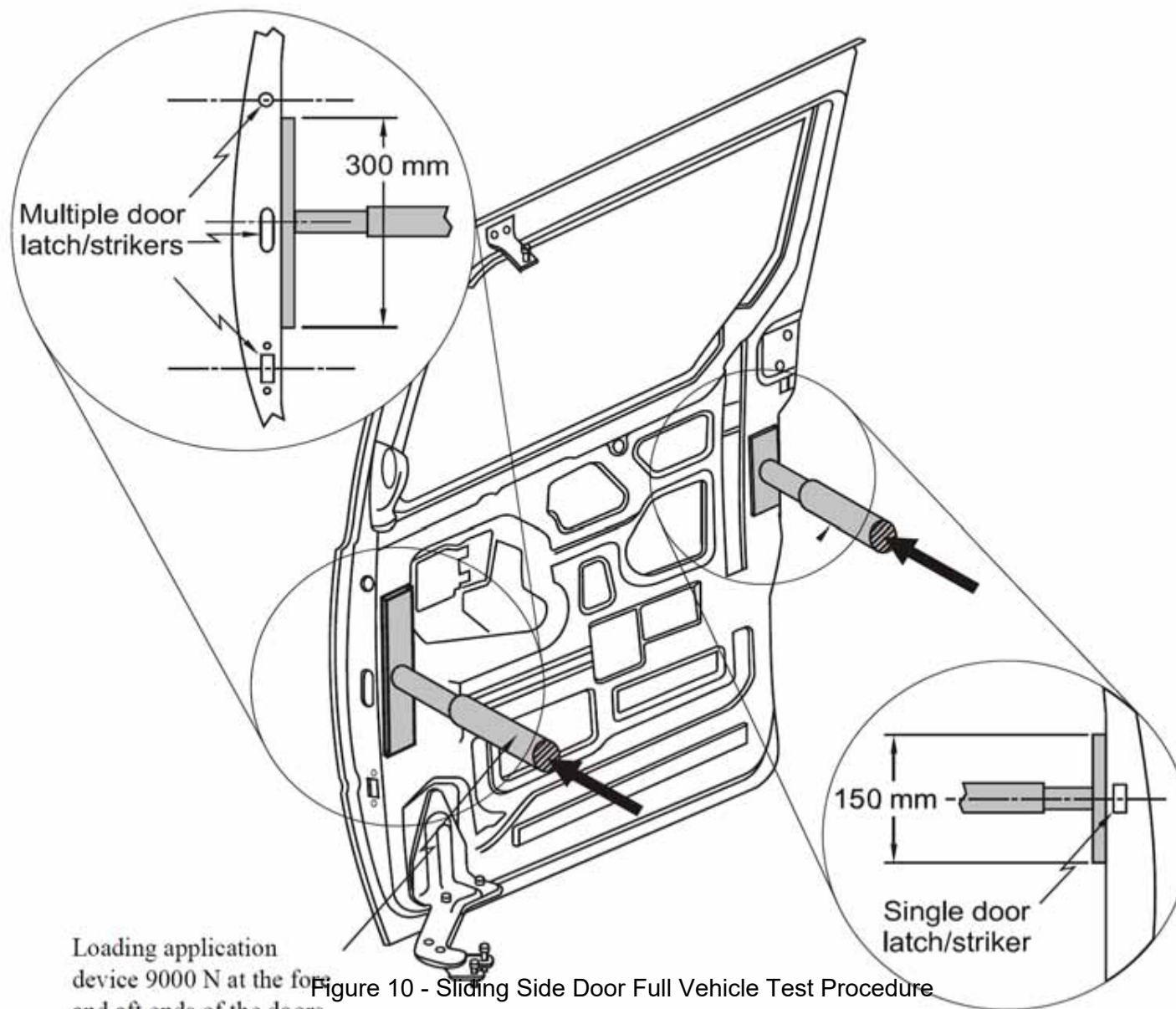


Figure 10 - Sliding Side Door Full Vehicle Test Procedure

#### 51-2.5.12 Sliding Side Door: Full Door System Performance Requirements

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51-2.5.12.1 The track and slide combination or other supporting means for each sliding door, while in the closed fully latched position, shall not separate from the door frame when a total force of 18,000 N along the vehicle transverse axis is applied to the door.

51-2.5.12.2 The sliding door fails this requirement if any one of the following occurs:

51-2.5.12.2.1 A separation which permits a sphere with a diameter of 100 mm to pass unobstructed from the interior of the vehicle to the exterior of the vehicle, while the required force is maintained.

51-2.5.12.2.2 Either force application device reaches a total displacement of 300 mm.

#### 51-2.5.13 Door Locks

51-2.5.13.1 Each door shall be equipped with at least one locking device which, when engaged, shall prevent operation of the exterior door handle or other exterior latch release control and which has an operating means and a lock release/engagement device located within the interior of the vehicle.

51-2.5.13.1.1 If fitted, a full locking system may only be activated when the ignition key is not in the engine running mode (or the electric vehicles is not in the running mode) and shall be installed in combination with at least one of the following measures:

(a) An alarm system with interior detection or other equipment which is able to detect an occupant's movement. The setting of the full locking system shall be prohibited where an occupant's movement is detected within the passenger compartment; or

(b) An acoustic warning device (e.g. horn) which can be activated from the interior of the vehicle in case that the ignition is switched off (or the electric vehicles is not in the running mode) and the full locking system is activated.

#### 51-2.5.13.2 Rear side doors.

Each rear side door shall be equipped with at least one locking device which, when engaged, prevents operation of the interior door handle or other interior latch release control and requires separate actions to unlock the door and operate the interior door handle or other interior latch release control.

51-2.5.13.2.1 Based on a determination by each Contracting Party or regional economic integration organization, the locking device may be a:

(a) child safety lock system, or

(b) lock release/engagement device located within the interior of the vehicle and readily accessible to the driver of the vehicle or an occupant seated adjacent to the door.

51-2.5.13.2.2 Either system described in paragraph 51-2.5.13.2.1. (a) and (b) shall be permitted as an additional locking feature.

#### 51-2.5.13.3 Back doors

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Each back door equipped with an interior door handle or other interior latch release control, shall be equipped with at least one locking device located within the interior of the vehicle which, when engaged, prevents operation of the interior door handle or other interior latch release control and requires separate actions to unlock the door and operate the interior door handle or other interior latch release control.