



Static Test of the Tie-Down Eyelets Cargo Shift Protection

1 Introduction

Note: Nothing in this standard supercedes applicable laws and regulations.

Note: In the event of conflict between the English and domestic language, the English language shall take precedence.

1.1 Purpose. To evaluate the load capacity of the cargo securing eyelets for fastening of the cargo in wagons, multipurpose passenger vehicles, vans, and pickups.

1.2 Applicability. The test procedure set forth in this document is applicable to all cargo carrying capable GM vehicles. The target test values may have some regional differentiation, and, therefore, may apply to the region in which the vehicle is marketed. The Designing Engineer should refer to the program specific Vehicle Technical Specifications (VTS) and/or the program specific Subsystem Technical Specifications (SSTS) for actual test requirements. The Designing Engineer should refer to the specific regional laws which govern the product performance of a cargo shift protection. This test procedure is intended to aid in validation of passenger vehicles such as: notchbacks, hatchbacks, wagons, multi-purpose sport utility vehicles, pickups, delivery vans and light commercial vehicles.

This test may apply, but is not limited to DIN 75410-1, ISO 27955 "Lashing Points", and ISO 27956 "Lashing Points".

1.3 Remarks. This test procedure helps to ensure that the provisions made for the securing of cargo in motor vehicles, is safe in traffic and operation.

All values given in this test procedure were valid at the date of issue. For the actual values refer to the newest editions of the standards mentioned in 2.1.

2 References

Note: Only the latest approved standards are applicable unless otherwise specified.

2.1 External Standards/Specifications.

DIN 75410-1 ISO 27955 ISO 27956

2.2 GM Standards/Specifications.

None

2.3 Additional References.

- CG2556 Program specific Structures Subsystem Technical Specifications (SSTS) (ID)
- Vehicle Technical Specifications (VTS)

(ID) = This standard is limited to internal distribution within General Motors and shall not be distributed outside this company. Contact the GM Lead Engineer for further instructions.

3 Resources

The conditions for a correct realization of the test procedures are defined in the standards and its appendices in Section 2. The described test procedure installation or a demonstrably comparable one shall be used.

The facilities and equipment listed contribute to a test conduction in accordance with the requirements stated in the standards and allow an evaluation exceeding the requirements pursuant to the actual state of the art.

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3.1 Facilities. An approved test laboratory with an adequate bedplate or equivalent surface for mounting test samples and associated fixtures. Hydraulic multiple-cylinder push/pull system.

3.1.1 Calibration. The test facilities and equipment shall be in good working order and shall have a valid calibration label.

3.1.2 Alternatives. Alternative test facilities and equipment may also be used. However, all measuring variables as specified in this standard shall be determined correctly with respect to their physical definition.

3.2 Equipment.

3.2.1 Electronic instrumentation and equipment to record and process the sensor data or equivalent measurement device.

3.2.2 Computer system and software to evaluate and save data.

3.2.3 Video cameras to take film shots as required.

3.2.4 If maximum displacement is specified in the SSTS or test request, then a displacement measurement device will also be required.

3.3 Test Vehicle/Test Piece. A Body-In-White (BIW) assembly with cargo securing eyelets, which has gone through the bake oven to activate any structural adhesives, or transform the steel properties to represent production conditions. Care should be taken to not cause material property degradation in materials such as plastic composites. Production material properties should be simulated. The evaluation can also be conducted using cut sections of the BIW assembly, but it will be necessary to constrain each section as rigidly as possible at the cut locations. Also, the section as cut should represent enough area so that the absence of material does not influence the test outcome.

3.4 Test Time. 5 days.

3.5 Test Required Information. The Design Engineer should provide specifications appropriate for the vehicle being evaluated. Worst case shall be tested. All realistic usage possibilities have to be considered to choose the worst case. If possible, analysis techniques should be used to identify the worst case angle, within the specified angles of the DIN or ISO Standard. The load direction should be towards the diagonal opposite cargo securing eyelet. Test according to the conditions as stated in CG2556 Body Structures SSTS/VCRI (for the force) and the DIN or ISO Standard (for all other aspects of the test). Upon achieving the requirements of the DIN or ISO Standard, for future product development it is recommended to increase the load beyond the load required per the DIN and continue the test per the SSTS.

3.6 Personnel/Skills. Not applicable.

4 Procedure

4.1 Preparation. The BIW shall be fixed rigidly to the mounting plate of the test device. A Body on Frame (BOF) vehicle shall be supported and bolted to the fixtures, at the design intent frame attachment locations.

Ties in accordance with the standards shall be fastened to the cargo securing eyelets in order to apply the test loads.

4.2 Conditions.

4.2.1 Environmental Conditions. Not applicable.

4.2.2 Test Conditions. Deviations from the requirements of this standard shall have been agreed upon. Such requirements shall be specified on component drawings, test certificates, reports, etc.

4.3 Instructions.

4.3.1 Reference Illustration. Install the load actuator and load measurement devices using support fixtures, which are rigidly grounded to the test bedplate. The actuator should be positioned such that its centerline intersects the cargo tie down at the specified test angle. (See Figure A1 in Appendix A).

If the maximum displacement or permanent set measurements are required for the tie down, mount the displacement device (e.g., Linear Variable Displacement Transducer (LVDT), dial indicator, etc.) so that the displacement of the actuator is measured in the direction of travel.

4.3.2 Commercial vehicles for goods transportation up to a total mass of 3.5 t having a loading platform (e.g., pickup trucks) (t = metric ton = 1000 kg).

Test according to the load in CG2556 Body Structures SSTS/VCRI and test setup according to DIN 75410-1.

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4.3.3 Passenger Cars, Station Wagons and Multi-Purpose Passenger Cars. Test according to the load in CG2556 Body Structures SSTS/VCRI and test setup according to ISO 27955 “Lashing Points”.

4.3.3.1 The cargo securing eyelets shall be tested individually in the BIW.

4.3.3.2 The load direction shall be towards the diagonal opposite cargo securing eyelets at an angle from 15° to 45° from the vertical, see Figure 1.

4.3.3.2.1 Reference the Structures SSTS to determine which angle should be tested.

4.3.3.3 Each tie position shall be subjected to the load as described in CG2556 Body Structures SSTS/VCRI.

4.3.3.3.1 Test force = $F = F_t \times \text{Percentage listed in Body Structures SSTS}$.

4.3.3.3.1.1 $F_t = \text{ISO Test force (N)} = 1.25 \times F_n$.

4.3.3.3.1.1.1 $F_n = \text{is the ISO nominal tension force (N)} = 1/2 m_P \times G$.

4.3.3.3.1.1.1.1 F_n must be at least 3 kN and not more than 3.5 kN.

- If F_n (as calculated in the equation) is less than 3 kN, then F_n shall be 3 kN for the F_t calculation.
- If F_n (as calculated in the equation) is greater than 3.5 kN, then F_n shall be 3.5 kN for the F_t calculation.

4.3.3.3.1.1.1.2 $m_P = \text{is the maximum payload, in kg}$.

4.3.3.3.1.1.1.3 $G = \text{is the acceleration of gravity (9.81 m/s}^2\text{), in m/s}^2\text{}$.

4.3.3.4 The test force shall be applied within 20 s up to F and shall be maintained for at least 30 s.

4.3.3.5 Load profile can be seen in Figure 2.

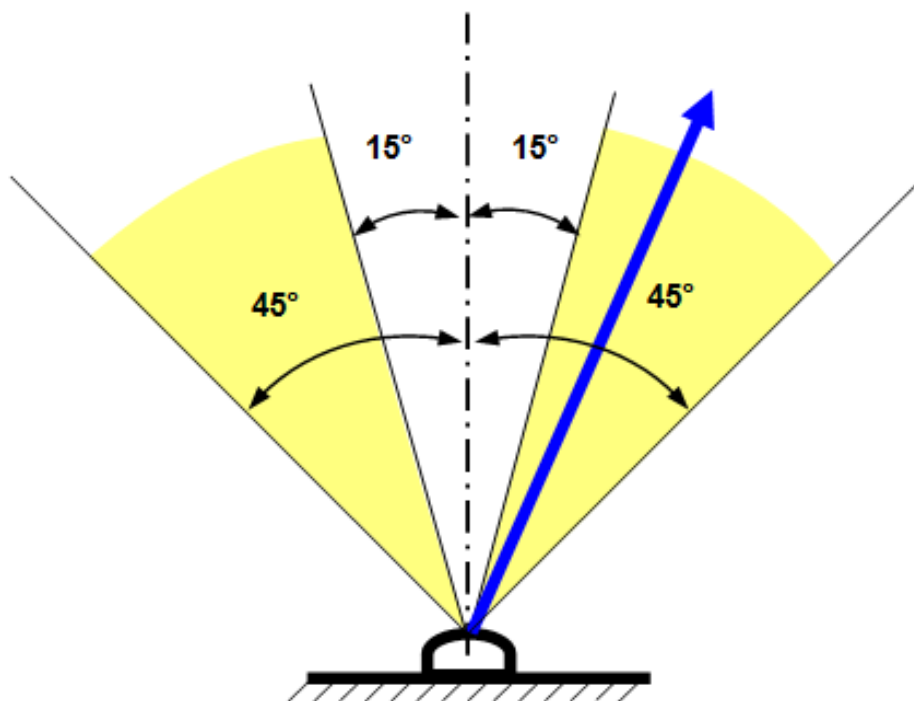


Figure 1: Illustration (ISO 27955)

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