



Ingress/Egress Safety Belt Pyrotechnic Lap Pretensioner (PLP) Durability Test

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. This test is used to evaluate wear and durability of a completely trimmed seat cushion and back assembly with safety belt Pyrotechnic Lap Pretensioner (PLP), when subjected to occupant, ingress, seating and exiting the vehicle on the seat.

1.2 Applicability. This test applies to safety belt systems which include PLPs either seat mounted or rocker mounted.

1.2.1 Evaluation Criteria. Use criteria in Appendix A, Table A1 and/or CG4358 to determine if a system shall be evaluated to this procedure. **Note:** When success for PLP evaluation is 100% a durability test to this procedure is not needed. An evaluation below 100% requires the durability test per this procedure.

1.3 Remarks. This test incorporates the use of robotics, pressure mapping and video review if needed. The path of the robotics includes an entry and an exit.

2 References

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

2.1 External Standards/Specifications.

SAE J826

2.2 GM Standards/Specifications.

GMW14832

2.3 Additional References.

- CG4358
- GM Master Math File

3 Resources

3.1 Facilities.

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 An adequate bedplate or equivalent work surface necessary for mounting the test sample and associated test fixtures.

3.2.2 Use of the Seat Saddle (SAE J826 "H" Point Form) Three Dimensional (3D) form without torso back, covered with 12.5 mm of foam pad with a density of 48 kg/m³ to 80 kg/m³ (3 lb/ft³ to 5 lb/ft³) of foam and covered with number ten (10) Oceanic Duck fabric or specified fabric and pattern from the GM Validation/Responsible Engineer. Cover must be changed every 50 000 cycles.

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3.2.3 Robotics capable of motion planning of 10 Hz or higher. Additionally, the software must be capable of compensating for load for every point of motion, and load controlled sinusoidal motion of 2 Hz. (See Figure 1).

Figure 1: Robotic and Form Apparatus



3.2.4 Pressure mat with minimal hysteresis, 7 Hz minimum sensor response time, and accurate within 5% of total required weight.

3.2.5 Appropriate mounting blocks to secure seat subsystem in body position (stanchions, fixtures and/or brackets). Mount a post to the bed plate to secure a safety belt retractor and shoulder belt guide loop (D ring) in body position (coordinates provided from GM Master Math File). Safety belt routing to be approved by GM Validation/Responsible Engineer.

3.3 Test Vehicle/Test Piece.

3.3.1 A test vehicle is required with design representative seat for videotaping and if applicable pressure mapping. Engineering judgment may be used if data from other vehicles are representative. Robot programing for enter/exit path only, no pressure control to be used.

3.3.2 The test seat is to be completely trimmed with design intent fabric and components (i.e., side shields, recliner handle) including poured foam and PLP. Refer to the GMW14832 for sample selection.

Note: PLP should be INERT.

3.4 Test Time. Setup and cycle times as required.

3.5 Test Required Information. See 5.3.

3.6 Personnel/Skills.

3.6.1 Lead Safety Belt Engineer.

3.6.2 GM Validation Engineer/GM Responsible Engineer.

3.6.3 Test Engineer.

3.6.4 Test Technician.

4 Procedure

4.1 Preparation.

4.1.1 If applicable pressure mapping with PLP contact and video taping of 95% weight occupants of various heights to verify the appropriate contact area. The pressure mapping is completed with occupants entering and exiting the vehicle. The door is initially closed before the occupant entrance with the seat back also being mapped in order to address occupant contact upon entrance and exit.

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4.1.2 Cut hole in PLP sleeve at beginning of test, for better observation of cable. Leave shrink tube on cable, if present. See Figure 2.

Figure 2: PLP Sleeve Cut Out



4.2 Conditions.

4.2.1 Environmental Conditions. Tests are to be conducted in an ambient environment as specified by the laboratory's certification.

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 Verify, the seat back angle and position the cushions and adjusters in such a way so that the 3D form makes contact with the PLP. Adjust seat height to worst case position as to have the buckle and cable role over seat plastic and/or seat frame.

4.3.2 Mount the PLP sample with retractor on a test fixture in the approved worst case PLP position. Before testing, the setup is to be approved by the GM Validation/Responsible Engineer.

4.3.3 The robotic path shall consist of an entry seated position, and an exit as defined by pressure mapping and/or videotaping. Bend and twist cable over a fulcrum.

4.3.4 At every 1000 cycles, inspect the safety belt PLP for wear, including checking the cable for wire fatigue and fractures. Record any wear or deformities on the data sheet and take photographs (see Appendix B, Data Sheet B1).

4.3.5 Cover and foam is to be replaced every 50 000 cycles if applicable.

4.3.6 Test machine is to be stopped when all cycles are complete (50 000 cycles).

4.3.7 Tested hardware to be returned to safety belt supplier to conduct tensile load test.

5 Data

5.1 Calculations.

5.1.1 The data sheet is to include; the seat back angle, adjuster position, and content of the seat, such as trim material. See Appendix B, Data Sheet B1.

5.1.2 Pre-periodical and posttest photographs shall consist of a frontal view of the seat, and a side view of the outboard bolster with PLP, a close up view of the PLP and the PLP cable. Flex the cable to the original position to assess if strands are damaged. **Note:** Photographs should be taken before any 3D form contact with PLP.

5.1.3 Periodically, during cycling, visually inspect the safety belt PLP for wear. Record any wear or deformities on the data sheet (see Appendix B, Data Sheet B1) and take photographs. Supply photographs with final report.

5.1.4 Remove sample from seat and hardware to be returned to safety belt supplier to conduct tensile load test. Results shall be recorded for each sample.

5.2 Interpretation of Results. Refer to GMW14832.

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