GM WORLDWIDE ENGINEERING STANDARDS	Test Procedure	GMW14200

Frame Global Matchboxing Static Stiffness Evaluation Procedure

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 determine the global matchboxing static stiffness of the frame from a full-frame vehicle.

1.2 Applicability. Frames from GM and competitive full-frame vehicles.

1.3 Remarks. The global matchboxing stiffness of the frame is an important factor in the level of on-road shake and steering wheel dither experienced by the occupants of a full-frame vehicle. Frame static stiffness metrics are intended as an improvement over the previous practice of specifying free-free frame mode frequencies, which have not been shown to relate to full vehicle performance.

2 References

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

2.1 External Standards/Specifications.

None

2.2 GM Standards/Specifications.

None

2.3 Additional References.

Subsystem Technical Specification (SSTS)

3 Resources

3.1 Facilities. A large bedplate.

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 Spherical bearings.

3.2.2 Elephant's feet.

3.2.3 Force ring transducers.

3.2.4 Dial indicators.

3.2.5 Wedge blocks.

3.2.6 Threaded rod/nuts.

3.3 Test Vehicle/Test Piece. A Frame including bolt-on hardware (e.g., bumpers and cross members).

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3.4 Test Time.

Calendar time:	1 day
Test time:	3 hours
Coordination time:	5 hours

3.5 Test Required Information. May require fabrication for load application interface.

3.6 Personnel/Skills. One (1) engineer and one (1) technician skilled in calibration and data acquisition using force transducers and dial indicators.

4 Procedure

4.1 Preparation.

4.1.1 Calibrate force ring transducers.

4.1.2 Boundary Conditions: Constrain the frame at the No. 1 and No. 3 body mount brackets on one side of the frame. On the other side, use a vertical-only constraint at the No. 3 body mount bracket. See Appendix A, Figure A1.

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 Force Input Locations. Applied fore/aft through the rear suspension lower link bracket on one side of the frame.

4.3.2 Displacement Measurements. On the rear suspension lower link bracket as close as practical to the force input. Also, on the center top of the frame rail on the side opposite the load, in line with the No. 3 body mount constraint. See Appendix A, Figure A1.

5 Data

5.1 Calculations.

5.1.1 Measurements (for each load case).

Where:

F	Applied Force (N)
X_{Load}	Measured Fore/Aft Displacement on Rear Suspension Lower Link Bracket, Near Applied Load (mm)
$X_{Reference}$	Measured Fore/Aft Displacement on Top Center of Frame Rail, In Line With No. 3 Body Mount Constraint, Side Opposite of Load (mm)

See Appendix A, Figure A2.

5.1.2 Equation.

5.1.2.1 Frame Global Matchboxing Static Stiffness (N/mm).

$$K_{Frame\,Matchboxing} = \frac{F}{X_{Load} - X_{Reference}}$$

Note: Use the generated data to plot the Effective Load vs. the Effective Displacement for all load cases.

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