



Vehicle Recreational Towing Dynamics Testing

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 standard provides a common test procedure for evaluating the dynamics of a vehicle during recreational towing including dinghy and dolly tow operations. Dinghy towing is where the vehicle is towed forward behind a towing vehicle with all four wheels on the ground. This is also known as "flat towing". Dolly towing involves towing the vehicle with one axle carried on a wheeled dolly. The towed test vehicle is evaluated for system irregularities and the steering system is evaluated for cyclic stability and self-centering capability.

1.2 Applicability. Vehicles with a requirement for recreational towing, dinghy and or dolly tow capability. Primarily used for North American and Australian vehicles.

1.3 Remarks. Not all vehicles can be dinghy and/or dolly towed. See 4.1.1.

2 References

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

2.1 External Standards/Specifications.

FMVSS 126

2.2 GM Standards/Specifications.

GMW15917

GMW15918

2.3 Additional References.

- Component Technical Specification (CTS)
- Feature Technical Specification (FTS) (ID)
- Owners Manual
- Subsystem Technical Specification (SSTS)
- Test Request
- Towed Test Vehicle Suspension Alignment Specifications
- Towing Device (Tow Bar or Dolly) Manufacturers Recommended Procedures
- Towing Vehicle Manufacturers Towing Specifications/Recommendations
- Vehicle Technical Specification (VTS) (ID)

(ID) = This specification 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

3.1 Facilities. Test roads/area where a vehicle can be dinghy or dolly towed at 115 km/h (71 MPH) in both straight and turn maneuvers. Specific General Motors Milford Proving Ground (GM MPG) test facilities as indicated in 4.3.4, or equivalent 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 Towing Vehicle. A towing vehicle with sufficient towing capacity for the as-tested mass of the towed test vehicle.

Note: Observe all Gross Combined Weight Rating (GCWR), Gross Axle Weight Rating (GAWR) and hitch load restrictions.

3.2.2 Dinghy Towing.

3.2.2.1 A commercial tow bar and tow bar mount (base plate) for connection between the towing vehicle and the towed test vehicle.

Note: If a commercial tow bar mount is not currently available for the towed test vehicle, a mount may be fabricated. Ensure the tow bar has sufficient load capacity for the mass of the towed test vehicle. Observe all tow bar mount installation guidelines.

3.2.2.2 A vehicle brake actuator.

Note: Dinghy towing tests include with and without actuating the towed test vehicle brakes. Brake actuators such as the "Brake Buddy" or a brake robot may be used.

3.2.3 Dolly Towing. A commercial vehicle dolly with vehicle tie downs in good condition and a lighting system. A dolly with integrated brakes is highly recommended.

3.2.3.1 Steering wheel clamping device if required by the towing instructions. See 4.1.1.

3.2.4 Safety chain(s)/cable(s). Chain(s)/cable(s) used to connect the towing and towed test vehicle/dolly as a secondary coupling system.

3.2.5 Auxiliary brake/turn signal lights to place on the towed test vehicle. Alternatively, the lights of the towed test vehicle may be wired to operate with the towing vehicle lights, or utilize tow dolly lighting system.

3.2.6 Data acquisition system to record steering signal and vehicle speed from the vehicle bus and pertinent Diagnostic Trouble Codes (DTCs).

3.3 Test Vehicle/Test Piece. Towed test vehicle with production representative steering, tire, suspension components and controllers.

Note: The towed test vehicle shall represent the desired test condition. All operating components likely to influence the test results, especially the steering system and controller modules shall be in proper operating condition and software level. The Test Request may require specific quality of components such as low friction steering gear or suspension joints.

3.4 Test Time.

Calendar time: 8 d

Test time: 24 h

Coordination time: 40 h

3.5 Test Required Information. Not applicable

3.6 Personnel/Skills. Technicians qualified to install instrumentation and a driver qualified for towing and performing dynamic maneuvers, as well as operating the instrumentation.

4 Procedure

4.1 Preparation.

4.1.1 Test Engineer Preparation. Refer to the Vehicle Technical Specification (VTS), Subsystem Technical Specification (SSTS), Component Technical Specification (CTS), Owners Manual, Feature Technical Specification (FTS), or Test Request to determine the driveline, ignition switch power moding and controller requirements/procedure for the dinghy or dolly towing test and the gear placement of the transmission and/or transfer case. These may include instructions for:

- Removing fuses

- Shifting the transmission and/or transfer case into a specific shift gate position
- Starting the vehicle prior to the beginning of the towing cycle
- Starting the vehicle at each towing vehicle fuel stop
- Limitations to speed/time/distance while towing the vehicle
- Placing ignition switch in ACCESSORY or RUN mode
- Disconnecting the negative battery cable

4.1.2 Vehicle Preparation.

4.1.2.1 Towing Vehicle.

- The vehicle shall be equipped with a tow package and functionally ready to tow per manufacturer specifications/recommendations
- The vehicle driveline and chassis should be inspected and any components should be replaced as necessary

4.1.2.2 Towed Test Vehicle.

- All equipment and ballast inside the passenger compartment of the vehicle shall be secured in place. All loose equipment should be removed from the passenger compartment, including tools, extra transducers, and personal belongings
- The vehicle suspension shall be aligned to nominal specifications
- With the fuel tank full, the vehicle test weights shall be determined and recorded

Note: The use of Electronic Stability Control (ESC) in the default mode is the standard condition for the recreational towing test. Testing with any alternative ESC modes or ESC disabled should be discussed and agreed upon between the Requesting Engineer or Feature Owner and Responsible Test Engineer. Perform the ESC malfunction telltale bulb check as follows: With the vehicle stationary and the ignition locking system in the Lock or Off position, activate the ignition locking system to the ON/RUN position or, where applicable, the appropriate position for the lamp check. The ESC malfunction telltale shall be activated as a check of lamp function, as specified in FMVSS 126 S5.3.4, and if equipped, the ESC Off telltale shall also be activated as a check of lamp function, as specified in FMVSS 126 S5.5.6. The telltale bulb check is not required for a telltale shown in a common space as specified in FMVSS 126 S5.3.6 and S5.5.8.

4.1.2.3 Both Towing Vehicle and Towed Test Vehicle.

- Check fluid levels of engine and driveline components and fill to capacity if necessary
- Check wheel lug nut torques, tire pressures, and for the towed test vehicle, state of tire wear at the start of each test and regularly during testing in order to identify any deviations from nominal
- Before the start of testing, use a diagnostic scan tool to extract and clear any diagnostic codes

4.2 Conditions. The test is run on dry asphalt and concrete surfaces. Wet surfaces may be specified in special cases.

4.2.1 Environmental Conditions. Ambient air temperature should be $\geq 0\text{ }^{\circ}\text{C}$ ($> 32\text{ }^{\circ}\text{F}$) and $\leq 40\text{ }^{\circ}\text{C}$ ($\leq 104\text{ }^{\circ}\text{F}$). The test should not be run if wind speeds are $> 40\text{ km/h}$ ($> 25\text{ MPH}$).

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 With both the towing vehicle and towed test vehicle on level ground, hook up the towing device (tow bar or dolly) following the manufacturers recommended procedures.

Note: No vehicle shall be reverse dolly towed with the rear axle on the towing dolly and the front axle on the ground.

4.3.2 Start and stop data recording when entering or leaving the garage/staging area

4.3.3 For the towed test vehicle, verify 4.3.3.1 through 4.3.3.3.

4.3.3.1 The vehicle ignition switch is in the OFF position (unlocked) or as otherwise indicated for the vehicle specific dinghy/dolly towing procedure (4.1.1).