



Specification for Fuel Tank Straps

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 document provides the standard technical requirements for the fuel tank straps. This document shall only be used when invoked by a program specific technical specification. References to the program specific technical specification are included in this document where program specific requirements are expected to exist.

The program specific technical specification may include additional program specific requirements that are not referenced in this document and may supercede any requirements included in this document. In the case of any conflicts between this document and the program specific technical specification, the program specific technical specification takes precedence.

This specification establishes the fuel tank strap requirements for General Motors gasoline, gasoline blend, and diesel fueled vehicles. The functions, performance, design constraints, and validation required of the fuel tank straps are directly defined in this document or a reference is made to another document.

This document contains Component Technical Specifications (CTS) common to all programs. Reference the program/vehicle specific document for additional requirements unique to the application.

1.2 Applicability. This specification applies only to gasoline, gasoline blend and diesel fueled vehicles. It includes requirements for both complete and incomplete vehicles, and for specific applications, such as police and taxi use.

1.3 Remarks. The fuel tank strap is a functional vehicle component and part of a subsystem for receiving and storing fuel; sensing and signaling fuel quantity; supplying fuel to the engine; and managing both refueling vapor and fuel vapor generated during use of the vehicle by the vehicle operator (for gasoline only). The fuel tank straps are to carry out these functions while meeting specific requirements of the customer, the powertrain, other interfaces, mandated safety and emission standards, and company objectives.

2 References

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

2.1 External Standards/Specifications.

ASTM D4169	GB 18296-2001	SAE J1645
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2.2 GM Standards/Specifications.

GMW3032	GMW14106	GMW14872	GMW15359
GMW3059	GMW14234	GMW14911	GMW15451
GMW3116	GMW14508	GMW14992	GMW15862
GMW8518	GMW14573	GMW15010	GMW16331
GMW14056	GMW14671	GMW15200	GMW17000
GMW14057	GMW14842	GMW15272	
GMW14081	GMW14850	GMW15311	
GMW14085	GMW14854	GMW15357	

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2.3 Additional References.

- California Evaporative Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles
- California Refueling Emission Standards and Test Procedures for 2001 and Subsequent Model Motor Vehicles
- CG4923
- Component Technical Specifications (CTS)
- Evaporative Emissions Interface Document
- Fuel Storage and Handling Subsystem Structural Performance Standard Work Load cases (<https://documents.naeng.gm.com/gdm3/drl/objectId/090163bc82319945/chronicleId/090163bc82319945>)
- Global Legal Database
- GM Best Practices: CHASSIS-1 (<https://e2ks.gm.com/e2ks/>)
- GM Best Practices: ELEC86-S5128 (<https://e2ks.gm.com/e2ks/>)
- GM Best Practices: FSH-106 (<https://e2ks.gm.com/e2ks/>)
- GM Engineering Materials and Processes Standards
- GM Global Fastening Catalog
- Preferred Material Guidelines
- Subsystem Technical Specifications (SSTS)
- Vehicle Technical Specifications (VTS)

3 Requirements

3.1 System/Subsystem/Component/Part Definition. The fuel tank straps support the fuel storage subsystem's capability to receive and store fuel. Reference GMW15311 for a complete listing of system definitions.

3.1.1 Appearance. Not applicable.

3.1.2 Content.

3.1.2.1 Physical Content. The fuel tank strap consists of:

- Stamped/fabricated strap body.
- Integrated mounting studs (when designated as Part of Assembly (POA)).
- Integrated clips or brackets (when designated as POA).
- Integrated isolator grommets (when designated as POA).
- Integrated isolator pads (when designated as POA).
- Fasteners (when designated as POA).
- Shielding (if necessary, when designated as POA).
- Labeling.

3.1.2.2 Functional Content. The fuel tank straps are to provide the functions as in 3.1.2.2.1 through 3.1.2.2.2.

3.1.2.2.1 The fuel tank straps shall physically support the integrated fuel tank assembly as mounted into the vehicle environment.

3.1.2.2.2 The fuel tank straps shall provide mounting features for additional surrounding components, such as (but not limited to) underbody aero shields.

3.1.3 Ambient Environment. The ambient environmental conditions that the fuel tank straps may encounter during their life are defined in GMW15311. Reference that document for definitions of the ambient environment.

3.1.3.1 Contamination. Reference GMW15311 for a complete table of contaminants.

3.1.3.2 Corrosives. Reference GMW15311 section on Corrosives.

3.1.3.3 Ultraviolet Radiation. Reference GMW15311 for Ultraviolet (UV) radiation exposure requirements.

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3.1.4 Interfaces. The fuel tank strap assembly interfaces with several physical entities that will affect or constrain its functionality and design. A complete listing of system interfaces exists in GMW15311. Specifics to the fuel tank straps are described in 3.1.4.1 and 3.1.4.2.

3.1.4.1 Fuel Tank Straps to Other Subsystems. Interfaces between the other subsystems and fuel tank straps are depicted at a high level in GMW15311. These interfaces may constrain or drive the design of the fuel tank straps and, therefore, shall be addressed during strap design and development. The fuel tank strap implementation and operation in the vehicle shall also successfully accommodate the identified interfaces.

3.1.4.2 Component to Component. Generic component to component interface requirements for the fuel tank straps are identified in 3.1.4.2.1 through 3.1.4.2.4.

3.1.4.2.1 Crashworthiness. The fuel tank straps shall not create any leak that causes the fuel system to fail crashworthiness requirements. Components shall be designed to prevent disconnection and damage to adjacent components.

3.1.4.2.2 Noise. Component to component connections shall minimize transmission of noise.

3.1.4.2.3 Electrostatic Discharge (ESD). Components shall not create ESD related failures in adjacent or downstream components.

3.1.4.2.4 Corrosion. The interfaces between components shall satisfy the Vehicle Technical Specification (VTS) relative to cosmetic corrosion and GMW15272.

3.1.5 Usage Definition. Reference GMW15311 for specific usage conditions that the fuel tank straps may encounter in a vehicle.

3.2 Product Characteristics. The required product characteristics for the fuel tank straps are identified in several different categories in 3.2.1 and 3.2.2.

3.2.1 Performance Requirements. The functional performance requirements for the fuel tank straps are specified in 3.2.1.1 through 3.2.1.3. All requirements apply for the conditions specified in 3.1.3 and 3.1.4, except where noted otherwise. Special vehicle, operational, or ambient conditions may be identified in the performance requirements (3.2.1.1 through 3.2.1.3).

3.2.1.1 Store Fuel. The fuel tank straps shall provide for fuel storage capacity and integrity according to 3.2.1.1.1 through 3.2.1.1.7.

3.2.1.1.1 Fuel Tank Usable Capacity. The fuel tank assembly and straps shall be designed to provide a usable fuel capacity as defined in the platform specific Statement of Requirements (SOR). This capacity value shall comprehend installation into the vehicle, including strap up conditions.

3.2.1.1.2 Fire Resistance. Fuel tank strap designs shall be integrated with the tank shell design in order to support the fire resistance requirements per GMW14106. The strap edges shall be curved away from the polymer tank surface to avoid damaging the tank shell when heated during this test.

3.2.1.1.3 Unusable Capacity. Fuel tank strap designs shall be integrated with the tank shell design in order to support the unusable capacity requirements per GMW14106.

3.2.1.1.4 Fuel Level Indication. The fuel tank straps shall be designed to support fuel level indication requirements as defined in the Fuel Pump Module CTS and the integrated fuel tank assembly CTS.

3.2.1.1.5 Diagnostic and Purge Pressures. The fuel tank straps shall be designed to be robust to diagnostic-induced pressure and vacuum conditions as defined in GMW14106.

The fuel system components shall be robust to these pressure levels to avoid undue warranty and/or customer complaints (i.e., excessive tank or strap deflection, which may cause a perceptible shift in the fuel gauge Instrument Panel (IP) position or fuel tank capacity). Permanent deformation of the fuel tank straps is not allowed.

3.2.1.1.6 Tank and Strap Deformation Due to Pressure. All components of the integrated fuel tank assembly including the straps must be robust enough to withstand tank shell expansion/deformation from internal pressure up to 18 kPa (2.6 psi). The fuel tank assembly must be mounted in a vehicle or representative fixture and contain the GN-1 fuel volume (or representative mass of water) during this evaluation. All connection and attachment points must remain intact. The integrated fuel tank assembly or straps must not contact any moving components (i.e., prop, suspension).

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Note: This procedure is intended to represent a plugged canister vent and thermal expansion. If the fuel system contains a relief function, then the relief value shall be used. The component containing the relief valve must be included in the test.

3.2.1.1.7 Tensile strength of the strap (as assembled) shall have a minimum force of 11 000 N.

3.2.1.2 Manage Noise. The fuel tank straps shall manage noise as defined in 3.2.1.2.1 and 3.2.1.2.2.

3.2.1.2.1 Pressure-Vacuum Related Noise. Pressure-vacuum cycling related oil-canning noise from the fuel tank or straps shall not result in a subjective rating of less than nine (9) at the driver and passenger ear levels in the front, and shall not be less than eight (8) in the rear seating areas of the vehicle.

3.2.1.2.2 Fuel Slosh Noise. Reference program-specific documents for noise requirements. Fuel tank straps shall support the function of the integrated fuel tank assembly as necessary in order to meet the slosh noise requirements defined in GMW14106.

3.2.1.2.3 Squeaks and Rattles.

3.2.1.2.3.1 The fuel tank straps shall not cause or contribute to any squeak and rattle sound annoyances when subjected to the static and dynamic test conditions specified in GMW8518.

3.2.1.2.3.2 The squeak and rattle performance of the fuel tank straps shall not degrade over the first 40% of the durability test schedule specified in the platform specific VTS.

3.2.1.2.4 Refueling Noise. During refueling, the fuel tank straps shall not generate objectionable noise at the refueling operator's ear level that results in a subjective rating of less than nine (9), per GMW14508 conditions, specified in the Fuel Storage and Handling SSTs. The vehicle's ignition is to be off during refueling.

3.2.1.3 Safety and Crashworthiness. The fuel tank straps shall conform to the fuel spillage requirements defined in VTS section titled Crash Protection, relative to fuel system performance by country.

3.2.1.3.1 Clips, Studs and Other Weld-on Parts. Paragraphs 3.2.1.3.1.1 through 3.2.1.3.1.3 apply to clips, studs, brackets and other components welded to the fuel tank straps. Reference GMW15451 as appropriate for axial pulls.

3.2.1.3.1.1 Breakaway Forces. The minimum breakaway load for clips, studs, etc shall be 500 N applied in shear.

3.2.1.3.1.2 Breakaway Features. Clips, studs and other attaching parts shall not be capable of pulling parent strap material from the fuel tank interface surface, causing permanent deformation of the fuel tank interface surface, or presenting an unfriendly surface to the tank shell when breakaway forces are applied in any direction.

3.2.1.3.1.2.1 Procedure:

Note: Each clip, stud, and/or bracket must be tested separately.

- Attach the strap to the fuel tank and vehicle per vehicle assembly procedure, or use an equivalent fixture (requires GM engineer approval).
- Using a flat impact object, apply an impact force to the clip, stud, or bracket at a rate of 5 m/s parallel to the parent strap, such that the part folds over or breaks off of the parent strap.
- Test at least two (2) directions per attaching part, vehicle forward and vehicle backward, or as agreed by GM engineer (use a new sample for each test).
- Inspect the parent strap material that interfaces (or is adjacent to) the fuel tank surface.
- Pass/fail criteria: no deformation or removal of fuel tank interface surface from the parent strap, no unfriendly surface or edge pointed to, or adjacent to, the fuel tank surface.

3.2.1.3.1.3 Retention Features. Clips, studs and other attaching parts shall be robust to shipping, handling, and vehicle durability.

3.2.1.3.2 Flame Propagation. The fuel tank straps must be located or shielded, such that they will not initiate or propagate flame, as evaluated by GMW14911 (reference the Fuel Storage and Handling SSTs).

3.2.2 Physical Characteristics. The required physical characteristics for the fuel tank straps are specified in 3.2.2.1 through 3.2.2.8.

3.2.2.1 Dimensions and Capacity.

3.2.2.1.1 Strap Metal and Plate Material. Galvanized sheet steel 2.0 mm $\pm$ 0.05 mm thick per:

- GMW3032M-ST-S-HR340LA-HD70G70G-U.

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