

NFPA® 1917

Standard for Automotive Ambulances

2013 Edition



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An International Codes and Standards Organization

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NFPA® 1917

Standard for

Automotive Ambulances

2013 Edition

This edition of NFPA 1917, *Standard for Automotive Ambulances*, was prepared by the Technical Committee on Ambulances and acted on by NFPA at its June Association Technical Meeting held June 11–14, 2012, in Las Vegas, NV. It was issued by the Standards Council on August 9, 2012, with an effective date of August 29, 2012.

This edition of NFPA 1917 was approved as an American National Standard on August 29, 2012.

Origin and Development of NFPA 1917

In October 2008, the Standards Council, after receipt of a request from the Technical Committee on Automotive Fire Apparatus for the development of a standard for ambulances, approved the establishment of a Technical Committee on Automotive Ambulances. The Committee developed this first edition of NFPA 1917, *Standard for Automotive Ambulances*, which establishes the minimum requirements for the design, performance, and testing of new automotive ambulances used for out-of-hospital medical care and patient transport.

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Committee Scope: This Committee shall have primary responsibility for documents on the design and performance of ambulances used to provide patient care and transport under emergency conditions.



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NOTICE: An asterisk (*) following the number or letter designating a paragraph indicates that explanatory material on the paragraph can be found in Annex A.

A reference in brackets [] following a section or paragraph indicates material that has been extracted from another NFPA document. As an aid to the user, the complete title and edition of the source documents for extracts in mandatory sections of the document are given in Chapter 2 and those for extracts in informational sections are given in Annex B. Extracted text may be edited for consistency and style and may include the revision of internal paragraph references and other references as appropriate. Requests for interpretations or revisions of extracted text shall be sent to the technical committee responsible for the source document.

Information on referenced publications can be found in Chapter 2 and Annex B.

Chapter 1 Administration

1.1* Scope. This standard shall define the minimum requirements for the design, performance, and testing of new automotive ambulances used for out-of-hospital medical care and patient transport.

1.2 Purpose. The purpose of this standard shall be to establish the minimum requirements for new automotive ambulances that are safe and reliable when properly maintained and used within their design parameters.

1.3 Application.

1.3.1 This standard shall apply to new ambulances that are contracted for on or after January 1, 2013.

1.3.2 This standard shall not apply to the following:

- (1) Refurbished and remounted vehicles
- (2) Vehicles that are used for transport of more than two stretcher-bound patients at the same time
- (3) Mass casualty vehicles
- (4) Military field ambulances
- (5) Vehicles intended for use as fire apparatus as specified in NFPA 1901, *Standard for Automotive Fire Apparatus*, or NFPA 1906, *Standard for Wildland Fire Apparatus*
- (6) Wheeled chair transport vehicles

1.4* Retroactivity. This standard shall not be applied retroactively.

1.5 Equivalency. Nothing in this standard is intended to prevent the use of systems, methods, or devices of equivalent or

superior quality, strength, fire resistance, effectiveness, durability, and safety over those prescribed by this standard.

1.5.1 Technical documentation shall be submitted to the authority having jurisdiction (AHJ) to demonstrate equivalency.

1.5.2 The system, method, or device shall be approved for the intended purpose by the AHJ.

1.6* Units and Formulas.

1.6.1 In this standard, values for measurement in U.S. customary units shall be followed by equivalents in SI units.

1.6.2 Either set of values can be used, but the same set of values (either U.S. customary units or SI units) shall be used consistently.

Chapter 2 Referenced Publications

2.1 General. The documents or portions thereof listed in this chapter are referenced within this standard and shall be considered part of the requirements of this document.

2.2 NFPA Publications. National Fire Protection Association, 1 Batterymarch Park, Quincy, MA 02169-7471, www.nfpa.org.

NFPA 70®, *National Electrical Code*®, 2011 edition.

NFPA 1901, *Standard for Automotive Fire Apparatus*, 2009 edition.

NFPA 1906, *Standard for Wildland Fire Apparatus*, 2012 edition.

2.3 Other Publications.

2.3.1 AMECA Publications. Automotive Manufacturers Equipment Compliance Agency, 1025 Connecticut Avenue, NW, Suite #1012, Washington, DC 20036.

AMECA Compliance Handbook for GSA and SAE Warning Lamp Systems, 2010.

2.3.2 ANSI Publications. American National Standards Institute, Inc., 25 West 43rd Street, 4th Floor, New York, NY 10036, www.ansi.org.

ANSI S1.4, *Specification for Sound Level Meters*, 2006.

ANSI Z535.4, *Product Safety Signs and Labels*, 2007.

2.3.3 ASTM Publications. ASTM International, 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959, www.astm.org.

ASTM D 4956, *Standard Specification for Retroreflective Sheeting for Traffic Control*, 2009.

ASTM E 661, *Standard Test Method for Performance of Wood and Wood-Based Floor and Roof Sheathing Under Concentrated Static and Impact Loads*, 2009.

2.3.4 IPC Publications. IPC, 300 Lakeside Drive, 309 S, Bannockburn, IL 60015, www.ipc.org.

IPC A-610D, *Acceptability of Electronic Assemblies*, 2005.

2.3.5 ISO Publications. International Organization for Standardization, 1, ch. de la Voie-Creuse, Case postale 56, CH-1211 Geneva 20, Switzerland, www.iso.ch.net.

ISO/IEC 17020, *General Criteria for the Operation of Various Types of Bodies Performing Inspection*, 1998.

ISO/IEC 17025, *General Requirements for the Competence of Testing and Calibration Laboratories*, 2005.

2.3.6 SAE Publications. Society of Automotive Engineers, 400 Commonwealth Drive, Warrendale, PA 15096, www.sae.org.

SAE J156, *Fusible Links*, 2005.

SAE J551/1, *Performance Levels and Methods of Measurement of Electromagnetic Compatibility of Vehicles, Boats (up to 15 m), and Machines (16.6 Hz to 18 GHz)*, 2006.

SAE J553, *Circuit Breakers*, 2004.

SAE J554, *Electric Fuses (Cartridge Type)*, 1987.

SAE J575, *Test Methods and Equipment for Lighting Devices and Components for Use on Vehicles Less Than 2032 mm in Overall Width*, 2007.

SAE J576, *Plastic Material or Materials for Use in Optical Parts Such as Lenses and Reflex Reflectors of Motor Vehicle Lighting Devices*, 2010.

SAE J578, *Color Specification*, 2006.

SAE J595, *Directional Flashing Optical Warning Devices for Authorized Emergency, Maintenance, and Service Vehicles*, 2005.

SAE J683, *Tire Chain Clearance — Trucks, Buses (Except Suburban, Intercity, and Transit Buses), and Combinations of Vehicles*, 1985.

SAE J689, *Approach, Departure, and Ramp Break over Angles*, 2009.

SAE J845, *Optical Warning Devices for Authorized Emergency, Maintenance, and Service Vehicles*, 2007.

SAE J994, *Alarm — Backup — Electric, Laboratory Performance Testing*, 2003.

SAE J1127, *Low Voltage Battery Cable*, 2005.

SAE J1128, *Low Voltage Primary Cable*, 2005.

SAE J1292, *Automobile, Truck, Truck-Tractor, Trailer, and Motor Coach Wiring*, 1981.

SAE J1318, *Gaseous Discharge Warning Lamp for Authorized Emergency, Maintenance, and Service Vehicles*, 1998.

SAE J1330, *Photometry Laboratory Accuracy Guidelines*, 2007.

SAE J1690, *Flashers*, 1996.

SAE J1849, *Emergency Vehicle Sirens*, 2008.

SAE J1888, *High Current Time Lag Electric Fuses*, 1990.

SAE J1889, *L.E.D. Signal and Marking Lighting Devices*, 2005.

SAE J2077, *Miniature Blade Type Electrical Fuses*, 1990.

SAE J2420, *COE Frontal Strength Evaluation — Dynamic Loading Heavy Trucks*, 2003.

SAE J2422, *Cab Roof Strength Evaluation — Quasi-Static Loading Heavy Trucks*, 2003.

SAE J2917, *Occupant Restraint and Equipment Mounting Integrity — Frontal Impact System-Level Ambulance Patient Compartment*, 2010.

2.3.7 UL Publications. Underwriters Laboratories Inc., 333 Pfingsten Road, Northbrook, IL 60062-2096, www.ul.com.

ANSI/UL 153, *Standard for Portable Electric Luminaires*, 2002, Revised 2010.

ANSI/UL 498, *Standard for Safety Attachment Plugs and Receptacles*, 2001, Revised 2010.

ANSI/UL 969, *Standard for Marking and Labeling Systems*, 1995, Revised 2008.

ANSI/UL 1598, *Luminaires*, 2008, Revised 2010.

ANSI/UL 2034, *Standard for Safety, Single and Multiple Station Carbon Monoxide Alarms*, 2008, Revised 2009.

2.3.8 U.S. Government Publications. U.S. Government Printing Office, Washington, DC 20402, www.gpo.gov.

Title 49, Code of Federal Regulations, Part 571, Subpart B, “Federal Motor Vehicle Safety Standards” (FMVSS), No. 108, “Lamps, reflective devices, and associated equipment – passenger cars, multipurpose passenger vehicles, trucks, busses, trailers, (except pole trailers and trailer converter dollies), and motorcycles.”

Title 49, Code of Federal Regulations, Part 571, Subpart B, “Federal Motor Vehicle Safety Standards” (FMVSS), No. 202, “Head restraints for passenger vehicles.”

Title 49, Code of Federal Regulations, Part 571, Subpart B, “Federal Motor Vehicle Safety Standards” (FMVSS), No. 206, “Door locks and door retention components – passenger cars, multipurpose passenger vehicles, and trucks.”

Title 49, Code of Federal Regulations, Part 571, Subpart B, “Federal Motor Vehicle Safety Standards” (FMVSS), No. 210, “Seat belt assembly anchorages.”

Title 49, Code of Federal Regulations, Part 571, Subpart B, “Federal Motor Vehicle Safety Standards,” (FMVSS), No. 213, “Child restraint systems – passenger cars, multipurpose passenger vehicles, trucks, and busses, and child restraint systems for use in motor vehicles and aircraft.”

Title 49, Code of Federal Regulations, Part 571, Subpart B, “Federal Motor Vehicle Safety Standards” (FMVSS), No. 302, “Flammability of interior materials – passenger cars, multipurpose passenger vehicles, trucks, and busses.”

2.3.9 Other Publications.

Merriam-Webster’s Collegiate Dictionary, 11th edition, Merriam-Webster, Inc., Springfield, MA, 2003.

2.4 References for Extracts in Mandatory Sections.

NFPA 70®, *National Electrical Code*®, 2011 edition.

NFPA 1451, *Standard for a Fire Service Vehicle Operations Training Program*, 2007 edition.

NFPA 1901, *Standard for Automotive Fire Apparatus*, 2009 edition.

Chapter 3 Definitions

3.1 General. The definitions contained in this chapter shall apply to the terms used in this standard. Where terms are not defined in this chapter or within another chapter, they shall be defined using their ordinarily accepted meanings within the context in which they are used. *Merriam-Webster’s Collegiate Dictionary*, 11th edition, shall be the source for the ordinarily accepted meaning.

3.2 NFPA Official Definitions.

3.2.1* Approved. Acceptable to the authority having jurisdiction.

3.2.2* Authority Having Jurisdiction (AHJ). An organization, office, or individual responsible for enforcing the requirements of a code or standard, or for approving equipment, materials, an installation, or a procedure.

3.2.3 Labeled. Equipment or materials to which has been attached a label, symbol, or other identifying mark of an organization that is acceptable to the authority having jurisdiction and concerned with product evaluation, that maintains periodic inspection of production of labeled equipment or materials, and by whose labeling the manufacturer indicates compliance with appropriate standards or performance in a specified manner.

3.2.4* Listed. Equipment, materials, or services included in a list published by an organization that is acceptable to the authority having jurisdiction and concerned with evaluation of products or services, that maintains periodic inspection of production of listed equipment or materials or periodic evaluation of services, and whose listing states that either the equipment, material, or service meets appropriate designated standards or has been tested and found suitable for a specified purpose.

3.2.5 Shall. Indicates a mandatory requirement.

3.2.6 Should. Indicates a recommendation or that which is advised but not required.

3.2.7 Standard. A document, the main text of which contains only mandatory provisions using the word “shall” to indicate requirements and which is in a form generally suitable for mandatory reference by another standard or code or for adoption into law. Nonmandatory provisions are not to be considered a part of the requirements of a standard and shall be located in an appendix, annex, footnote, informational note, or other means as permitted in the *Manual of Style for NFPA Technical Committee Documents*.

3.3 General Definitions.

3.3.1 Acceptance. An agreement between the purchasing authority and the contractor that the terms and conditions of the contract have been met. [1901, 2009]

3.3.2 Acceptance Tests. Tests performed on behalf of or by the purchaser at the time of delivery to determine compliance with the specifications for the ambulance.

3.3.3 Ambulance. A vehicle used for out of hospital medical care and patient transport, which provides a driver's compartment; a patient compartment to accommodate an emergency medical services provider (EMSP) and one patient located on the primary cot so positioned that the primary patient can be given emergency care during transit; equipment and supplies for emergency care at the scene as well as during transport; safety, comfort, and avoidance of aggravation of the patient's injury or illness; two-way radio communication; and audible and visual traffic warning devices.

3.3.3.1* Substantially Similar Ambulance. An ambulance in which the relevant area or component that is being compared or considered is comparable. Applicable to the test being considered for an ambulance in which like areas are compared.

3.3.3.2 Type I Ambulance. An ambulance with a 10,001 lb to 14,000 lb gross vehicle weight rating (GVWR) constructed on a cab chassis with a modular ambulance body.

3.3.3.3 Type I-AD (Additional Duty) Ambulance. An ambulance with a 14,001 lb or more GVWR constructed on a cab chassis with a modular ambulance body.

3.3.3.4 Type II Ambulance. An ambulance constructed on a van.

3.3.3.5 Type III Ambulance. An ambulance with a 10,001 lb to 14,000 lb GVWR constructed on a cutaway van chassis with integrated modular ambulance body.

3.3.3.6 Type III-AD (Additional Duty) Ambulance. An ambulance with a 14,001 lb or more GVWR constructed on a cutaway van chassis with integrated modular body.

3.3.4 Angle.

3.3.4.1 Angle of Approach. The smallest angle made between the road surface and a line drawn from the front point of ground contact of the front tire to any projection of the ambulance in front of the front axle.

3.3.4.2 Angle of Departure. The smallest angle made between the road surface and a line drawn from the rear point of ground contact of the rear tire to any projection of the ambulance behind the rear axle.

3.3.4.3 Ramp Breakover Angle. The angle measured between two lines tangent to the front and rear tire static loaded radius, and intersecting at a point on the underside of the vehicle that defines the largest ramp over which the vehicle can roll. [1901, 2009]

3.3.5 Automatic Electrical Load Management System. A device that continuously monitors the electrical system voltage and automatically sheds predetermined loads in a selected order to prevent overdischarging of the ambulance's batteries.

3.3.6 Bonded (Bonding). Connected to establish electrical continuity and conductivity. [1901, 2009]

3.3.7 Bulkhead. The partition dividing the driver compartment from the patient compartment.

3.3.8 Center of Gravity. The point at which the entire weight of the ambulance is considered to be concentrated so that, if supported at this point, the ambulance would remain in equilibrium in any position.

3.3.9* Chassis. The basic operating motor vehicle, including the engine, frame, and other essential structural and mechanical parts, but exclusive of the body and all appurtenances for the accommodation of driver, property, passengers, appliances, or equipment related to functions other than control.

3.3.10 Compartment.

3.3.10.1 Enclosed Compartment. A weather-resistant area designed to protect stored items from environmental damage that is confined on six sides and equipped with an access opening(s) that can be closed and latched.

3.3.10.2 Patient Compartment. The portion of the ambulance behind the cab.

3.3.10.2.1 Type I Patient Compartment. The modular body area added on behind the cab.

3.3.10.2.2 Type II Patient Compartment. The body area beginning immediately behind the forward bulkhead.

3.3.10.2.3 Type III Patient Compartment. The modular body area added on behind the cab.

3.3.11 Conductor.

3.3.11.1 Grounding Conductor. A non-current-carrying conductor used to connect equipment or the ground circuit of a

wiring system to the power source grounding system. [1901, 2009]

3.3.11.2 Line Voltage Conductor. An ungrounded current-carrying conductor of a line voltage circuit. [1901, 2009]

3.3.11.3 Neutral Conductor. The conductor connected to the neutral point of a system that is intended to carry current under normal conditions. [1901, 2009]

3.3.12 Continuous Duty. Operation at a substantially constant load for an indefinitely long time. [1901, 2009]

3.3.13* Contractor. The person or company responsible for fulfilling an agreed upon contract. [1901, 2009]

3.3.14 Defect. A discontinuity in a part or a failure to function that interferes with the service or reliability for which the part was intended. [1901, 2009]

3.3.15 Documentation. Any data or information supplied by the manufacturer or contractor relative to the ambulance, including information on its operation, service, and maintenance.

3.3.16 Electrical Appliance. An electrical device or instrument designed to perform a specific function, such as scene lights, battery charger, medical equipment, and so forth.

3.3.17* Electronic Siren. An audible warning device that produces sound electronically through the use of amplifiers and electromagnetic speakers. [1901, 2009]

3.3.18 Exterior. A nonsheltered location exposed to the environment, either continuously or intermittently. [1901, 2009]

3.3.19 Federal Motor Vehicle Safety Standards (FMVSS). Regulations promulgated by the National Highway Traffic Safety Administration (NHTSA) of the United States under Public Law 89-563 that are mandatory and must be complied with when motor vehicles or items of motor vehicle equipment are manufactured and certified thereto.

3.3.20 Fixed Power Source. Any line voltage power source except a portable generator.

3.3.21 Fully Latched Position. The last or fully closed position on the striker of a FMVSS 206 compliant door latch.

3.3.22 Gallon. United States gallon. [1901, 2009]

3.3.23 Gauge. A visual device that indicates a measurement. [1901, 2009]

3.3.24 GAWR. See 3.3.66.1, Gross Axle Weight Rating.

3.3.25 Generator. An electromechanical device for the production of electricity. [1901, 2009]

3.3.26* Grade. A measurement of the angle used in road design and expressed as a percentage of elevation change over distance. [1901, 2009]

3.3.27 Ground Clearance. The clearance under a vehicle at all locations except the axles and driveshaft connections to the axle or items designed to swing clear. [1901, 2009]

3.3.28 GVWR. See 3.3.66.3, Gross Vehicle Weight Rating (GVWR).

3.3.29 High-Idle Speed Control. A control or switch system that provides a means to increase the engine operating speed from an idle condition to a higher preset operating speed. [1901, 2009]

3.3.30 Instruction Plate. A visual indication whether in pictorial or word format that provides instruction to the operator in the use of a component on the ambulance.

3.3.31 Interior. A sheltered location not exposed to the environment. [1901, 2009]

3.3.32 Interlock. A device or arrangement by means of which the functioning of one part is controlled by the functioning of another. [1901, 2009]

3.3.33 Label. A visual indication whether in pictorial or word format that provides for the identification of a control, switch, indicator, or gauge, or the display of information useful to the operator. [1901, 2009]

3.3.34 Latch. A mechanical device used to position the door in a closed position relative to the body framework with provision for controlled release or operation.

3.3.35 Line Voltage Circuit, Equipment, or System. An ac or dc electrical circuit, equipment, or system where the voltage to ground or from line to line is equal to or greater than 30 volts rms (ac), 42.4 volts peak (ac), or 60 volts dc.

3.3.36 Load Distribution Plan. A drawing or spreadsheet of shelves, cabinets, drawers, compartment, or otherwise storage with a maximum weight attached to each location.

3.3.37* Loose Equipment. Equipment other than the occupants and the cot that is intended to be stored on the ambulance.

3.3.38 Low Voltage Circuit, Equipment, or System. An electrical circuit, equipment, or system where the voltage does not exceed 30 volts rms (ac), 42.4 volts peak (ac), or 60 volts dc; usually 12 volts dc in an ambulance.

3.3.39 Manufacturer. The person or persons, company, firm, corporation, partnership, or other organization responsible for turning raw materials or components into a finished product. [1901, 2009]

3.3.40 Optical Center. The point specified by the optical warning device manufacturer of highest intensity when measuring the output of an optical warning device. [1901, 2009]

3.3.41 Optical Power. A unit of measure designated as candelaseconds/minute that combines the flash energy and flash rate of an optical source into one power measurement representing the true visual effectiveness of the emitted light. [1901, 2009]

3.3.42* Optical Source. Any single, independently mounted, light-emitting component in a lighting system. [1901, 2009]

3.3.43 Optical Warning Device. A manufactured assembly of one or more optical sources. [1901, 2009]

3.3.44 Panelboard. A single panel or group of panel units designed for assembly in the form of a single panel, including buses and automatic overcurrent devices, and equipped with or without switches for the control of light, heat, or power circuits; designed to be placed in a cabinet or cutout box placed in or against a wall, partition, or other support; and accessible only from the front. [70, 2011]

3.3.45 Patient Cot. An elevating patient conveyance device upon which the primary patient is transported, which is also known as a transporter, gurney, and carrier. [1901, 2009]

3.3.46 Power Source. A device that produces line voltage electricity. [1901, 2009]

3.3.47 Power Supply Assembly. Any cord or distribution assembly that is partly comprised of the neutral conductor, grounding conductor, and line voltage conductors connected from the output terminals of the power source to the first main overcurrent protection device. [1901, 2009]

3.3.48 Proper(ly). In accordance with the manufacturer's specifications or as recommended by the manufacturer. [1901, 2009]

3.3.49 psi. Pounds per square inch.

3.3.50 PTO. Power takeoff.

3.3.51 Purchaser. The authority having responsibility for the specification and acceptance of the ambulance.

3.3.52 Purchasing Authority. The agency that has the sole responsibility and authority for negotiating, placing, and, where necessary, modifying each and every solicitation, purchase order, or other award issued by a governing body. [1901, 2009]

3.3.53 Qualified Person. A person who, by possession of a recognized degree, certificate, professional standing, or skill, and who, by knowledge, training, and experience, has demonstrated the ability to deal with problems relating to a particular subject matter, work, or project. [1451, 2007]

3.3.54 Readily Accessible. Able to be located, reached, serviced, or removed without removing other components or parts of the ambulance and without the need to use special tools to open enclosures.

3.3.55 Reserve Capacity. The ability of a battery to sustain a minimum electrical load in the event of a charging system failure or a prolonged charging system deficit. [1901, 2009]

3.3.56 Seat.

3.3.56.1 Child Restraint Seat. A seat capable of transporting a child 66 lb (30 kg) or less in accordance with FMVSS 213 and mounted in accordance with the seat manufacturer's recommendation.

3.3.56.2 Infant Restraint Seat. A seat capable of transporting an infant 22 lb (10 kg) or less in accordance with FMVSS 213 and mounted in accordance with the seat manufacturer's recommendation.

3.3.57 Side Entry Door. The body door on the side of the ambulance body that provides entry into the patient compartment and through which patients can be loaded and unloaded.

3.3.58 Sign. A visual indication whether in pictorial or word format that provides a warning to the operator or other persons near the ambulance.

3.3.59 Stretcher. A non-elevating transportation device designed to transport a supine patient, which is also known as a litter or flat.

3.3.60 Striker. A mechanical device with which the latch engages on the opposing member of the body framework.

3.3.61 Switch. Any set of contacts that interrupts or controls current flow through an electrical circuit. [1901, 2009]

3.3.62 Total Continuous Electrical Load. The total current required to operate all of the devices permanently connected to the ambulance that can be simultaneously energized excluding intermittent-type loads.

3.3.63 Turning Clearance Radius. One-half the larger of the left or right full circle wall-to-wall turning diameter. [1901, 2009]

3.3.64 Usable Payload. The weight of the loose equipment, occupants, and cot that can be carried in the ambulance without exceeding the GVWR.

3.3.65 Weight.

3.3.65.1* Curb Weight. The total weight of the complete ambulance less the payload.

3.3.66 Weight Rating.

3.3.66.1* Gross Axle Weight Rating (GAWR). The final stage manufacturer's specified maximum load-carrying capacity of an axle system, as measured at the tire-ground interfaces.

3.3.66.2 Gross Combination Weight Rating (GCWR). The final stage manufacturer's specified maximum loaded weight for a combination (articulated) vehicle consisting of a tow vehicle and one or more towed units.

3.3.66.3* Gross Vehicle Weight Rating (GVWR). The final stage manufacturer's specified maximum load-carrying capacity of a single vehicle.

3.3.67 Wet Location. A location on a nonenclosed, exterior surface of an ambulance body or driving and crew compartment or a nonsheltered location inside a compartment with a door or cover that, while open, exposes the enclosure or panelboard to the environment.

Chapter 4 General Requirements

4.1 General. All ambulances shall comply with Chapters 1 through 9.

4.2 Responsibility of the Purchaser.

4.2.1 It shall be the responsibility of the purchaser to consider the amount of equipment and personnel that will be carried on the ambulance and to specify a minimum usable payload that will accommodate this weight once the ambulance is placed in service.

4.2.2 It shall be the responsibility of the purchaser to specify any details of the ambulance that would exceed the minimum specifications of this standard.

4.2.3 After acceptance of the ambulance, the purchaser shall be responsible for ongoing training of personnel to develop and maintain proficiency regarding the proper and safe use of the ambulance and the associated equipment.

4.3 Responsibility of the Contractor.

4.3.1 The contractor shall provide a detailed description of the ambulance, a list of equipment to be furnished, and other construction and performance details to which the ambulance shall conform.

4.3.1.1 The detailed description of the ambulance shall include, but shall not be limited to, minimum usable payload, wheelbase, curb-to-curb turning clearance radius, principal dimensions, angle of approach, and angle of departure.

4.3.1.2 The contractor's detailed description shall include a statement specifically describing each aspect of the delivered ambulance that will not be fully compliant with the requirements of this standard.

4.3.1.3 The purpose of these contractor specifications shall be to define what the contractor intends to furnish and deliver to the purchaser.

4.3.2 Responsibility for the ambulance and equipment shall remain with the contractor until they are accepted by the purchaser.

4.4 Ambulance Components.

4.4.1 All components shall be installed in accordance with the manufacturer's installation instructions or with the written approval of the component manufacturer.

4.4.2 All medical devices furnished shall comply with the U.S. Food and Drug Administration (FDA) regulatory requirements.

4.4.3 Vehicles shall be free from defects that could impair their reliability or serviceability.

4.4.4 All bodies, systems, equipment, and interfaces with the chassis not otherwise specified in this standard shall be done in accordance with the Chassis OEM Body Builders Guidelines.

4.5 Legal Requirements. The ambulance shall comply with the following:

- (1) Applicable federal regulations
- (2) State regulations as specified by the purchaser

4.6 Third-Party Certification of Test Results. Where this standard requires the witnessing or performing of tests by an independent third-party organization, that organization shall meet the requirements of this section.

4.6.1 Testing shall be witnessed or performed by an organization that is accredited for inspection of ambulances in accordance with ISO/IEC 17020, *General Criteria for the Operation of Various Types of Bodies Performing Inspection*, or accredited for testing ambulances to this standard in accordance with ISO/IEC 17025, *General Requirements for the Competence of Testing and Calibration Laboratories*.

4.6.2 The certification organization shall not be owned or controlled by the final-stage ambulance manufacturer.

4.6.3 The certification organization shall witness all tests and shall refuse to certify any test results for a system if all components of that system requiring testing do not pass the testing required by this standard. [1901: 4.7.4]

4.6.4 Conditional, temporary, or partial certification of test results shall not be permitted.

4.6.5 Appropriate forms or data sheets shall be provided and used during the testing. [1901: 4.7.6]

4.6.6 Programs shall be in place for training, proficiency testing, and performance verification of any staff involved with certification. [1901: 4.7.7]

4.6.7 Appeal Process.

4.6.7.1 The certification organization's operating procedures shall provide a mechanism for the manufacturer to appeal decisions.

4.6.7.2 The procedures shall include provisions for the presentation of information from representatives of both sides of a controversy to a designated appeals panel.

4.6.8 The third party that certifies any test results shall supply the following information on the certification organization letterhead:

- (1) Company or business for which the results are certified
- (2) Date of certification
- (3) Ambulance model, components, or equipment being certified
- (4) Certification organization and address
- (5) Date product tested

- (6) Model number and specification data
- (7) Applicable specification references and test requirement
- (8) Summary of the test report
- (9) A certifying statement with official signature

4.6.9* The testing facility for each certification shall supply the following supportive verification data and information on letterhead stationery in electronic format:

- (1) Name of company or business for whom ambulance product was tested
- (2) Report date
- (3) Name of sample product or device
- (4) Contractor's address
- (5) Serial and model number(s)
- (6) Specification referral and amendment number(s), and test requirement(s)
- (7) Test facilities used and location
- (8) Test equipment used
- (9) Test procedure
- (10) Test results
- (11) Verifying test data
- (12) Photographs
- (13) Drawings
- (14) Test conclusion(s)
- (15) Witness(es)
- (16) Authorized signature

4.7 Certification of Test Results by Manufacturer. Where this standard requires the results of tests or the performance of a component to be certified by the manufacturer, the manufacturer shall meet the requirements of this section. [1901: 4.8]

4.7.1 A representative of the manufacturer shall witness all tests and shall refuse to certify any test results for a system unless all components of that system requiring testing pass the testing required by this standard. [1901: 4.8.1]

4.7.2 Conditional, temporary, or partial certification of test results shall not be permitted.

4.7.3 The manufacturer shall have the facilities and equipment necessary to conduct the required testing, a program for the calibration of all instruments, and procedures to ensure the proper control of all testing. [1901: 4.8.3]

4.7.4 Appropriate forms or data sheets shall be provided and used during the testing. [1901: 4.8.4]

4.7.5 Programs shall be in place for training, proficiency testing, and performance verification of any personnel involved with certification. [1901: 4.8.5]

4.7.6 An official of the company that manufactures or installs the product shall designate in writing who is qualified to witness tests and certify results. [1901: 4.8.6]

4.7.7 Certification documentation shall be delivered with the ambulance, including results of the certification tests. [1901: 4.8.7]

4.7.8 Certification tests performed on a substantially similar ambulance shall be valid for up to 7 years or until such time as the production product changes are so significant that they no longer meet the definition of a substantially similar ambulance.

4.8 Personnel Protection.

4.8.1* Guards, shields, or other protection shall be provided where necessary in order to prevent injury of personnel by hot, moving, or rotating parts during nonmaintenance operations. [1901: 4.9.1]

4.8.2 Electrical insulation or isolation shall be provided where necessary in order to prevent electrical shock from on-board electrical systems. [1901: 4.9.2]

4.8.3 Vehicular workmanship shall ensure an operating environment free of accessible sharp projections and edges. [1901: 4.9.3]

4.8.4 Safety-related (caution, warning, danger) signs shall meet the requirements of ANSI Z535.4, *Product Safety Signs and Labels*. [1901: 4.9.4]

4.9 Controls and Instructions.

4.9.1 Illumination shall be provided for controls, switches, gauges, and instruments necessary for the operation of the ambulance and the equipment on it.

4.9.2* All required signs, instruction plates, and labels shall be permanent in nature, securely attached, and meet the requirements of 4.9.2.1 and ANSI/UL 969, *Standard for Marking and Labeling Systems*.

4.9.2.1 The signs, instruction plates, and labels shall be resistant to damage from the following:

- (1) Fluids to which they will normally be exposed
- (2) Temperatures between -30°F and 176°F (-35°C and 80°C)
- (3) Ultraviolet radiation

4.9.2.2* The exterior-mounted labels relating to safety or critical operational instructions shall be reflective or illuminated.

4.9.2.3 Controls and Switches.

4.9.2.3.1 Controls and switches that are expected to be operated by the belted driver while the ambulance is in motion shall be visible and within reach.

4.9.2.3.2 Controls and switches that are expected to be operated by the belted emergency medical service provider (EMSP) while the ambulance is in motion shall be visible and within reach of the designated primary patient care position.

4.9.2.4 Lever controls, equipment, items, and devices shall be installed, located, and stowed for the convenience of the purpose intended and shall not interfere with the EMSP's or the patient's ingress into or egress from respective compartments.

4.9.2.5 Marking of switches, indicators, and control devices shall be perceptively and permanently identified with at least 12-point letters for the noun or function and 8-point letters for the remainder of the legend.

4.9.2.6 The identifications shall be contrasting colors etched or engraved in plastic or metal or printed and laminated translucent plastic, grouped according to function, and mounted in illuminated or backlit panel(s) or the console.

4.10 Component Protection.

4.10.1* Hydraulic hose lines, air system tubing, control cords, and electrical harnesses shall be mechanically attached to the frame or body structure of the ambulance.

4.10.2 The types of equipment described in 4.10.1 shall be furnished with protective looms, grommets, or other devices at each point where they pass through body panels or structural members or wherever they lie against a sharp metal edge.

4.10.3 A through-the-frame connector shall be permitted to be used in place of protective looms or grommets.

4.11* Ambulance Performance.

4.11.1 The ambulance shall meet the requirements of this standard at elevations up to 2000 ft (600 m) above sea level.

4.11.2* The ambulance shall meet all the requirements of this standard while stationary on a grade of 6 percent in any direction.

4.11.3* Where temperature requirements are not otherwise specified, the ambulance shall be designed to function in ambient temperature conditions between -20°F and 110°F (-29°C and 43°C).

4.11.3.1 All interior systems, components, and permanently attached equipment shall function satisfactorily over a temperature range of 32°F to 95°F (0°C to 35°C).

4.11.3.1.1 Compliance of the equipment function shall be validated by testing a substantially similar ambulance in accordance with Section 9.11.

4.11.3.1.2 The ambulance and all systems, components, and equipment shall be capable of being stored at an ambient temperature between 32°F and 95°F (0°C to 35°C) without damage or deterioration.

4.11.4 The ambulance shall be capable of being driven for at least 250 mi (402 km) without refueling.

4.11.5 The vehicle shall be capable of three fordings without water entering patient and equipment compartments while being driven through a minimum of 8 in. (203 mm) of water, at speeds of 5 mph (8 km/hr), for a distance of at least 100 ft (30 m).

4.12 Roadability.

4.12.1 The ambulance when loaded to its GVWR shall be capable of the following performance while on dry, paved roads that are in good condition:

- (1) From a standing start, the ambulance shall be able to attain a speed of 55 mph (88 km/hr) within 25 seconds on a level road.
- (2) The ambulance shall be able to maintain a speed of at least 5 mph (8 km/hr) on any grade up to 35 percent.
- (3) The ambulance shall be able to maintain a speed of at least 55 mph (88 km/hr) on any grade up to 3 percent.

4.12.2 The determination shall be made by actual test or original equipment manufacturer's (OEM) certified computer prediction.

4.12.3 The maximum top speed of the ambulance shall not exceed 77 mph (124 km/hr) or the manufacturer's maximum service speed rating for the tires installed on the ambulance, whichever is lower.

4.12.4* The ambulance shall be capable of a sustained speed of not less than 65 mph (105 km/hr) over dry, hard-surfaced, level roads, at sea level, and passing speeds of 70 mph (112 km/hr) when tested under normal ambient conditions.

4.13 Serviceability.

4.13.1 The ambulance shall be designed so that all the manufacturer's recommended routine maintenance checks of lubricant and fluid levels can be performed by the operator without the need for hand tools.

4.13.2 Special Tools.

4.13.2.1 Where special tools are required for routine service on any component of the ambulance, such tools shall be provided with the ambulance.

4.13.2.2 Where the purchaser is purchasing multiple ambulances under the same contract, the purchaser shall specify the number of tools required.

4.13.3 Ambulance components that interfere with repair or removal of other major components shall be attached with fasteners, such as cap screws and nuts, so that the components can be removed and installed with ordinary hand tools.

4.13.4 These components shall not be welded or otherwise permanently secured in place.

4.14 Tests on Delivery.

4.14.1 If acceptance tests are conducted at the point of delivery, they shall not be performed in a manner that requires the ambulance or a component to operate outside its designed operating range.

4.14.2 Certification from OEM and individual equipment manufacturers are acceptable, provided they are not altered.

4.15* Documentation.

4.15.1 Any documentation delivered with the ambulance shall be permitted to be in printed format, electronic format, audiovisual format, or a combination thereof.

4.15.2* The ambulance manufacturer shall calculate the load distribution plan for the ambulance and deliver that load distribution plan with the ambulance.

4.16 Data Required of Contractor.

4.16.1 Ambulance Documentation. The contractor shall deliver with the ambulance at least one copy of the following documents:

- (1) The manufacturer's record of ambulance construction details, including the following information:
 - (a) Owner's name and address
 - (b) Ambulance manufacturer, model, and serial number
 - (c) Chassis make, model, and vehicle identification number (VIN)
 - (d) GAWR of front and rear axles and GVWR
 - (e) Front tire size and total rated capacity in pounds (kilograms)
 - (f) Rear tire size and total rated capacity in pounds (kilograms)
 - (g) Type of fuel and fuel tank capacity
 - (h) Electrical system voltage and alternator output in amps
 - (i) Paint manufacturer and paint number(s)
 - (j) Company name and signature of responsible company representative
 - (k) Documents from a certified scale showing curb weight on the front axle and rear axle(s) (without personnel and equipment)
- (2) Certification of compliance of the optical warning system (*see 7.9.16*)
- (3) Siren manufacturer's certification of the siren (*see 7.10.1.1*)
- (4) Written load analysis and results of the electrical system performance tests (*see Section 9.5 and Section 9.9*)
- (5) Certification of slip resistance of all exterior stepping, standing, and walking surfaces (*see Section 6.11*)

4.16.2 Operations and Service Documentation.

4.16.2.1 The contractor shall deliver with the ambulance at least one set of complete operation and service documentation covering the completed ambulance as delivered and accepted.

4.16.2.2 The documentation shall address at least the inspection, service, and operations of the ambulance and all major components thereof.

4.16.2.3* The contractor shall also deliver with the ambulance the following documentation for the entire ambulance and each major operating system or major component of the ambulance:

- (1) Manufacturer's name and address
- (2) Country of manufacture
- (3) Source for service and technical information
- (4) Parts replacement information
- (5) Descriptions, specifications, and ratings of the chassis
- (6) Wiring diagrams for low voltage and line voltage ambulance-specific systems to include the following information:
 - (a) Circuit logic for all electrical components and wiring
 - (b) Circuit identification
 - (c) Connector pin identification
 - (d) Zone location of electrical components
 - (e) Safety interlocks
 - (f) Alternator battery power distribution circuits
 - (g) Input/output assignment sheets or equivalent circuit logic implemented in multiplexing systems
- (7) Lubrication charts
- (8) Operating instructions for the chassis and any major components
- (9) Instructions regarding the frequency and procedure for recommended maintenance
- (10) Overall ambulance operating instructions
- (11) Safety considerations
- (12) Limitations of use
- (13) Inspection procedures
- (14) Recommended service procedures
- (15) Troubleshooting guide
- (16) Ambulance body, chassis, and other component manufacturer's warranties
- (17) Special data required by this standard
- (18) Material safety data sheet (MSDS) for any fluid that is specified for use on the ambulance module

4.16.3 Certification and Payload Signage.

4.16.3.1* All ambulances shall have a certification and payload label as shown in Figure 4.16.3.1.

Ambulance Data	
Manufactured By _____	Mo./Yr. _____
Address _____	
City _____	State _____ Zip _____
VIN _____	Job No. _____
Chassis Model _____	Statement of Exception Applies _____
Vehicle Type _____	Usable Payload (lb or kg)* _____
This ambulance is certified by the manufacturer to conform to the edition of NFPA 1917, <i>Standard for Automotive Ambulances</i>, in effect on the date the ambulance is contracted for, subject to any applicable statement of exception as mandated by this standard. *Usable payload is the weight of the loose equipment, occupants, and cot as defined by NFPA 1917 that can be carried in this ambulance without exceeding the GVWR.	

FIGURE 4.16.3.1 Certification and Payload Label.



4.16.3.2 The label shall be mounted on the body (module) interior in a conspicuous location.

4.16.3.3 The calculation of the usable payload listed on the label shall also be provided with the ambulance.

4.17 Statement of Exceptions. The entity responsible for final assembly of the ambulance shall deliver with the ambulance either a certification that the ambulance fully complies with all requirements of this standard or, alternatively, a Statement of Exceptions specifically describing each aspect of the completed ambulance that is not fully compliant with the requirements of this standard at the time of delivery.

4.17.1 The Statement of Exceptions shall contain, for each noncompliant aspect of the ambulance or missing required item, the following information:

- (1) A separate listing of the section(s) of the applicable standard for which compliance is lacking
- (2) A description of the particular aspect of the ambulance that is not in compliance therewith or required equipment that is missing
- (3) A description of the further changes or modifications to the delivered ambulance that must be completed to achieve full compliance
- (4) Identification of the entity that will be responsible for making the necessary post-delivery changes or modifications or for supplying and installing any missing required equipment to the ambulance to achieve full compliance with this standard

4.17.2 Prior to, or at the time of, delivery of the ambulance, the Statement of Exceptions shall be signed by an authorized

agent of the entity responsible for final assembly of the ambulance and by an authorized agent of the purchasing entity, indicating mutual understanding and agreement between the parties regarding the substance thereof.

4.17.3 An ambulance that is delivered subject to a Statement of Exceptions other than a certification of full compliance shall not be placed in emergency service until the ambulance has been modified as necessary to accomplish full compliance with this standard.

Chapter 5 Chassis

5.1 Carrying Capacity.

5.1.1 The manufacturer shall establish the required GVWR during the design of the ambulance using the method and values specified in Table 5.1.1.

5.1.2 The manufacturer shall design the ambulance such that the completed ambulance, when loaded to its required GVWR with all loose equipment distributed as close as practical to its intended in-service configuration, does not exceed the GVWR or GAWR of the chassis.

5.1.3 Label.

5.1.3.1 The ambulance manufacturer shall provide a high-visibility label in a location visible to the driver while seated.

5.1.3.2* The label shall show the height of the completed ambulance in feet and inches (meters), and the GVWR in tons (metric tons).

Table 5.1.1 Required GVWR Calculation

Component		Weight (lb)
Chassis		
Ambulance body complete		
Automotive fluids		
Permanently mounted equipment		
Loose equipment (Use one of these values unless the required loose equipment is specified by the purchaser)	Type I	750
	Type I-AD	1250
	Type II	500
	Type III	750
	Type III-AD	1250
Belted occupant seating positions	(No. Seats) ×	171
Cot patient		171
Cot	Standard cot	100
	Power cot	150
Spare capacity		200
Minimum GVWR required		

Note: 1 lb = 0.45 kg.

5.2* Weight Distribution.

5.2.1 Longitudinal Weight Distribution.

5.2.1.1 When the ambulance is loaded to its GVWR, the front-to-rear weight distribution and vertical center of gravity shall be within the limits set by the chassis manufacturer.

5.2.1.2 The front GAWR shall be not less than 20 percent of the GVWR.

5.2.1.3 The rear GAWR shall be not less than 50 percent of the GVWR.

5.2.2* **Lateral Weight Distribution.** The vehicle, when loaded to its GVWR, shall have a side-to-side tire load variation of no more than 5 percent of the total tire load for that axle.

5.2.3 The front axle loads shall not be less than the minimum axle loads specified by the chassis manufacturer under full load and all other loading conditions.

5.2.4 Vehicle and component ratings shall be the manufacturer's published ratings and shall not be modified without written authorization from the OEM.

5.2.5 The manufacturer shall design the ambulance to comply with the GAWR, the overall GVWR, and the chassis manufacturer's load balance guidelines.

5.3 Engine and Engine System Design.

5.3.1 Cold Start Performance Requirements.

5.3.1.1 The chassis engine shall start and run for 5 minutes without stalling at 0°F (−18°C) without the use of external power or starting fluids and without the aid of engine block preheating devices (except glow plugs or combustion air pre-heater).

5.3.2 Indicators shall be provided to alert the driver to high engine temperature or low oil pressure conditions.

5.3.3 An engine hour meter shall be provided.

5.3.4 Idle reduction engine shutdown device shall be disabled if provided in accordance with federal and state exemptions.

5.4 Engine Speed Auxiliary Control Device.

5.4.1* An engine speed auxiliary control device (high-idle switch, throttle, or automatic voltage monitor) shall be installed to allow an increase in the engine speed when the ambulance is parked.

5.4.2 An interlock shall prevent the operation of the engine speed auxiliary control device unless the parking brake is engaged and the transmission is in neutral or park, or the parking brake is engaged and the engine is disengaged from the drive wheels.

5.5 Cooling System.

5.5.1* The engine's cooling system shall maintain a temperature at or below the engine manufacturer's maximum coolant temperature.

5.5.2 Compliance of the engine's cooling system shall be validated by testing a substantially similar ambulance in accordance with Section 9.14.

5.6 Exhaust System.

5.6.1 The exhaust piping and discharge outlet shall be located or shielded so as not to expose any portion of the ambulance or equipment to excessive heating.

5.6.2 Where parts of the exhaust system are exposed so that they are likely to cause injury to operating personnel, protective guards shall be provided.

5.6.3 The tailpipe outlet shall not terminate within 12 in. (300 mm) of the vertical axis of the fuel fill opening, oxygen storage, or patient entry doors where these features are located on the same side of the vehicle.

5.7 Braking System.

5.7.1 All brakes shall be readily accessible for inspection.

5.7.2 Where air-actuated braking systems are provided, they shall include the following:

- (1) An automatic moisture ejector
- (2) An air dryer
- (3) A pressure protection valve to prevent all air-operated accessories from drawing air from the air brake system when the air system's pressure drops below a pressure setting no lower than 80 psi (550 kPa)

5.7.3* Any time a secondary braking device such as transmission retarders or exhaust restriction devices are used, they shall have a switch to turn them off during adverse road conditions.

5.8 Suspension.

5.8.1* With the exception of the OEM's furnished and installed components, the ambulance shall provide not less than the following clearance, measured in accordance with SAE J689, *Approach, Departure, and Ramp Break over Angles*:

- (1) Approach angle of 10 degrees
- (2) Ramp breakover of 10 degrees
- (3) Departure angle of 10 degrees

5.8.2* A traction control feature shall be provided.

5.8.3 Shock absorbers shall be furnished on the front and rear axles.

5.8.4 Any ambulance with an air-ride suspension shall include an air dryer and automatic heated moisture ejection device to ensure that the air system is provided with dry air to protect the suspension control components.

5.9 Wheels and Tires.

5.9.1 Hub caps or wheel covers shall be removable without loosening the lug nuts so that wheels can be readily observed for daily inspection.

5.9.2 Mud Flaps.

5.9.2.1 Mud flaps, at least as wide as the tire(s), shall be provided behind the front and rear wheels and shall be reinforced at the point of attachment to the vehicle.

5.9.2.2 Mud flaps shall be permitted to be incorporated into the running boards.

5.9.3 Clearance for tire chains shall be provided for rear wheels in accordance with SAE J683, *Tire Chain Clearance — Trucks, Buses (Except Suburban, Intercity, and Transit Buses), and Combinations of Vehicles*.



5.9.4 Bodies designed with wheel openings shall have the rear wheels centered, within ± 2 in. (± 52 mm) of those openings.

5.9.5* Each tire shall be equipped with a visual indicator or monitoring system that indicates tire pressure.

5.10* Vehicle Stability. If the ambulance is equipped with a stability control system, the system shall have, at a minimum, a steering wheel position sensor, a vehicle yaw sensor, a lateral accelerometer, and individual wheel brake controls.

5.11 Bumpers.

5.11.1* A front bumper shall be furnished in the front of the chassis that is at least the equivalent of the chassis manufacturer's OEM bumper.

5.11.2 The rear of the ambulance shall be furnished with a bumper that extends to within 6 in. (152 mm) of each side of the ambulance.

5.11.2.1 The rear bumper shall be secured to the vehicle's chassis frame.

5.11.2.2 The rear bumper of Type I and Type III vehicles shall be provided with an integrated step.

5.11.2.3 The step shall be designed to prevent the accumulation of mud, ice, or snow and shall be made of anti-skid open grating material.

5.11.2.4 The step shall not be located or exposed to the interior of the ambulance when the door(s) is closed.

5.11.2.5 The step shall be at least the width of the door opening for which it is provided.

5.11.2.6 The stepping surface shall have a minimum depth of 5 in. (127 mm) and a maximum depth of 10 in. (254 mm).

5.11.2.7 If the step protrudes more than 7 in. (178 mm) from the rear of the vehicle, a fold-up step shall be furnished.

5.11.2.8 Stepping Surface.

5.11.2.8.1 The rear stepping surface shall withstand a load of 500 lb (227 kg) with no more than 1.0 in. (25.4 mm) of deflection or 0.25 in. (6.4 mm) of permanent deformation.

5.11.2.8.2 Compliance of the rear step surface shall be validated by testing a substantially similar ambulance or bumper and step structure in accordance with Section 9.18.

5.11.2.8.3 The distance from the road surface to the top surface of the first step shall not exceed 22 in. (559 mm) with the vehicle loaded to its GVWR and/or the suspension in the kneeling condition.

5.11.2.8.4 Steps shall be provided in the door openings.

5.11.2.8.5 Step wells shall be illuminated.

5.11.2.8.6 Step surfaces shall be constructed with anti-slip material.

5.11.2.8.7* All steps shall have a minimum area of 35 in.² (22,580 mm²) and shall be of such a shape that a 5 in. (125 mm) diameter disk does not overlap any side when placed on the step.

5.12 Cab Seal.

5.12.1 If the cab and the patient compartment are separate enclosures, the cab shall be provided with a sealing device.

5.12.2 The seal shall be fabricated from a material resistant to ozone, sunlight, oil, and fungus.

5.12.3 The seal shall remain flexible in temperatures between -20°F and 110°F (-29°C and 43°C).

5.12.4 The seal shall be designed for proper fit and finish and be able to absorb lateral, vertical, and torsional displacement due to body/cab movement.

5.13 Front Seats.

5.13.1 Front cab seating for the driver and at least one passenger shall be provided.

5.13.2 The driver's seat shall have the OEM's full, unobstructed seat track travel range of longitudinal adjustment and a minimum of 30 percent of the range of inclination, but not less than the angle furnished on the OEM's standard nonreclining high back seat.

5.14* Mirrors.

5.14.1 Dual side view mirrors having a combination flat and convex mirror system shall be furnished.

5.14.2 All primary side view mirrors used by the driver shall be adjustable from the driver's position.

5.14.3 Hardware and mirror heads shall have a corrosion-resistant exterior finish.

5.14.4 Each side view mirror's reflective surface outboard edge shall extend at least 1 in. (25.4 mm) beyond the outside of the modular body.

5.15 Cab Integrity. Cabs on ambulances with a GVWR greater than 26,000 lb (11,800 kg) shall meet the requirements of SAE J2420, *COE Frontal Strength Evaluation — Dynamic Loading Heavy Trucks*, and SAE J2422, *Cab Roof Strength Evaluation — Quasi-Static Loading Heavy Trucks*.

Chapter 6 Patient Compartment

6.1 Patient Compartment Configuration. The patient compartment shall provide a minimum of 275 ft³ (7.7 m³) of space, less volume for cabinets, while complying with 6.1.1 and 6.1.2.

6.1.1 A minimum of 10 in. (254 mm) shall be provided from the nearest edge of the cot mattress to the loading door(s).

6.1.2 The compartment shall provide a minimum of 12 in. (300 mm) of clear aisle walkway on at least one side of the patient cot.

6.2 Mounting. If the body is of modular construction, it shall be mounted per the allowed and/or recommended methods of the chassis manufacturer.

6.3 Structural Integrity — Roof Loading.

6.3.1 Any Type I ambulance body shall withstand a force equal to 2.5 times the curb weight of the vehicle applied to the roof of the vehicle's body structure, validated by testing a substantially similar ambulance in accordance with Section 9.1.

6.3.1.1 The modular body shall be tested in accordance with Section 9.1.

6.3.2 Any Type II ambulance body shall withstand a force equal to 1.5 times the curb weight of the vehicle applied to the roof of the vehicle's body structure, validated by testing a substantially similar ambulance in accordance with Section 9.1.

6.3.3 Any Type III ambulance body shall withstand a force equal to 2.5 times the curb weight of the vehicle applied to the roof of the vehicle's body structure, validated by testing a substantially similar ambulance in accordance with Section 9.1.

6.3.4 The downward vertical movement at any point on the roof application plate shall not exceed 5.12 in. (130 mm).

6.3.5 Each exterior door of the vehicle shall be capable of opening and closing during the full application of the force and after release of the force.

6.3.6 No structural damage to any load bearing or supporting members (e.g., torn or broken material, broken welds, popped or sheared body rivets, bolts, and/or fasteners) shall be evident during the application of the force and after the release of the force.

6.4 Body Structural Integrity — Side Loading.

6.4.1 Any Type I ambulance body shall withstand a force equal to 2.5 times the curb weight of the vehicle applied to either the driver or passenger side of the vehicle's body structure, validated by testing a substantially similar ambulance in accordance with Section 9.1.

6.4.2 Any Type III ambulance body shall withstand a force equal to 2.5 times the curb weight of the vehicle applied to either the driver or passenger side of the vehicle's body structure, validated by testing a substantially similar ambulance in accordance with Section 9.1.

6.5 Body Sealing.

6.5.1 Sealing Out Water.

6.5.1.1 There shall be no water leakage into the cab, any exterior compartment, or the patient compartment or through any door seal, light seal, or cab-to-module seal.

6.5.1.2 Compliance of the body sealing out water shall be validated by testing each finished ambulance in accordance with Section 9.10.

6.5.2 Sealing Out Exhaust Gas.

6.5.2.1 The body shall be sealed and vented so that the interior carbon monoxide level does not exceed 13 ppm of carbon monoxide (CO).

6.5.2.2 The patient compartment shall include a listed CO detector in accordance with ANSI/UL 2034, *Standard for Safety, Single and Multiple Station Carbon Monoxide Alarms*.

6.6 Wheel Housings.

6.6.1 Wheel housings of modular bodies shall include metal or plastic splash shields between the body wheel housing and the wheels extending over the top of the tires to the bottom of the body side skirting.

6.6.2 Wheel housing openings shall allow for tire chain usage and easy tire removal and service and conform to SAE J683, *Tire Chain Clearance — Trucks, Buses (Except Suburban, Intercity, and Transit Buses), and Combinations of Vehicles*.

6.6.3 The OEM's standard wheel housings on Type II ambulances shall be acceptable.

6.7 Patient Compartment to Cab Partition.

6.7.1 A bulkhead partition shall be provided between the cab and the patient compartment.

6.7.2 The partition(s) shall be located directly behind the driver's seat and the cab passenger seat when in the rearmost position.

6.7.3 The partition shall extend from the floor to the ceiling.

6.7.4 The partition shall be wide enough to cover the width of each cab seat excluding arm rests.

6.7.5* The cab and body bulkheads shall have an aligned window opening of at least 150 in.² (96,780 mm²) or other means of visual and hands-free audio communication.

6.7.6 If so equipped, a window in the cab or body shall be of the sliding type, aligned, and connected with the modular body window opening.

6.7.7 The window shall be latchable from the cab side and shall be a transparent, shatterproof panel.

6.8 Access Handrails or Handholds.

6.8.1 Interior or exterior access handrails or handholds shall be provided at each entrance to a driving or crew compartment and at each position where steps or ladders for climbing are located.

6.8.2 Exterior access handrails shall be constructed of or covered with a slip-resistant (e.g., cross-hatched stainless steel, rubberized), noncorrosive material.

6.8.3 Exterior access handrails shall be between 1 in. and 1½ in. (25 mm and 42 mm) in diameter and have a minimum clearance between the handrails and any surface of at least 2 in. (50 mm).

6.8.4 All exterior access handrails shall be designed and mounted to reduce the possibility of hand slippage and to avoid snagging of equipment or clothing.

6.8.5 Access handrails supplied by the chassis manufacturer on a commercial chassis shall be permitted to be used to meet the requirements of this section.

6.8.6 Handrail Testing.

6.8.6.1 Handrails shall withstand a force of 300 lb (136 kg) applied in any direction without detaching, loosening, or permanently deforming.

6.8.6.2 Compliance of the handrail shall be validated by testing a substantially similar ambulance or body structure in accordance with Section 9.8.

6.9 Patient Compartment Entry Doors.

6.9.1 Door handles shall be designed and installed to protect against accidental or inadvertent opening.

6.9.2 Entry doors and door openings shall be designed to minimize inadvertent snagging of apparel.

6.9.3 Door latches, hinges, and hardware furnished by OEMs and final stage ambulance manufacturers (FSAMs) shall meet the performance requirements of FMVSS 206.

6.9.4 When doors are open, the hinges, latches, and door-checks shall not protrude into the access area.

6.9.5 Doors shall have hardware or devices to prevent inadvertent closing.

6.9.6 One externally operated lock for each door opening shall be provided.

6.9.7* An internal lock on each patient compartment primary entry door shall be provided.

6.9.8 If a key lock is provided, all patient compartment entry door locks shall be identically keyed.

6.9.9 Doors shall be equipped with not less than 250 in.² (161,300 mm²) of safety glass area per door.

6.9.10 Doors shall be designed to prevent leakage of exhaust fumes, dust, water, and air into the patient compartment.

6.9.11 Doors shall, in addition to meeting applicable FMVSS standards, withstand the loads on the latches and hinges listed in Table 6.9.11 when tested in accordance with Section 9.2.

6.9.11.1 Compliance of the door shall be validated by testing on a patient compartment sample of a substantially similar design.

6.9.11.2 During the tests, the door(s) or its retention components shall not do either of the following:

- (1) Open at any time during the test procedure
- (2) Fail at the latch, striker(s), hinge, or their points of attachment to the door or the body framework

6.10 Means of Escape.

6.10.1 Any interior area to be occupied by personnel shall have a minimum of two means of escape.

6.10.2 Each means of escape opening shall be a minimum of 24 in. × 24 in. (610 mm × 610 mm).

6.11 Exterior Stepping Surfaces and Interior Steps.

6.11.1 All materials used for exterior surfaces designated as stepping, standing, and walking areas and all interior steps shall have a minimum slip resistance in any orientation of 0.68 when tested wet using the English XL tester in accordance with the manufacturer's instructions or 0.52 when tested wet using the Brungraber Mark II tester in accordance with the manufacturer's instructions.

6.11.2 A standard Neolite[®] test sensor shall be used with both the English XL tester and the Brungraber Mark II tester.

6.11.3 Sampling Strategy.

6.11.3.1 For uniformly patterned materials, at least 16 readings shall be taken on each sample.

6.11.3.1.1 Each reading shall be taken 90 degrees clockwise from the previous orientation, resulting in at least four readings in each orientation.

6.11.3.1.2 The readings shall be averaged and reported as the slip resistance for the material.

6.11.3.2 For directionally patterned materials, at least 32 readings shall be taken on each sample.

6.11.3.2.1 Each reading shall be taken 45 degrees clockwise from the previous orientation, resulting in at least four readings in each orientation.

6.11.3.2.2 The four readings in each direction shall be averaged and reported as the slip resistance for the material in that orientation.

6.11.4 The contractor shall deliver with the ambulance a certification that all materials used for exterior surfaces designated as stepping, standing, and walking areas meet the requirements of Section 6.11.

6.12 Exterior Storage.

6.12.1 Doors shall provide secure closure properties.

6.12.2 All hinged doors wider than 14 in. (356 mm) and excluding battery compartments shall have positive hold-open devices that permit one-hand closure.

6.12.3 Hardware shall be rust resistant.

6.12.4 All primary exterior compartment doors shall have latches with locks.

6.12.5 All exterior compartments greater than 4 ft³ (0.11 m³) shall be automatically illuminated when opened and shall meet the requirements of 7.11.7.1.

6.12.6 Any absorbent material, such as carpeting, fabric, or inside/outside plastic-type carpeting, that resists cleaning and decontamination shall not be used.

6.13 Floor.

6.13.1 The patient compartment floor shall be flat, except where the area near the rear entrance door is sloped for a lower entering height.

6.13.2 With the exception of cot retention hardware, the floor shall be unencumbered in the door(s) access and work area.

6.13.3 The floor shall be designed to eliminate voids or pockets where water or moisture can become trapped.

6.13.4 The subfloor construction shall cover the full length and width of the patient compartment.

6.13.5 If plywood is used in the subfloor, it shall be marine or exterior grade.

6.13.6 If the ambulance has a modular body, the subfloor shall be designed to prevent water penetration and shall include a heat shield.

Table 6.9.11 Loads Withstood on Ambulance Door Latches and Hinges

Latch or Hinge	Side Door				Rear Door			
	Transverse Load		Longitudinal Load		Transverse Load		Longitudinal Load	
	lbf	N	lbf	N	lbf	N	lbf	N
Fully latched position	2,500	11,120	2,500	11,120	2,500	11,120	2,500	11,120
Secondary latched position	1,500	6,672	1,500	6,672	1,500	6,672	1,500	6,672
Hinge	2,500	11,120	2,500	11,120	2,500	11,120	2,500	11,120

6.13.7 Body Floor Structural Integrity.

6.13.7.1 If the subfloor is constructed of plywood, the plywood shall have an American Plywood Association (APA) floor rating of 16 in. (406 mm) on center or better.

6.13.7.2 If the subfloor is constructed of other than plywood, it shall be tested using a 3 in. (76 mm) disk and have a maximum of 0.125 in. (3 mm) deflection at 200 lb (91 kg) force and a minimum ultimate load of 400 lb (181 kg) for a 16 in. (406 mm) on center load.

6.13.7.2.1 The maximum floor structure spacing shall be used for testing.

6.13.7.2.2 Compliance of the floor structural integrity shall be validated by testing the midpoint of the longest unsupported section of a substantially similar ambulance or floor structure in accordance with the concentrated static load test procedure in ASTM E 661, *Standard Test Method for Performance of Wood and Wood-Based Floor and Roof Sheathing Under Concentrated Static and Impact Loads*.

6.13.7.2.2.1 If panel joints occur at the maximum span location, they should be present in the test sample as a worst-case scenario.

6.13.7.3 A drawing of the floor structure and fastening schedule of the subfloor material to the structure is required in the certification report.

6.14 Floor Covering.

6.14.1 Floor covering shall be nonpermeable, seamless, and easily cleaned.

6.14.2* The floor covering shall cover the entire length and width of the compartment's exposed floor.

6.14.3 Joints where the floor covering meets the sidewalls shall be sealed and bordered with corrosion-resistant cove molding, or the floor covering shall extend at least 3 in. (76 mm) up the sidewalls.

6.15 Insulation.

6.15.1 Where the patient compartment is insulated, it shall be insulated with a nonsettling type, verminproof, mildewproof, nontoxic, and nonhygroscopic material that meets the requirements of FMVSS 302.

6.15.2 If fiberglass insulation is used, it shall be protected from exposure to water.

6.16* Interior Storage.

6.16.1 The interior of the patient compartment shall provide enclosed storage cabinetry, compartment space, and shelf space.

6.16.2 Compartment(s) under the floor that have opening panel(s) inside the patient compartment shall not be acceptable.

6.16.3 Where furnished, top-opening squad bench lids shall be fitted with an automatic hold-open device and a quick-release slam-type latching device when closed.

6.16.4 Storage compartment door handles, where provided, shall not protrude more than 1 in. (25 mm) if located 14 in. (356 mm) or higher above the floor and shall not protrude more than 2 in. (51 mm) if located lower than 14 in. (356 mm) or higher above the floor.

6.16.5 Doors shall be designed to remain closed during transport.

6.16.6 Storage compartments shall be firmly fastened to the body structure.

6.17 Interior Surfaces.

6.17.1 The interior of the body shall be free of all sharp projections and sharp corners.

6.17.2 All hangers or supports for equipment and devices shall be mounted as flush as possible with the surrounding surface.

6.17.3 The finish of the entire patient compartment and exterior storage, including interiors of storage cabinets, shall be as follows:

- (1) Impervious to soap, water, body fluids, and disinfectants
- (2) Mildew resistant
- (3) Fire resistant in compliance with FMVSS 302
- (4) Able to be cleaned and disinfected

6.17.4 Countertop horizontal surface shall be seamless and impervious to contaminants.

6.17.5 All edges that meet vertical cabinets shall be sealed.

6.18 Equipment Mounting.

6.18.1 Medical Supplies and Equipment Storage Mounting. Supplies, devices, tools, and so forth, shall be stored in enclosed compartments or fastened to secure them during vehicle motion.

6.18.2 Equipment weighing 3 lb (1.36 kg) or more mounted or stored in a driving or patient area shall be contained in an enclosed compartment capable of containing the contents when a 10G force is applied in the longitudinal, lateral, or vertical axis of the vehicle, if the equipment is secured in a bracket(s) or mount that can contain the equipment when the equipment is subjected to those same forces.

6.18.3 Each patient compartment cabinet shall be permanently labeled with its maximum load capacity.

6.19* Waste and Sharps Disposal. A receptacle for general waste and an OSHA-compliant container for sharps disposal shall be provided in the patient compartment.

6.20 Holder for Intravenous Fluid Containers.

6.20.1 One mounted device specifically designed for holding and securing an IV fluid container against accidental release during normal transport activity shall be provided.

6.20.2 The device shall not protrude more than 1.0 in. (25 mm) in the closed position.

6.21 Patient Compartment Seats.

6.21.1 Seat Integrity. Any seat mounted on an adjustable seat device shall be dynamically tested along the direction of the adjustment using the crash pulse in SAE J2917, *Occupant Restraint and Equipment Mounting Integrity — Frontal Impact System-Level Ambulance Patient Compartment*.

6.21.1.1 The test shall be conducted with the seat oriented in the direction of adjustment for both the forward-facing and rear-facing directions.

6.21.1.2 During and after the test, the seat shall remain securely attached to the adjustment device.

6.21.1.3 Seat belt anchorages on side facing seats shall be tested in accordance with the strength requirements of FMVSS 210.



6.21.2* SCBA Storage. SCBA packs shall not be stored in the seat backs of seats in the patient compartment.

6.21.3 Seat Belts.

6.21.3.1* Each designated seating position shall be provided with a seat belt.

6.21.3.2 Ambulances above 19,500 lb (8845 kg) GVWR shall provide seat belts in accordance with 6.21.3.2.1 and 6.21.3.2.2.

6.21.3.2.1 The effective seat belt web length for a Type 1 lap belt for pelvic restraint shall be a minimum of 60 in. (1524 mm) with the seat adjusted all the way back and down when measured using the following procedure and referring to Figure 6.21.3.2.1:

- (1) Locate an imaginary line where the plane of the center of the seat back surface intersects the plane of the center of the seat cushion surface (see line 1 in Figure 6.21.3.2.1).
- (2) Locate point A on line 1 at the outside of the seat on the retractor side of the seat.
- (3) Locate point C on line 1 at the outside of the seat on the receiver side of the seat.
- (4) Locate point D at the tip of the receiver.
- (5) Pull the seat belt webbing entirely out of the retractor and measure along the webbing between point A and the male seat belt buckle.
- (6) Record this length as AD.
- (7) Measure from point C to point D and record this length as CD.
- (8) Add AD and CD for the effective seat belt web length.

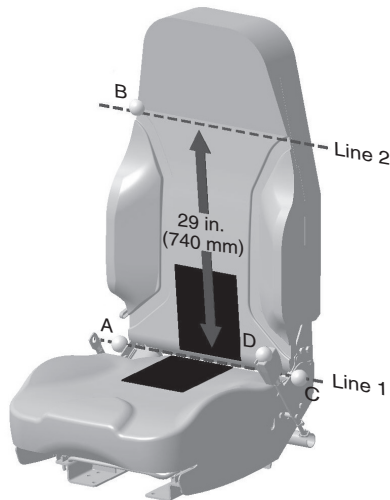


FIGURE 6.21.3.2.1 Dimension Lines for Measuring Seat Belt Effective Length.

6.21.3.2.2 The effective seat belt web length for a Type 2 pelvic and upper torso restraint-style seat belt assembly shall be a minimum of 110 in. (2800 mm) with the seat adjusted all the way back and down when measured using the following procedure:

- (1) Locate an imaginary line where the plane of the center of the seat back surface intersects the plane of the center of the seat cushion surface (see line 1 in Figure 6.21.3.2.1).
- (2) Locate an imaginary line parallel with line 1 and lying on the center of the seat back surface 29 in. (740 mm) from line 1 (see line 2 in Figure 6.21.3.2.1).

- (3) Locate point A on line 1 at the outside of the seat on the retractor side of the seat.
- (4) Locate point B on line 2 at the shoulder strap edge of the seat back.
- (5) Locate point C on line 1 at the outside of the seat on the receiver side of the seat.
- (6) Locate point D at the tip of the receiver.
- (7) Pull the seat belt webbing entirely out of the retractor and measure along the webbing between points A and B.
- (8) Record this length as AB.
- (9) Measure from point C to point D and record this length as CD.
- (10) Add AB and 2CD for the effective seat belt web length.

6.21.3.3 Signs that read "Occupants Must Be Seated and Belted When Ambulance Is in Motion" shall be visible from each seated position.

6.21.4 Seated Head Clearance.

6.21.4.1 The minimum seat-to-ceiling dimension from the top surface of the seat bottom cushion to the nearest overhead obstruction for each designated seating position shall be 43 in. (1092 mm).

6.21.4.2 The measurement shall be in accordance with Section 9.25.

6.21.5 Seat Adjustment. Where independent horizontal seat adjustment is provided, it shall be fully adjustable within 10 seconds.

6.21.6 Seating Position Width. Each designated seating space shall have a minimum width of 24 in. (610 mm) measured from the seat surface to 43 in. (1092 mm) above the seating surface.

6.21.7 Seat Size.

6.21.7.1 Seat bottom cushions shall be a minimum of 18 in. (460 mm) in width.

6.21.7.2 Seat bottom cushions shall be between 15 in. and 19 in. (380 mm and 483 mm) from the front of the cushion to the face of the seat back.

6.21.7.3 A back cushion that extends from the seat bottom cushion vertically at least 7 in. (460 mm) and that is a minimum of 18 in. (460 mm) wide at the base shall be provided.

6.21.7.4 Each seat shall provide back and head support beginning no more than 24 in. (610 mm) above the seat bottom cushion and continuing to at least 32 in. (813 mm) above the seat bottom cushion.

6.21.7.5 For any seat not covered by FMVSS 202, the top of the seat back or head rest shall be a minimum of 10 in. (254 mm) in width.

6.21.8 Access to Patient.

6.21.8.1 If the primary patient care seat is at the patient torso position, it shall be capable of being adjusted such that the nearest edge of the seat bottom cushion is within 6 in. (152 mm) of the nearest edge of the patient cot.

6.21.8.2 If the primary patient care position is at the patient torso position, the fore-aft position of the seat shall be capable of lining up within 6 in. (152 mm) of the midpoint between the head end of the cot and the backrest hinge.

6.21.8.3 If the primary patient care seat is at the patient head position, it shall be capable of being adjusted such