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INTRODUCTION

For more than 30 years, the emergency medical services in the U.S. has been represented by an association dedicated to the production of safe, state-of-the-art ambulances. That organization is the Ambulance Manufacturers Division (AMD) of the National Truck Equipment Association (NTEA).

The NTEA is the only trade association representing the nation’s manufacturers and distributors of commercial trucks, truck bodies, truck equipment and accessories. NTEA members include companies that produce highly specialized vehicles, such as ambulances, towing and recovery vehicles, small school buses and mid-size buses. The Association provides its nearly 1,800 members with resource materials, technical assistance, education and training and business improvement programs. Headquartered in Detroit, the NTEA interacts directly with the major truck chassis manufacturers on product compatibility issues. From its government relations office in Washington, DC, the Association keeps its members advised of changing regulations affecting commercial trucks and lobbies on the industry’s behalf.

Before affiliating with the NTEA, the AMD was a division of the Truck Body and Equipment Association. In 1986, the AMD became a division of the NTEA to further enhance its credibility and depth of professionalism. The organization has grown dramatically over the past 20 years as more and more ambulance manufacturers and industry-related companies have realized the value and significance of being an AMD member. Currently composed of approximately 45 companies, the AMD has consistently maintained representation of more than 90% of the ambulance production in North America. Since its founding in 1976, the AMD has worked closely with all state and federal regulatory agencies and has been directly involved in activities that benefit the general public as well as the industry. These activities include:


- Partnership with the General Services Administration (GSA) in further development and revision of KKK-A-1822.

- Active involvement with truck chassis manufacturers in the development of new models and options that make their chassis more compatible for ambulance service.
• Support of the Ford Qualified Vehicle Modifier Program.

• Continued development, improvement and updating of AMD Standards.

Federal laws and regulations require that all motor vehicles, including ambulances, operated on public highways conform and be certified to all applicable Federal Motor Vehicle Safety Standards (FMVSS). The FMVSS set the performance requirements for the safety of new motor vehicles and motor vehicle equipment. The National Highway Traffic Safety Administration (NHTSA) of the U.S. Department of Transportation oversees these Standards that were established by the National Traffic and Motor Vehicle Safety Act of 1966. All AMD Standards are in addition to, and in no way substitute for, FMVSS and other federal requirements that apply to motor vehicles and other regulated aspects of ambulances and their intended functions.

Most AMD members maintain staff engineers to keep their companies abreast of technological advances applying to the manufacture of ambulance bodies, electrical systems, environmental systems and other ambulance components. These advances are incorporated into new ambulance models thereby continuously improving the industry through competition. No governmental agency dictates that AMD members make these improvements; they are done voluntarily to upgrade the product, make it more reliable, and provide even more dependable life support capabilities.

Development of AMD Standards began almost 30 years ago by AMD members, in conjunction with the GSA, and are currently cited in Federal Specification for the Star-of-Life Ambulance (KKK-A-1822). AMD Standards are meant to work in tandem with the KKK-A-1822 Specification by providing ambulance purchasers and users with performance standards specific to ambulances. AMD Standards provide a verifiable means to help assure that ambulatory vehicles comply with certain performance requirements of the KKK-A-1822 Specification.

AMD Standards are developed and revised with input from the GSA, ambulance manufacturers and component suppliers, emergency medical technicians, paramedics, vehicle maintenance personnel, the Emergency Medical Service community at large and other interested parties through public comment. All proposed changes received during periods of public comment that may enhance the quality of the Standards within their respective context are considered, and appropriate revisions are made before a standard is adopted. All of the enclosed AMD Standards have been incorporated into the latest revision of KKK-A-1822. These documents and others are available for download through the NTEA Web site at www.ntea.com

Ambulance Manufacturers Division of the NTEA
37400 Hills Tech Drive,
Farmington Hills, MI 48331-3414
S1. SCOPE. This standard establishes minimum requirements for testing ambulance body structural integrity.

S2. PURPOSE. The purpose of this standard is to demonstrate static strength of the patient compartment of an ambulance when subjected to a uniform load. This is a type test.

S3. APPLICABILITY. This standard applies to all ambulances. This is a type test.

S4. DEFINITION.

S4.1 “Curb weight” shall include the weight of the complete ambulance; chassis, cab and body, including all mandatory equipment, full complement of fuel, lubricants and coolant.

S5. REQUIREMENTS. For Type II’s a force equal to 1.5 times the curb weight of the vehicle, and for Type I’s and Type III’s 2.5 times the curb weight of the vehicle, is applied to the roof of the vehicle’s body structure through a force application plate as specified in S6.:

a. The downward vertical movement at any point on the roof application plate shall not exceed 5.125”.

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

c. No structural damage to any load-bearing or supporting members (i.e., 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.

S5.1 For Type I and III modular bodies only, a force equal to 2.5 times the curb weight of the vehicle is applied to either the driver or passenger side of the vehicle’s body structure through a force application plate as specified in S9.:

a. The downward vertical movement at any point on the side application plate shall not exceed 5.125”.

b. The rear doors of the vehicle shall be capable of opening and closing during the full application of the force and after release of the force.

c. No structural damage to any load-bearing or supporting members (i.e., 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.

S6. TEST PROCEDURES. Each vehicle tested shall be capable of meeting the requirements of S5. when tested in accordance with the procedures set forth below:

S6.1 Place the vehicle on a rigid horizontal surface so that it is entirely supported by means of the vehicle frame without any support from the suspension system. If the vehicle is constructed without a frame, place the vehicle on its body sills. Remove any components that extend upward from the vehicle roof.
a. For Type I’s and Type III’s the modular body may be tested separately from the chassis (vehicle’s curb weight still applies for test load).

b. Place the module on I-beams or box beams located in line (front to rear) with the body mounting points.

S6.2 Mark the outside corners with an elevation point from the ground up to the very edge of the surface of the roof. Install in the interior of the module in the approximate center, an elevation recording device to measure roof deflection in 1/8-inch increments.

S6.3 Apply a rigid, rectangular force application plate fitted as near as possible, to the contour of the ambulance roof. The application plate shall be a minimum of 5" longer and 5" wider than the vehicle roof of the patient’s compartment. For the purposes of these measurements, the ambulance roof is that structure, seen in the top projected view that coincides with the patient compartment of the ambulance (see Figures 1 and 2).

S6.4 Position the force application plate on the vehicle roof so that its rigid surface is perpendicular to a vertical longitudinal plane in the top projected view so its longitudinal centerline coincides with the longitudinal centerline of the vehicle (or module), and its rear edge measures a minimum of 2.5" from the rear edge of the vehicle (or module) roof at the centerline.

S6.5 With all doors fully closed; apply an evenly distributed vertical force in the downward direction to the force application plate at any deflection rate of not more than 0.5" per second, until a force of 500 lbs. has been applied.

S6.6 Record elevation readings of all four corners of the roof and interior measurements.

S6.7 Apply additional vertical force in the downward direction to the force application plate at a deflection rate of not more than 0.5" per second until 50% of the force specified in S5. has been applied.

S6.8 Repeat procedure in S6.6.

S6.9 Continue to apply a vertical force to the application plate until the total load specified in S5. is recorded.

S6.10 Repeat procedure in S6.6.

S7. DOOR CAPABILITIES.

S7.1 With total load applied, test all patient compartment exit doors for compliance with S5.b and record results.

S8. CONCLUSION.

S8.1 Remove applied load from application plate, and test all patient compartment exit doors for compliance with S5.b and record results.

S8.2 Repeat procedure in S6.6, check for damage and compare with original readings to determine permanent deformation of roof.
S8.3 Record all results.

S9. TEST PROCEDURES. Each vehicle tested shall be capable of meeting the requirements of S5.1 when tested in accordance with the procedures set forth below:

S9.1 Place either side of the body, on a rigid horizontal surface so that the body is entirely supported.

S9.2 Mark the outside corners with an elevation point from the ground up. Install in the interior of the module in the approximate center, an elevation recording device to measure vertical deflection in 1/8-inch increments.

S9.3 Apply a rigid, rectangular force application plate fitted as near as possible, to the contour of the ambulance roof. The application plate shall be a minimum of 5" longer and 5" wider than the vehicle side of the patient’s compartment.

S9.4 Position the force application plate on the vehicle roof so that its rigid surface is perpendicular to a vertical longitudinal plane in the top projected view so its longitudinal centerline coincides with the longitudinal centerline of the module, and its rear edge measures a minimum of 2.5" from the rear edge of the vehicle module at the centerline.

S9.5 With all doors fully closed; apply an evenly distributed vertical force in the downward direction to the force application plate at any deflection rate of not more than 0.5" per second, until a force of 500 lbs. has been applied.

S9.6 Record elevation readings of all four corners and interior measurements.

S9.7 Apply additional vertical force in the downward direction to the force application plate at a deflection rate of not more than 0.5" per second until 50% of the force specified in S5.1 has been applied.

S9.8 Repeat procedure in S9.6.

S9.9 Continue to apply a vertical force to the application plate until the total load specified in S5.1 is recorded.

S9.10 Repeat procedure in S9.6.

S10. DOOR CAPABILITIES.

S10.1 With total load applied, test rear exit doors for compliance with S5.1b and record results.

S11. CONCLUSION.

S11.1 Remove applied load from application plate, and test rear exit doors for compliance with S5.1b and record results.
S11.2 Repeat procedure in S9.6, check for damage and compare with original readings to determine permanent deformation of sides.

S11.3 Record all results.
S1. SCOPE. This standard shall establish the minimum requirements for testing of all body door retention components on the entry doors, whether side or rear, as installed in the vehicle body framework.

S2. PURPOSE. The purpose of this standard is to minimize the possible failure of the door(s) to remain closed and latched when subjected to a uniform static force. This is a type test.

S3. APPLICABILITY. This standard shall not apply to Type II ambulances. Compliance with FMVSS 206, as applicable, is a prerequisite for this testing.\(^1,2\)

S4. DEFINITIONS.

S4.1 “Side Entry Door” shall be defined as the body door on the right side of the ambulance body that provides entry into the patient compartment and through which patients may be loaded/unloaded.

S4.2 “Rear Door” means the door(s) at the rear of the body used to load patients into the patient compartment including but not limited to a two-part door.

S4.3 “Fully Latched Position” is defined as the last or fully closed position on the striker(s).

S4.4 “Secondary Latched Position” is defined as the first latched or partially closed position on the striker assembly.

S4.5 “Striker” means a mechanical device with which the latch engages on the opposing member of the body framework.

S4.6 “Latch” means a mechanical device used to position the door in a closed position relative to the body framework with provision for controlled release (or operation).

S4.7 “Force Application Brackets” shall be defined as the bracket(s) used to apply the prescribed force to the door(s), latch(es) and hinge(s).

S4.8 “Transverse Load” means a test to determine the ability of the door, latch striker and hinge to withstand the forces specified in the direction of the door opening.

S4.9 “Longitudinal Load” means a test to determine the ability of the door, latch, striker and hinge to withstand the forces specified in a direction horizontal and a right angle to that of the door opening.

S5. REQUIREMENTS. Each door shall be capable of withstanding the transverse and longitudinal loads specified in Table 1 of this section. During these tests the door(s) or its retention components shall not:

a. Open at any time during the test procedure.

b. Fail at the latch, striker(s), hinge or their points of attachment to the door or the body framework.
Table I: TEST LOAD LBS.

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<tr>
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<th>Side Door</th>
<th>Rear Door</th>
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<tr>
<td></td>
<td>Transverse Load</td>
<td>Longitudinal Load</td>
</tr>
<tr>
<td>Fully Latched Position</td>
<td>2,500</td>
<td>2,500</td>
</tr>
<tr>
<td>Secondary Latched Position</td>
<td>1,500</td>
<td>1,500</td>
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<tr>
<td>Hinge</td>
<td>2,500</td>
<td>2,500</td>
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S6. TEST PROCEDURES. Test forces shall be applied in all required directions and/or positions after the installation of associated body door retention components.

S6.1 Force shall be applied as specified in Table I of S5. to force application bracket(s) properly applied to the door structure. Care must be used to position the bracket so that as the load is applied it will be equally distributed and as near the latch or hinge being tested as possible.

S6.2 Test devices used to apply loads to the force application brackets shall be suitably installed within the body in such a manner that the opposing forces will be supported by the body structure.

S6.3 Forces shall be applied to a continuous hinge so that the load will be distributed equally from top to bottom. When individual (strap type) hinges are used, the force shall be applied in such a manner that the load specified in Table I of S5. is distributed proportionally on all the hinges used.

S7. TEST CONDITIONS. The following conditions shall apply to the requirement as specified in Table I of S5.

S7.1 The ambulance body shall be positioned on a level, horizontal surface or mounted on a chassis parked on a level surface with the transmission in the “park” position and emergency brake set.

S7.2 The ambulance body must be structurally completed up to but not including the interior panel or cabinet installation.

S7.3 Components and/or assemblies used with this test must be replaced by the ambulance manufacturer prior to the completion and sale of this unit.

S7.4 The ambient temperature during this test shall be within the range from 32° Fahrenheit (F) to 95° F.

1Compliance tests can be performed by latch and striker manufacturer if supplied by a single source and accompanied by a letter of compliance supplied to the body builder stating that the assembly as furnished meets Federal Motor Vehicle Safety Standard (FMVSS) 206.

2If striker and latch assembly is furnished by two different manufacturers, or if there is a modification to the single source manufacturer’s assembly, the assembly must be tested in accordance with FMVSS 206.
OXYGEN TANK RETENTION SYSTEM STATIC TEST

S1. SCOPE AND PURPOSE. This standard specifies the minimum static test requirements for oxygen tank holders. This is a type test.

S2. APPLICABILITY. This standard applies to holders for all oxygen tanks (including portable tanks) installed in ambulances.

S3. DEFINITION.

S3.1 “Oxygen tank holder” means the retention system, including all hardware provided for holding the oxygen tank(s).

S4. REQUIREMENTS. When a force equal to 25 times the weight of a fully loaded oxygen tank, for which the tank holder was designed to restrain, is applied to the oxygen tank holder, as specified in S5. (Test Procedure):

a. The oxygen tank holder components shall not fail or separate along attachment points.

b. The oxygen tank holder or any component thereof shall not separate from the vehicle at any attachment point.

c. The part of the vehicle to which the oxygen tank holder is attached shall not fail and/or separate at any attachment point.

d. The force application cylinder specified in S5.1 shall not disengage from the oxygen tank holder.

S5. TEST PROCEDURES. Each oxygen tank holder shall be capable of meeting the requirements of S4. when tested in accordance with the following procedures, using a force applications cylinder as described in S5.1.

S5.1 The force application cylinder is a rigid structure having the same physical dimensions as the oxygen tank for which the tank holder was designed to restrain.

S5.2 Using the oxygen tank holder, which is subject to requirements of S4., install the force application cylinder in the vehicle and apply the forces specified in S5.2.1 and S5.2.2. Simultaneous application of the forces required by S5.2.1 and 5.2.2 is not required.

S5.2.1 Apply the force required by S4. to the cylinder’s bottom surface, when the cylinder is installed in a vertical plane. In the case of horizontal installation, the force required in S4. must be applied to each end of the cylinder.

S5.2.2 Apply the force required by S4. to the cylinder in any direction in a plane perpendicular to the longitudinal center line of the cylinder and that passes through the location that corresponds to the location of the center of gravity of a full tank, for which the holder is designed to restrain.
S1. SCOPE AND PURPOSE. This standard establishes minimum requirements for testing the installation of the litter retention system when installed per the manufacturer’s directions. This is a type test.

S2. APPLICABILITY. This standard applies to all ambulances.

S3. DEFINITIONS.

S3.1 “Litter retention system” means a system that provides means for securing a litter by the posts and wheels to the floor and/or side wall of an ambulance.

S3.2 “Litter” means a wheeled cot (elevating) and/or a wheeled cot-bench (non-elevating).

S4. REQUIREMENTS. Each litter retention system shall be capable of meeting requirements set forth under this standard when tested in accordance with test procedures outlined in S6.

S4.1 The litter retention system, anchorages and litter fastener(s) shall not fail or release when subjected to the cot manufacturers recommended load or a minimum force of 2,200 lbs. applied in the longitudinal, lateral and vertical direction. (NOTE: These are three individual tests.)

S5. TEST CONDITIONS. The following conditions apply:

S5.1 The ambulance floor shall be in a horizontal plane.

S5.2 If multiple locations exist, the litter retention system shall be tested in each location.

S5.3 The testing device is a structure of appropriate design used for locking onto the hook(s) (or other litter securing means) of the litter retention system (similar to the cot frame). Force is applied through a pivot located 15” above the floor at a point representing the center of the litter.

S6. TEST PROCEDURES.

S6.1 Install the test device in the litter retention system in such a manner that will preclude contact friction with the floor or cabinet surfaces.

S6.2 Attach a cable with a calibrated, in-line strain gauge to the test device pivot and apply an initial vertical upward load to the device.

S6.3 As rapidly as possible, apply the full force required in S4.1 to the device.

S6.4 Record strain gauge readings and observe any deformation of floor, cabinets or retention mechanism.

S6.5 Release applied load.
S6.6 If any deformation has occurred in the retention mechanism (i.e., hooks, antlers or side bars) replace damaged parts.

S6.7 Reinstall test fixture and repeat steps S6.1 through S6.5 in the longitudinal direction and again in the lateral direction.

S6.8 Record all resultant data.

NOTE: Rotation or deformation of retention mechanisms does not constitute failure.
S1. SCOPE. This standard establishes testing and certification requirements for ambulance electrical systems.

S2. PURPOSE. The purpose of this standard is to verify performance of an ambulance 12-volt DC electrical system. Each finished vehicle shall be tested.

S3. DEFINITION.

S3.1 “Common point” means a point in the ambulance 12-volt DC electrical system that is common for the electrical generating and storage system to the electrical consuming system of the vehicle, at which the current is to be measured.

S4. REQUIREMENTS. Each ambulance shall be tested.

S4.1 The following systems (loads) shall be simultaneously turned on during the process of the test:
   1. Ignition system
   2. Headlights (low beam) and all FMVSS running lights
   3. Windshield wipers (low speed)
   4. Cab air conditioning (at coldest setting with highest blower speed)
   5. Radio in receiving mode (or 5-amp load, if not equipped)
   6. Patient module dome lighting (in high-intensity setting)
   7. Patient module air conditioning (at coldest setting with highest blower speed)
   8. Emergency warning light system in “clear-right-of-way” mode (3.8.2)
   9. 10-amp medical load or equal
   10. Left and right side flood lights
   11. Rear flood light
   12. Optional 12-volt DC equipment and lights.

   NOTE: Any load management system that is operational during the test may not deactivate any of the loads in items 1–11.

S4.2 The generating system(s) shall produce the maximum required output at the regulated voltage, and minimum under hood temperature of 200° F, at an engine speed not exceeding 40% of the furnished engine’s SAE net horsepower @ rpm rating or in accordance with chassis manufacturer’s operating instructions.

S4.3 A certification label containing the information in S7.2 shall be affixed to the ambulance, certifying that the vehicle has been tested and is certified as capable of supporting the mandatory continuous current load as manufactured in accordance with S4.1.

S5. TEST PROCEDURES.
S5.1 A direct current (DC) ampere meter, capable of measuring the worst case continuous current, with an accuracy of not less than 2% of full-scale reading, shall be inserted into the common point of the ambulance electrical system along with a DC-voltmeter, capable of reading the voltage specified in S5.2 with an accuracy of plus or minus 2%.

S5.2 The engine will be started and set to the necessary revolutions per minute (rpm) in compliance with S4.2 to maintain the system voltage between 12.8 and 14.2 volts for the duration of the test.

S5.3 Immediately following warm-up, all systems and load(s) listed in S4.1 (1) through (11) will be turned on. If the ambulance is equipped with a load management system that inhibits certain systems and loads from operating under certain conditions, ambulance shall be put into the condition that will allow the maximum electrical load.

S5.4 The test shall be run for a full 15 minutes and the voltages shall remain within the limits specified in S5.2.

S5.5 At both the beginning and end of the 15-minute test period a reading as specified in S5.1 will be taken as required by S4.

S5.6 Immediately following warm-up, all systems and load(s) listed in S4.1 (1–12) will be turned on.

**NOTE:** Any load management system must be deactivated for the duration of this test.

S5.7 The test shall be run for a full 15 minutes and the voltages shall remain within the limits specified in S5.2.

S5.8 At both the beginning and end of the 15-minute test period a reading as specified in S5.1 will be taken as required by S4.

S6. TEST CONDITIONS. The following conditions apply to the requirements specified in S5.

S6.1 Ambulance and component systems shall be complete and ready to operate on the road.

S6.2 Temperature. Engine shall be started and allowed to operate until normal engine temperature is reached then allowed to operate an additional 15 minutes.

S6.3 Batteries. Batteries shall be fully charged.

S6.4 The engine speed indicated for S4.2 shall be determined with a tachometer that is accurate within plus or minus 3%.

S7. CERTIFICATION.

S7.1 The lowest reading recorded in S5.5 and S5.8 shall be recorded on the certification tag (7.2) and attached to the ambulance for easy inspection, attesting to the worst case continuous current for the specific ambulance being tested.
S7.2 Certification label. The following data and statement shall appear on the certification label:

This vehicle has been tested in accordance with Ambulance Electrical Systems, AMD Standard 005.

a. The data furnished herein is based upon simultaneously turning on the following electrical equipment and electrical load(s).
   1. Ignition system
   2. Headlights (low beam) and all FMVSS running lights
   3. Windshield wipers (low speed)
   4. Cab air conditioning (at coldest setting with highest blower speed)
   5. Radio in receiving mode (or equal load, if not equipped)
   6. Patient module dome lighting (in high-intensity setting)
   7. Patient module air conditioning (at coldest setting with highest blower speed)
   8. Emergency warning lighting system in “clear-right-of-way” mode (3.8.2)
   9. 10-amp medical load or equal
   10. Left and right side flood lights
   11. Rear flood light
   12. Optional 12-volt DC equipment and lights.

This vehicle is______/is not______ equipped with a load management system.

NOTE: IF EQUIPPED WITH A LOAD MANAGEMENT SYSTEM, CERTAIN LOADS/FUNCTIONS (ITEM 12) LISTED ABOVE MAY HAVE AUTOMATICALLY BEEN INHIBITED FROM OPERATING BY THE LOAD MANAGEMENT SYSTEM DURING TESTING. IF EQUIPPED WITH AN ACCESSIBLE ELECTRICAL LOAD MANAGEMENT OVERRIDE SWITCH, THE SWITCH WAS ACTIVATED DURING TESTING TO PROVIDE MAXIMUM ELECTRICAL LOAD ATTAINABLE.

b. Name of ambulance manufacturer: _____________________________________________
c. Ambulance type/model: _____________________________________________________
d. Chassis manufacturer: _______________________________________________________
e. Vehicle Identification Number (VIN): ____________________________________________
f. Electrical generating system data:
   1. Alternator or generator make/model: _________________________________________
   2. Maximum 12-volt DC manufacturer’s current rating at 200° F at 14-volt DC: ________ amps.
g. Test data:
   1. Lowest DC voltage at common point during test with loads 1–11: ___________ volts.
   2. Lowest DC voltage at common point during test with loads 1–12: ___________ volts.
   4. DC current draw at common point during test with loads 1–11: ___________ amps.
   5. DC current draw at common point during test with loads 1–12 without load management system: ___________ amps.
h. Generating reserve:
   1. Generating reserve (+)/overload (-) with loads 1–11: _______________ amps
      (difference between f. 2 and g. 4).
   2. Generating reserve (+)/overload (-) with loads 1–12 without load management system:
      ___________ amps (difference between f. 2 and g. 5).

i. Date of test: ______________________________________________________________.

j. The electrical system has been tested and is in compliance with AMD Standard 005.
AMD STANDARD 006
PATIENT COMPARTMENT SOUND LEVEL TEST

S1. PURPOSE AND SCOPE. This standard establishes the requirements for measuring the maximum sound level for ambulance patient compartments. This is a type test.

S2. APPLICABILITY. This standard applies to all ambulances.

S3. REQUIREMENTS. The interior sound level in the patient compartment shall not exceed 80 decibels.

S4. TEST PROCEDURES. Each ambulance tested shall be capable of meeting requirements of S3. when tested in accordance with procedures set forth below:

S4.1 Use sound level meter that meets requirements of the American National Standard Institute, Standard (ANSI) S1.4 — Specification for Sound Level Meters, for Type II meters. Set the meter to A — weighing network, “fast” meter response.

S4.2 Suspend the microphone vertically 6” above the normal position of the patient’s head on the primary cot.

S4.3 Park ambulance at a location so that no large reflecting surfaces, such as other vehicles, signboards, buildings or hills are within 50” of the vehicle being tested.

S4.4 Set vehicle transmission in neutral gear and accelerate engine to 50%–60% of the engine’s Society of Automotive Engineers (SAE) net horsepower @ rpm rating. Stabilize the engine at that speed and measure the highest sound level.

S4.5. Return engine speed to idle and repeat the process as specified in S4.4 until two maximum sound levels within 2 decibels (db) of each other are recorded. Numerically average these two maximum sound level readings. (NOTE: A 2-db tolerance over sound level limitation specified in S3. is permitted to allow for variations in test conditions and capabilities of meters.)

S5. TEST CONDITIONS. The following conditions apply to requirements specified in S3.

S5.1 Ambulance doors, windows and vents are to be in the closed position.

S5.2 Air conditioner/heater blower switch in patient compartment shall be placed at the highest speed.

S5.3 Siren and all warning lights shall be turned on for full duration of each test. (NOTE: Siren must be sounding in the loudest mode of operation.)

S5.4 This test shall be performed during the following weather conditions:
   a. Temperature not to exceed 95° F.
   b. Humidity not to exceed 75%.
   c. Wind velocity not to exceed 12 mph.
d. Barometric pressure 29 to 31.

S6. REFERENCE.

S6.1 ANSI S1.1 — Acoustical Terminology.
S1. PURPOSE AND SCOPE. This standard establishes the minimum requirements for testing for the presence of carbon monoxide (CO) gas in ambulances. This is a type test.

S2. TEST CONDITIONS.
   a. Open vehicle doors and ventilate with fresh air for 10 minutes.
   b. Do not conduct testing during high wind periods (above 15 mph) or during any type of precipitation.
   c. Calibrate equipment at start of test.

S3. TEST EQUIPMENT.
   a. MSA Model I or Model II CO monitor or equivalent instrument with accuracy of plus or minus 4%.
   b. Canister of 60–100 parts per million (ppm) CO.

S4. TEST PROCEDURE.

S4.1 Sample ambient air around the outside of the vehicle and record.

S4.2 Close all doors and windows of vehicle, assuring that heating, air conditioning and ventilating systems are off.

S4.3 Start and idle engine in parked position for 10 minutes.

S4.4 Monitor CO at head of primary cot for the first five minutes and record results.

S4.5 Monitor CO around doors, windows and floor for the remaining five minutes and record results.

S4.6 With environmental systems remaining off, drive the vehicle for 10 minutes on traffic laden city streets (15–30 mph).

S4.7 Repeat S4.4.

S4.8 Repeat S4.5.

S4.9 With environmental systems remaining off, drive vehicle for 10 minutes on limited access (interstate) highway (45–65 mph).

S4.10 Repeat S4.4

S4.11 Repeat S4.5

S4.12 Stop vehicle and repeat S4.1
S5.  CALCULATION OF RESULTS.

S5.1  Determine the average reading taken in S4.1 and S4.2.

S5.2  Deduct result of S4.1 from the highest reading taken in each of the three tests. The resultant levels of CO shall not exceed 10 ppm.

S5.3  Record all results noting time, date, location and route of tests. Record temperature, barometric pressure and humidity at the time of the test.
S1. PURPOSE AND SCOPE. This standard establishes minimum requirements for testing an ambulance grab rail. This is a type test.

S2. APPLICABILITY. This standard applies to all ambulances.

S3. REQUIREMENTS. The grab rail shall not detach, loosen or permanently deform during the load application of 300 lbs. in any direction.

S4. TEST PROCEDURE.

S4.1 With the vehicle parked on a flat surface, measure the grab rail for straightness and the space between topsides of rail and ceiling.

S4.2 Attach force application device to grab rail at the midpoint between two brackets and incrementally apply the required load in S3. in the vertical plane. Hold that load for two minutes and release.

S4.3 Repeat S4.2 at three other locations equally spaced along the rail.

S4.4 Repeat S4.2 and S4.3 applying the load horizontally.

S4.5 Repeat S4.2 and S4.3 applying the load diagonally at any convenient angle.

S4.6 Examine and measure the grab rail for loosening or bending and record results.
S1. PURPOSE AND SCOPE. This standard establishes test requirements for ambulances and equipment installed within or on ambulances and the conductors that connect ambulances to 125- or 125/240-volt, nominal, AC electrical supply system(s). Each finished vehicle shall be tested.

S2. APPLICABILITY. This standard applies to all ambulances.

S3. DEFINITIONS.

S3.1 “Dielectric breakdown test” means testing insulation and mountings using high voltage for potential damage to prevent shorts.

S3.2 “Continuity test” means testing all metal parts to make sure they are properly bonded.

S3.3 “Operational test” means testing all added 125-volt or 125/240-volt equipment or outlets for function.

S3.4 “Polarity Test” means using a polarity tester to test all outlets for proper polarity.

S4. FACTORY ELECTRICAL TESTS. Each ambulance shall be subjected to the following tests:

a. Dielectric breakdown test. The 125-volt AC electrical system shall withstand the applied potential without breakdown of a one minute, 900-volt dielectric strength test with all switches closed, between current-carrying conductors including neutral and vehicle ground.

b. Continuity test. A continuity test is to be performed to ensure that all metallic parts are properly bonded using a volt/ohm meter.

c. Operational test. Operational tests are to be performed to demonstrate that all equipment is properly connected and in working order. This may be done by use of volt/ohm meters or by using test loads.

d. Polarity test. A polarity test is to be performed to ensure that all electrical connections have been properly made.
S1. SCOPE. This standard establishes requirements for the testing of ambulances for water leakage.

S2. PURPOSE. The purpose of this standard is to minimize the possibility of water leakage in ambulances. Each finished vehicle shall be tested.

S3. APPLICABILITY. This standard applies to all ambulances.

S4. REQUIREMENTS. Each ambulance tested shall be capable of meeting the requirements set forth under this standard when tested in accordance with the test procedures outlined in S6.

S4.1 There shall be no water leakage into the cab, any exterior compartments, patient compartment, or through any door seal, light seal, cab/module seal, etc.

S5. TEST CONDITIONS. The following test conditions shall apply:

S5.1 The ambulance shall be located on level ground.

S5.2 Ambient temperature shall be 40° F to 95° F.

S5.3 Air velocity shall be less than 10 mph.

S5.4 (Method “A”) Water spray test facility shall be similar to Figure 1 capable of maintaining a minimum of 25–35 lbs. psi of water pressure at each nozzle with each water spray nozzle flowing at a minimum rate of approximately 4 gals. per hour and producing a fine droplet hollow conical spray over the entire vehicle.

(Method “B”) Water spray test is to utilize a 5/8-inch minimum diameter water hose maintaining a minimum of 25–35 lbs. psi. The water pressure at the spray nozzle is to be flowing at a minimum rate of 1 gal. per minute producing a direct water stream.

S6. TEST PROCEDURES.

S6.1 All windows and doors should be closed, and ventilation heating and air conditioning systems turned off.

S6.2 (Method “A”) Commence water spray test and check for water leaks inside the cab and patient compartment for 15 minutes.

(Method “B”) Commence water spray test and check for water leaks inside the cab and patient compartment for five minutes.

S6.3 Start engine and operate the cab and patient compartment ventilation systems at maximum ventilation rates for 15 minutes while maintaining water spray.

S6.4 At the conclusion of the water spray test examine all exterior lights, cab, patient and all exterior compartments for water leakage.
END VIEW
Spray Nozzles
S1. PURPOSE AND SCOPE. This standard establishes testing requirements for the ambulance and ambulance equipment over a specified ambient temperature range. This is a type test.

S2. APPLICABILITY. This standard applies to all ambulances.

S3. REQUIREMENTS. Each ambulance, system, component and permanently attached equipment shall be capable of meeting the requirements set forth under this standard when tested in accordance with the test procedures outlined in S5.

S3.1 The ambulance and all systems, components and equipment shall be capable of being stored at 32° F to 95° F without damage or deterioration.

S3.2 The ambulance and all systems, components and permanently attached equipment shall be capable of being tested and operating satisfactorily over a temperature range of 32° F to 95° F.

S4. TEST CONDITIONS.

S4.1 The test chamber is to maintain +/- 4° F.

S4.2 Ambulance shall have all patient compartment entry doors, cabinet doors, cab doors and exterior compartment doors open throughout the entire test.

S4.3 Air velocity of at least 5 mph shall be maintained over the vehicle throughout the entire test.

S5. TEST PROCEDURES.

S5.1 Place the ambulance, complete with all systems, components and installed equipment into the test chamber. Turn off all power. Open all doors to the patient compartment, cabinets, exterior compartments and cab.

S5.2 Two exterior thermocouples are to be placed on the centerline of the vehicle, half way between the ground and the highest point of the vehicle (excluding bolt-on items), 36" forward of the front extremity of the vehicle and 36" rear of the rear extremity.

S5.3 Soak at 32° F with an air velocity of at least 5 mph for three hours.

S5.4 While maintaining 32° F, the engine shall be started and all vehicle systems shall be tested and operate properly for one hour.

S5.5 Soak at 95° F with an air velocity of at least 5 mph for three hours.

S5.6 While maintaining 95° F, the engine shall be started and all vehicle systems shall then be tested and operate satisfactorily for one hour.
NOTE: Vehicle systems include all permanently attached equipment such as oxygen and suction systems.

S6. CERTIFICATION.

S6.1 This is a type certification, so any additional components that are installed or added to the base ambulance conversion to meet the performance criteria set in AMD Standard 011 must also be added to production units certified and built to comply with this standard.
S1. SCOPE. This standard verifies the performance of the primary heater/air conditioning system of an ambulance.

S2. PURPOSE. The purpose of this standard is to measure and ensure adequate performance of the heater/air conditioning system in an ambulance. This is a type test.

S3. APPLICABILITY. This standard applies to all ambulances.

S4. REQUIREMENTS. The engine shall start without the use of external power or starting fluids. The heater in each compartment shall raise the thermocouple temperatures to a minimum of 68° F within 30 minutes from an ambient temperature of 32° F. The air conditioner in each compartment shall lower the thermocouple temperatures to a maximum of 78° F within 30 minutes from an ambient temperature of 95° F and a minimum relative humidity of 40%.

S5. TEST CONDITIONS.

S5.1 The ambulance shall have all patient compartment doors, cabinet doors, cab doors, hood and exterior compartment doors open throughout S6.5 and S6.9.

S5.2 Air velocity of at least 5 mph shall be maintained over the vehicle throughout the entire test.

S5.3 The test chamber must be capable of maintaining temperature within a tolerance limit of +/- 4° F for duration of either test being performed.

S6. TEST PROCEDURE.

S6.1 Place the ambulance in the cold room. Turn off all power. Open all doors and hood. If in the case of cab dome lights being on, roll the cab windows all the way down.

S6.2 Two exterior thermocouples are to be placed on the centerline of the vehicle, half way between the ground and the highest point of the vehicle (excluding bolt-on items), 36" forward of the front extremity of the vehicle and 36" rear of the rear extremity. This requirement shall also hold the same +/-4° F tolerance.

S6.3 Place nine thermocouples along the centerline of the patient compartment equally spaced longitudinally from the back of the primary patient EMS seat to the rear doors and with three thermocouples 7" above the floor, three thermocouples 7" below the ceiling and three thermocouples located midway between the floor and ceiling. If the EMS seat is adjustable then the seat shall be positioned all the way towards the front of the vehicle for testing purposes.

S6.4 Place three thermocouples in the cab horizontally positioned 24" above the seat cushion and located 12" in front of the headrest. Locate first and third thermocouples along the centerline of driver’s and passenger’s seat and center the second between the first and third.

S6.5 Cool the ambulance to 32° F with an air velocity of at least 5 mph for three hours.
S6.6 Close all doors and hood with exception of partition doors (if present) and patient compartment/cab partition window (if present). Set heaters in cab and patient compartment to maximum heating setting (maximum temperature; maximum blower speed; re-circulating air).

S6.7 Perform the heater test as follows:
   a. Start engine and maintain transmission in neutral or park and engine high idle on with a maximum engine speed of 1,500 rpm.
   b. Patient compartment dome lights should be off.
   c. Exterior chassis and warning lights may be on.
   d. Record the thermocouple temperatures at the start of the test, after 10 minutes, after 20 minutes, and after 30 minutes.

S6.8 Using same thermocouple requirements of S6.2–S6.4, place the ambulance in the hot room. Open all doors; cabinet doors, partition door (if present), patient compartment/cab window (if present), exterior compartment doors and hood.

S6.9 Heat to 95° F with a relative humidity of a minimum of 40% and an air velocity of at least 5 mph for three hours.

S6.10 Close all doors and hood with exception of partition doors (if present) and patient compartment/cab partition window (if present).

S6.11 Set air conditioners in cab and patient compartment to maximum cooling setting (maximum blower speed, coldest temperature setting, re-circulating air).

S6.12 With all other ambulance equipment off, perform the air conditioning test as follows:
   a. Start engine and maintain transmission in neutral or park and engine high idle on with a maximum engine speed of 1,500 rpm.
   b. Patient compartment dome lights should be off.
   c. Exterior chassis and warning lights may be on.
   d. Record the thermocouple temperature at the start of the test, after 10 minutes, after 20 minutes, and after 30 minutes.

S7. CERTIFICATION.

S7.1 This is a type certification, so any additional components that are installed or added to the primary heat and/or air conditioning system (water heaters, pumps, etc.) to meet the performance criteria set in AMD Standard 012 must also be added to production units certified and built to comply with this standard.
S1. SCOPE. This standard establishes measurement of ambulance weight distribution.

S2. PURPOSE. The purpose of this standard is to assure vehicle weight is within required limits and proportionally distributed to each wheel. This is a type test.

S3. APPLICABILITY. This standard applies to all ambulances.

S4. DEFINITIONS.

S4.1 “Curb weight” means the weight of a motor vehicle with standard equipment — maximum capacity of engine fuel, oil and coolant.

S5. REQUIREMENTS. In the absence of instructions from the chassis manufacturer to the contrary, the following requirements shall apply to all ambulances. The total weight of the vehicle, including all occupants and cargo, shall not exceed the gross vehicle weight rating (GVWR) or any gross axle weight rating (GAWR). The requirements of S5.2 can be satisfied through actual weights and/or calculated methods.

NOTE: All specifications and requirements of the chassis manufacturer shall take precedence where they may conflict, be more stringent or more complete than the following requirements of this standard.

S5.1 Payload. The curb weight of the completed vehicle shall provide enough payload capacity to meet the minimum value as required for the ambulance type under the current version of KKK-A-1822, unless optional items are ordered by customer. If customer-ordered, optional items are included in the curb weight (i.e., permanently attached equipment), minimum payload values no longer apply and the resulting payload will be communicated to the customer. Curb weight of the completed vehicle shall be verified in accordance with S6., but initial values of payload capacity may be calculated to evaluate customer payload requirements per the specific application.

S5.2 Weight Distribution.
   a. The curb weight of the completed ambulance shall be the same from side to side within 5% on any given axle.

   When loaded to GVWR:
   b. The weight on each axle shall be within its respective GAWR;
   c. The front to rear weight distribution shall have not less than 20% of the total weight on the front axle, and not less than 50% nor more than 80% on the rear axle; and
   d. The center of gravity of the loaded vehicle must be located in accordance with all stated limitations of the chassis manufacturer.
S6. TEST PROCEDURES.

S6.1 On level ground, determine the amount of curb weight on each wheel end (i.e., “corner weight”) of the completed ambulance.

S6.2 Divide the weight on the left front wheel by the sum of the weights on the left front and right front wheels. Then multiply the number by 100% to obtain the percent of the front axle load carried by the left front wheel.

S6.3 Find the difference between the percent of the front axle load carried by the left front wheel and 50%. Multiply the resulting number by 2 to obtain the percent weight difference between the left front and right front wheels.

S6.4 Use the procedures outlined in S6.2 and S6.3 to determine the percent weight difference on the rear axle.

S6.5 Subtract the total curb weight of the completed vehicle from the GVWR. Verify that the resulting payload capacity is equal to or greater than the minimum required by the current version of KKK-A-1822 or other amount established with the customer. Any permanently attached, optional items of equipment specified by the customer are to be included in the curb weight of the completed vehicle. Any other items of optional equipment (i.e., not permanently attached and/or removable) are to be included in the payload requirement. Use this value for the payload signage required in the current version of KKK-A-1822.

S6.6 Using the curb/corner weight information from S6.1, load the vehicle to its GVWR using actual weight or by mathematical weight distribution. The weight of occupants at 150 lbs. shall be calculated or placed at each designated seating position and cot position. Any optional equipment shall be placed accordingly or combined to a single value and location to represent the effect of the weight. Any remaining cargo capacity shall be evenly distributed from the front occupant compartment through the rear of the patient compartment and/or placed accordingly in cabinets and storage areas or according to customer specific requirements.

S6.7 Under the loading conditions of S6.6, determine the weight on the front and rear axles and compare each load to the GAWR for each axle. All axle loads shall comply with the front/rear distribution conditions of S5.2 c.

S6.8 Using the previous information where appropriate, determine the center of gravity location under the conditions set forth by the chassis manufacturer and compare to the limits/conditions set forth in the respective incomplete vehicle document or other appropriate chassis manufacturer publication.
S1. SCOPE. This standard verifies performance of the engine cooling system.

S2. PURPOSE. The purpose of this test is to reduce the possibility of ambulance overheating while operating in a high-temperature environment. This is a type test.

S3. APPLICABILITY. This standard applies to all ambulances.

S4. REQUIREMENTS. With the patient compartment and cab air conditioners operating at maximum cooling settings (coldest setting, maximum blower speeds, re-circulating air), engine on high idle, an ambient temperature of 95° F, with a relative humidity of a minimum 40%, and air velocity of at least 5 mph, the cooling system must maintain the engine temperature within the OEM recommended safe operating limits for one hour. If a malfunction warning lamp is illuminated during the test due to excessive engine temperatures, the test is considered failed.

S5. TEST PROCEDURES.

S5.1 Place the ambulance in the hot room. Open all doors: cabinet doors, partition door (if present), patient compartment/cab window (if present) exterior compartment doors and hood.

S5.2 Heat room to 95° F with a minimum relative humidity of 40% and an air velocity of at least 5 mph for three hours.

S5.3 Close all doors, hood, partition door (if present) and patient compartment/cab partition window (if present).

S5.4 Reduce room air velocity to less than 3 mph.

S5.5 Set air conditioners in cab and patient compartment to maximum cooling setting (maximum blower speed, coldest temperature setting, re-circulating air).

S5.6 With all other ambulance equipment off, operate the engine at high idle for one hour.
AMD STANDARD 015
AMBULANCE MAIN OXYGEN SYSTEM TEST

S1. SCOPE. This standard establishes testing requirements for the on-board oxygen system.

S2. PURPOSE. The purpose of this standard is to minimize the possibility of an oxygen system leak and to demonstrate adequate flow through the oxygen outlets. Each finished vehicle shall be tested.

S3. APPLICABILITY. This standard applies to all ambulances.

S4. REQUIREMENTS.

S4.1 When subjected to a proof pressure of 200 pounds per square inch, the oxygen system for each ambulance shall retain a pressure of at least 195 psi for two (2) hours.

S4.2 With a line pressure of 50 +/- 5 psi, each individual outlet shall be capable of delivering at least 100 LPM of oxygen

S5. PRESSURE TEST PROCEDURES.

S5.1 Use a test system equivalent to that shown in Figure 1.

S5.2 If electric oxygen solenoid is installed, bypass must be in open position.

S5.3 Apply 200 psi of breathing air or dry nitrogen. Record pressure (gauge “B” in Figure 1), temperature and time.

S5.4 Close supply valves A and B in Figure 1

S5.5 Open vent valve in Figure 1. After pressure has been fully released, close vent valve.

S5.6 Record the pressure on gauge B and the temperature after 2 hours.

S5.7 Required test results.
   A. Pressure at gauge “A” at 0 psi.
   B. Pressure at gauge “B” at 195 psi minimum.

S6. FLOW TEST PROCEEDURES

S6.1 Set the regulator shown in figure 1 to 50 PSI.

S6.2 Pressurize the on-board oxygen system to 50 PSI, and leave the supply and tank valves open.

S6.3 With all other outlets plugged, measure and record the flow in LPM of each individual oxygen outlet.

NOTE: For the purposes of this test, breathing air or dry nitrogen must flow at a rate of 110 LPM at each outlet as an equivalent to a 100 LPM flow of oxygen.
S6.4 At the completion of a satisfactory test, the oxygen line shall be sealed and the certification label attached.

S7. CERTIFICATION and DOCUMENTATION.

S7.1 The initial temperature and system pressure, final temperature and pressure, date, and test operator’s signature shall be recorded on the certification label (S7.2) and permanently attached to the certification plate in the oxygen compartment for easy examination, attesting to the sealing integrity of the main oxygen system for the specific ambulance being tested.

S7.2 The following date and statement shall appear on the certification label:

This vehicle has been tested and is certified to be in compliance with the oxygen system proof pressure and leakage requirements of AMD Standard 015, Ambulance Main Oxygen System Test.

**Initial Conditions:**
Temperature: ______ °F
Pressure: _______ psi

**Final Conditions:**
Temperature: ______ °F
Pressure: _______ psi
Pressure Loss: ______ psi
Maximum Allowable Pressure Loss: 5psi

Signature of operator performing test:
____________________________________________________________

Date of test:___________________________________________________

S7.3 Example documentation of flow rate at each outlet:

Gas used for flow test (check one):

_____ Dry Nitrogen (110 LPM min. req’d.)
_____ Breathing Air (110 LPM min. req’d.)
_____ Oxygen (100 LPM min. req’d.)

Outlet # Flow Rate (LPM)
1. __________________
2. __________________
3. __________________
   etc.
AMD STANDARD 016
PATIENT COMPARTMENT LIGHTING LEVEL TEST

S1. SCOPE AND PURPOSE. This standard verifies performance of ambulance interior lighting. This is a type test.

S2. APPLICABILITY. This standard applies to all ambulances.

S3. DEFINITIONS.

S3.1 Illumination is the flux of light received in a unit area of a certain side being illuminated. The unit of measure is foot-candle (Fc). One Fc is the illumination, which falls on one side of a standard candle as measured at a distance of 1 foot (1Fc = 1Lm/ft²) (1 Fc = 10.76 Lux). One Lux is the light from the standard candle at a distance of 1 meter and striking a square meter.

S3.2 Light meter is the instrument for measuring illumination. For this standard, a light meter with resolution of 0.01 Fc is required (0.1 Lux).

S4. REQUIREMENTS. The ambulance shall be capable of meeting the requirements set forth under this standard when tested in accordance with test procedures outlined in S6.

S4.1 Illumination of patient compartment floor. The patient compartment floor shall have no less intensity than 15 Fc, measured along the centerline of the clear floor.

S4.2 Illumination of primary cot. The primary cot shall be provided with a minimum of 35 Fc of illumination measured on at least 90 % of the cot’s surface area.

S4.3 Door-entry illumination of patient compartment floor. The patient compartment dome lighting shall have a minimum illumination of 3.5 Fc measured along the length (85% of the centerline) of the patient compartment floor, and the side entry step well will be illuminated to a minimum of 2.0 Fc measured in the center of the step area.

S5. TEST CONDITIONS. The following conditions apply.

S5.1 Lighting test may be performed at any ambient temperature.

S5.2 All openings and windows must be covered over to prevent outside ambient light.

S5.3 Vehicle will be started and high idle engaged.

S6. TEST PROCEDURE.

S6.1 With the vehicle running perform test as described in S4.1.
   a. With cot removed and dome lights set on highest setting, mark centerline of floor between left wall and squad bench.
   b. From rear doors to the front bulkhead, mark floor every 10".
   c. Using a calibrated light meter, record the light readings along the centerline of the floor every 10".
S6.2 With vehicle running, perform test as described in S4.2.
   a. With cot installed and top of cot marked in 10-inch grid. This can be done on wood sheet laid on top of the cot mattress.
   b. Using a calibrated light meter, record the light readings. The light meter is to be placed in the center of each 10-inch square.

S6.3 With the vehicle running, perform test as described in S4.3.
   a. With cot remove mark the centerline of the patient compartment floor between the left wall and squad bench.
   b. Mark the centerline every 10" from rear doors to front bulkhead.
   c. Actuate the lights that come on with the side entry door or rear entry door.
   d. Using a calibrated light meter record the light readings along the centerline of the floor every 10".
   e. Place light meter in the center of the side entry step well and record the reading.
S1. PURPOSE AND SCOPE. This standard verifies ambulance road performance. This is a type test.

S2. APPLICABILITY. This standard applies to all ambulances.

S3. DEFINITIONS.

S3.1 “Curb Weight” is the total weight of the complete ambulance and is defined as chassis (including batteries, spare tire, jack tire changing tools and any other permanently attached or dedicated equipment); cab; body and a full complement of fuel, lubricants and coolant.

S3.2 “Payload Allowance” is the minimum payload for the listed vehicles.
   a. Single rear-wheeled, van ambulances (Type II), 1,500 lbs.
   b. Dual, rear-wheeled, modular ambulances (Type I or III), 1,750 lbs.
   c. Additional duty modular ambulances (Type I or III), 2,250 lbs. or more, as specified by customer.

S3.3 “Cross-Country Operation” is defined as travel over open fields, rolling hills, rough and muddy terrain.

S4. REQUIREMENTS. The ambulance shall be capable of meeting the requirements set forth under this standard when tested in accordance with test procedures outlined in S6. under the conditions set forth in S5.

S4.1 Speed. The vehicles shall be capable of a sustained speed of not less than 65 mph over dry, hard-surfaced, level roads, at sea level, and passing speeds of 70 mph.

S4.2 Acceleration. Vehicle shall have a minimum average acceleration at sea level of 0–55 mph within 25 seconds.

S4.3 Gradeability. The vehicle shall be capable of meeting the following requirements. The determination shall be made by actual test or chassis manufacturer’s certified computer prediction or chassis manufacturer’s certification.
   a. Minimum gradeability at speed shall be 55 mph on a 3% (1.72 degrees) grade.
   b. The minimum low speed gradeability of 5 mph on a 35% (19.3 degrees) grade is required for Class I (4x2) vehicles.
   c. The minimum low-speed gradeability of 5 mph on a 45% (24.2 degrees) grade for Class 2 (4x4) vehicle in the low 4x4 range.

S4.4 Fuel Range. The ambulance shall be capable of being driven for at least 250 miles without refueling.

S4.5 Fording. The vehicle shall be capable of three fordings, without water entering patient and equipment compartments while being driven through a minimum of 8" of water, at speeds of 5 mph, for a distance of at least 100'.

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S5. TEST CONDITIONS. The following conditions apply.

S5.1 Road test may be performed at any ambient temperature.

S5.2 Vehicle must be loaded to curb weight plus total usable payload (i.e., GVWR), or if specified by the customer, to the prescribed curb weight plus the minimum payload allowance for the type of vehicle being tested as listed in S3.2.

S6. TEST PROCEDURE.

S6.1 The vehicle shall be subjected to a minimum 150-mile road test.
   a. Seventy-five (75) miles shall be continuous miles on paved highways at speeds up to 70 mph.
   b. Thirty (30) miles on city streets.
   c. Fifteen (15) miles on gravel or dirt roads at speeds up to at least 35 mph.
   d. Not less than five miles in simulated or actual cross-country operation at speeds applicable to the terrain.
   e. Class 2 vehicles shall demonstrate cross-country operation in four-wheel drive for an additional 20 miles.
   f. Balance of the 150-mile road test may be accumulated during other tests and checks requiring vehicle movements.
   g. After completion of the road test, vehicle shall be subjected to the water spray test (AMD Standard 010).
S1. SCOPE AND PURPOSE. This standard establishes the minimum requirements for testing an ambulance rear step while the ambulance is not in motion. This is a type test.

S2. APPLICABILITY. This standard applies to all ambulances.

S3. DEFINITIONS.

S3.1 “Independent rear step,” means the rear step independent of the rear bumper.

S3.2 “Combination rear step bumper” means the rear step and bumper are intrinsic in design and construction.

S3.3 “Application plate” is defined as the load cell 36” wide x 9.75” deep x 5” tall and weighting 500 lbs.

S4. REQUIREMENTS. The ambulance shall be capable of meeting the requirements set forth under this standard when tested in accordance with test procedures outlined in S6.

S4.1 Independent rear steps. When the application plate is applied in the center of the step area, it shall not deflect more than 1”. After removal of application plate, there shall not be more than 0.25” permanent deformation.

S4.2 Combination Rear Step Bumper. When the application plate is applied in the center of step area and at each outboard position, if there is a step area available, it shall not deflect more than 1”. After removal of application plate, there shall not be more than 0.25” permanent deformation.

S5. TEST CONDITIONS. The following conditions apply.

S5.1 The test may be performed at any ambient temperature.

S5.2 The vehicle shall be parked on a flat level surface.

S5.3 Jack stands shall be placed under the chassis frame rails to prevent spring deflection during the test.

S6. TEST PROCEDURE.

S6.1 Independent rear step.
   a. Park the vehicle on a level flat surface and place jack stands under the chassis frame rails.
   b. Measure and record the step height at the center and at each end of the rear step.
   c. Apply application plate as close to center of the rear step as possible (reference Figure 1).
   d. Measure and record the step height at the center and at each end of the rear step.
   e. Remove application plate and measure and record any permanent deformation.
S6.2 Combination Rear Step Bumper.
   a. Park the vehicle on a level flat surface and place jack stands under the chassis frame rails.
   b. Measure and record the step height at the center and at each end of the rear step.
   c. Apply application plate as close to center of the rear step as possible (reference Figure 2).
   d. Measure and record the step height at the center and at each end of the rear step.
   e. Remove application plate from step area and apply plate as close to the centerline of outside bumper step area (reference Figure 2).
   f. Measure and record amount of deflection at the center of the step and the two outside corners of the bumper.
   g. Remove application plate and repeat procedure on opposite corner of outside bumper step area (reference Figure 2).
   h. Measure and record amount of deflection at the center of the step and the two outside corners of the bumper.
   i. Remove application plate and measure and record any permanent deformation measuring at the center and at each end.
S1. SCOPE AND PURPOSE. This standard establishes guidelines for accurately measuring the volume of interior cabinets and exterior compartments of an ambulance. This is a type test.

S2. APPLICABILITY. This standard applies to all ambulances.

S3. DEFINITIONS.

S3.1 “Cabinet depth” is the measured depth from the cabinet inside back wall to the outside cabinet face.

S3.2 “Compartment depth” is the measured depth from the compartment inside back wall to the outside compartment face.

S3.3 “Door OD” is the door overall outside thickness (dimension).

S3.4 “Depth ID” is the actual interior depth ether measured or figured by subtracting the Door OD from the cabinet or compartment measured depth.

S3.5 “Height ID” is determined by measuring from interior bottom surface to the interior surface of the cabinet or compartment top.

S3.6 “Width ID” is determined by measuring from one interior surface to the next interior surface of the cabinet or compartment.

S3.7 “Sliding window track” is the track used for sliding cabinet windows.

S3.8 “Sliding cabinet windows” is the sliding doors used on interior cabinets.

S4. TEST CONDITIONS.

S4.1 Remove any loose or mounted removal able equipment from interior cabinets or exterior compartments. Examples would be fire extinguishers, portable oxygen mounts, spare tires and tools.

S5. TEST PROCEDURE.

S5.1 Interior cabinet with sliding doors or roll-up doors (Figure 1).
   a. Measuring from the back of the rear wall to the back of the sliding window track, record that dimension for Depth ID.
   b. Measuring from cabinet interior wall to wall, record that dimension for Width ID.
   c. Measuring from the interior top to bottom, record dimension. This is the Height ID.
   d. Multiply Height ID x Width ID x Depth ID = then divide by 1,728 to get cubic feet.
S5.2 Interior cabinets with hinged doors (Figure 2).
  a. Measure from the back of the door to the face of the door and record that dimension for Door OD.
  b. Measure from the back of the rear wall to the cabinet face and record that dimension for cabinet depth.
  c. Subtract the Door OD from the cabinet depth to get Depth ID.
  d. Measure from cabinet interior wall to wall and record that dimension for Width ID.
  e. Measure from the interior top to bottom and record dimension. This is the Height ID.
  f. Multiply Height ID x Width ID x Depth ID = then divide by 1,728 to get cubic feet.

S5.3 Exterior Compartments with hinged doors (Figure 3).
  a. Measure from the back of the door to the face of the door and record that dimension for Door OD.
  b. Measure from the back of the rear wall to the cabinet face and record that dimension for cabinet depth.
  c. Subtract the Door OD from the cabinet depth to get Depth ID.
  d. Measure from cabinet interior wall to wall and record that dimension for Width ID.
  e. Measure from the interior top to bottom and record dimension this is the Height ID.
  f. Multiply Height ID x Width ID x Depth ID = then divide by 1,728 to get cubic feet.

**NOTE:** Subtract any notches for spring shackles or fuel systems from the total to get the correct total cubic feet.

**Figure 1**
FLOOR DISTRIBUTED LOAD TEST

S1. SCOPE. This standard establishes the minimum testing requirements for verifying patient compartment floor weight bearing capacity.

S2. PURPOSE. The purpose of this standard is to validate that the weight bearing capacity of the ambulance floor can support the weight of the laden cot. This is a type test.

S3. APPLICABILITY. This standard applies to all ambulances.

S4. DEFINITIONS.

S4.1 “Distributed loads.” Medium footprint of existing cots loaded to required test load of 400 lbs. for a standard cot or 800 lbs. for a bariatric cot.

S4.2 “Standard cot load” is designed to handle a cot load of 400 lbs.

S4.3 “Bariatric cot load” is designed to handle a cot load of 800 lbs.

S4.4 “Load Cell,” as shown in Figure 1, is loaded to either a standard cot load of 400 lbs. or a bariatric cot load of 800 lbs.

S4.5 “Deflection Indicator” as shown in Figure 2 used to measure floor deflection as close to centerline of the load cell and wheels as possible.

S5. REQUIREMENTS. With a load for either a standard cot or bariatric cot applied to the floor structure as specified in S7., the allowable maximum deflection is 1/16-inch for standard cot and 1/8-inch for a bariatric cot. If flooring material has a raised pattern, measure the pattern and subtract from any deflection.

S6 TEST CONDITIONS.

S6.1 The test may be conducted at any temperature with the vehicle parked on a level surface.

S7. TEST PROCEDURE.

Each vehicle tested shall be capable of meeting the requirements of S5. when tested in accordance with the procedures set forth below:

a. Locate load cell on centerline of floor (measured from left wall to squad bench) and flush with inside of rear doors (see Figure 3).

b. Load cell to required load (400 lbs. or 800 lbs.).

c. Using Deflection Indicator, measure floor deflection at centerline of each wheel along load cell axis (four points B, C, E and F).

d. Using Deflection Indicator, measure floor deflection across (22”) the front and rear of the load cell at centerline of floor (two points A and D).

e. Move load cell forward 12” and repeat procedures C and D.

f. Continue moving load cell forward and recording deflection at six points until 12” from front seat cushion.
S1. SCOPE. This standard verifies performance of an ambulance Aspirator System, Primary Patient, when installed per the manufacturer’s directions. Each finished vehicle shall be tested.

S2. PURPOSE. The purpose of this standard is to insure that minimum performance levels are attained that will permit collection of aspirate and semi-solid gastric stomach contents.

S3. APPLICABILITY. This standard applies to all ambulances.

S4. DEFINITIONS.

S4.1 “Suction Tubing” is transparent or translucent, non-kinking suction tubing used to collect aspiration of semi-solid gastric contents. The tubing is a minimum of 10' in length with a minimum inside diameter of ¼-inch.

S4.2 “Collection bottle” is transparent and used to collect aspiration of semi-solid gastric contents with a minimum 1,000-ml capacity.

S4.3 “Vacuum indicator gauge” shows the level of vacuum with a diameter of 3” (+/-0.5”) with numerical markers at least every 100 mm Hg and a total range of 0–760 mm Hg.

S4.4 “Combination vacuum control and shut-off valve” is used to adjust vacuum levels and to discontinue aspiration instantly.

S5. PERFORMANCE.

S5.1 The aspirator system shall provide a free airflow of at least 30 lpm and achieve a minimum of 300 mm (11.81”) Hg vacuum within four seconds after the suction tube is closed.

S6. TEST CONDITIONS. The following conditions apply.

S6.1 The test may be performed at any ambient temperature.

S6.2 Vehicle engine shall be started and high idle engaged during the duration of the test.

S6.3 A 3-meter (10-foot) length of transparent or translucent, non-kinking suction tubing shall be installed on the collection bottle.

S6.4 The vacuum control and shut-off valve shall be at full open.

S7. TEST PROCEDURE.
S7.1 With the vehicle running:
a. Open vacuum control and shut-off valve to full open.
b. Install suction tubing to collection bottle inlet.
c. Turn on vacuum pump.
d. Clamp or plug end of suction tubing.
e. Use a stopwatch to time.
f. Start watch at clamping of hose and record gauge reading at end of four seconds.
g. Attach flow meter and test for a minimum flow rate of 30 lpm and record.
S1. SCOPE. This standard verifies the ambulance engine starting performance requirements.

S2. PURPOSE. The purpose of this standard is to reduce the possibility of the engine failing to start in a cold environment. This is a type test.

S3. APPLICABILITY. This standard applies to all ambulances.

S4. REQUIREMENTS. The engine shall start without the use of external power or starting fluids. The engine shall start satisfactorily without the aid of engine block preheating devices (except glow plugs or combustion air pre-heater) at 0° F. The determination shall be by actual test, cooperative testing through AMD or by chassis manufacturer’s certification.

S5. TEST CONDITIONS.

S5.1 The ambulance shall have all patient compartment doors, cabinet doors, cab doors, hood and exterior compartment doors open throughout S6.3.

S5.2 Air velocity of at least 5 mph shall be maintained over the vehicle throughout the entire test.

S5.3 The test chamber must be capable of maintaining temperature within a tolerance limit of +/- 4° F for the duration of the test.

S6. TEST PROCEDURE.

S6.1 Place the ambulance in the cold room. Turn off all power. Open all doors and hood. If in the case of cab dome lights being on, roll the cab windows all the way down.

S6.2 Two exterior thermocouples are to be placed on the centerline of the vehicle, half way between the ground and the highest point of the vehicle (excluding bolt-on items), 36" forward of the front extremity of the vehicle and 36" rear of the rear extremity. Reference Figure 1. This requirement shall also hold the same +/- 4° F tolerance.

S6.3 Cool to 0° F with an air velocity of at least 5 mph for three hours.

S6.4 Close all doors, hood, partition door (if present) and patient compartment/cab partition window (if present) and start engine. Engine must run for five minutes without stalling.
S1. SCOPE AND PURPOSE. This standard verifies performance of an ambulance siren. This is a type test.

S2. APPLICABILITY. This standard applies to all ambulances.

S3. DEFINITION.

S3.1 “Electronic Siren” is a combination electronic siren with integral public address system, including radio interface capability. It is capable of producing the following sounds: wail, yelp and other applicable sounds such as “rapid yelp,” “air horn” or composite-type sounds.

S3.2 “Siren Control” shall permit the following sounds: manual, wail and yelp, or other applicable sounds.

S3.3 “Public address system” amplifier shall be independent of the two-way radio, except that a common microphone and control housing group may be employed.

S3.4 “Microphone” for the public address system shall be a noise-canceling type.

S3.5 “Dual speakers” shall be installed outside the vehicle in the bumper/hood area. Speakers shall not protrude beyond the face of the bumper or bumper guards.

S3.6 “Anechoic chamber” shall conform to ANSI Standard S1.13-1971.

S4. REQUIREMENTS. The siren, with the exception of cancellation effects due to dual speakers, when tested in a full anechoic chamber with test equipment and methods shall conform to California Administrative Code, Title 13, Article 8:

a. Shall be capable of producing a continuous warning sound at a minimum level of 123 dB, A-weighted, at 3 meters (10') on axis in the “wail mode” with “yelp” falling within 1 dB with 13.6 volts +/- 1% input, at a fundamental frequency in the range of 500–2,000 Hz maximum.

b. The output over the sweep range shall not drop to less than 116 dB. The speakers shall be located in the configuration that is representative of the vehicle on which they will be mounted.

c. In the “wail” mode, the siren shall have a sweep rate of 10–18 cycles per minute and in the “yelp” mode, a sweep rate of 150–250 cycles per minute. All sweep modes shall cover a range of at least one octave.

d. In voice (P.A.) operation, the unclipped sine wave output shall be at least 55 watts RMS into a resistive load matching the nominal speaker system impedance at 1000 Hz. The frequency response of the amplifier shall be from 500–3,000 Hz +/- 3 dB, when measured from 1,000 Hz reference. Total harmonic distortion shall not exceed 10%, at 20 watts RMS, over the specified frequency range when measured with the load shown above.
e. In addition, the electronic siren furnished with the exception of cancellation effects attributable to dual speakers shall comply with all the other requirements included in the State of California Vehicle Code Section 1020–1029, Title 13, Article 8, the latest issue for Class A sirens.

S4.1 The electronic siren shall be tested, approved and listed with the Automotive Manufacturers Equipment Compliance Agency.
S1. SCOPE. This standard verifies performance of ambulance perimeter lighting intensity.

S2. PURPOSE. The purpose of this standard is to measure and verify the exterior lighting provided for the sides and rear of ambulances. This is a type test.

S3. APPLICABILITY. This standard applies to all ambulances intended for use in the United States.

S4. DEFINITION.

S4.1 Illumination is the flux of light received in a unit area of a certain side being illuminated. The unit of measure is foot-candle (Fc). One Fc is the illumination, which falls on one side of a standard candle as measured at a distance of 1 foot (1Fc = 1Lm/ft²) (1 Fc = 10.76 Lux). One Lux is the light from the standard candle at a distance of 1 meter and striking a square meter.

S4.2 Light meter is the instrument for measuring illumination. For this standard, a light meter with resolution of 0.01 Fc is required (0.1 Lux).

S4.3 Flood light is a light mounted high on the side of the patient compartment of an ambulance that is manually switched on while emergency medical procedures are being carried out at a response scene.

S4.4 Load light is a light mounted high on the rear of the patient compartment of an ambulance that provides light for loading/unloading the ambulance. Load lights can provide scene illumination as well.

S5. REQUIREMENTS. Each ambulance tested to this standard and demonstrating compliance will be designated as capable of night emergency operation. Specific test requirements outlined in S6. must be met by exemplary units and the testing documented according to the test procedures detailed in S6.

S5.1 Testing to be done on level ground with the transducer aimed upward.

S5.2 Testing to be done with minimal ambient light to allow data to be recorded.

S5.3 Ambient air conditions to be recorded for test period.

S5.4 All test lights on a specific side of the ambulance to be tested simultaneously and electrical load recorded as part of the qualification testing.

S5.5 Digital light meter to be used in all illumination measurements.

S5.6 All distance measurements to be made with conventional steel tapes with resolution of at least 0.125".
S5.7 Individual illumination levels must be at least 1 foot-candle, 3" above ground level at a
distance of 60" from the vehicle on all sides of the ambulance and at least 0.3 foot-candle at
120" from the edge of the subject ambulance to meet this standard.

S6. TEST PROCEDURE.

S6.1 Place test vehicle on level surface with no structures within 20' of any side of the test unit. Run this test in a structure where ambient light can be controlled or outside after sunset.

S6.2 Make sure the electrical section of the vehicle has a fully changed battery pack.

S6.3 Layout a grid of test points off of the sides and rear of the test ambulance as shown in Figure 1. Parallel grid lines are to be located 5' and 10' from the test unit. The parallel lines are intersected by perpendicular grid lines extending out from the center of each exterior scene light and from each corner and mid-point of the sides and rear of the module. The intersections of the gridlines form the test points for illumination.

S6.4 Measure ambient illumination at all intersections of the grid. Record measurements on a graphical map of these locations.

S6.5 Turn on the lights on one side of the ambulance, and record the illumination level at each grid point on that side of the ambulance. Calculate the light-supplied illumination by subtracting the first measurement from the last at each grid point.

S6.6 Repeat 6.5 on the opposite side of the ambulance and at the rear of the ambulance.

NOTE: Only one side lighted and recorded at a time.

S6.7 Record all data on a top view of the ambulance showing illumination levels at the 5-foot and the 10-foot distances.

S6.8 Measure current and voltage for each lighted side of the ambulance prior to taking light readings.

S7. DATA ANALYSIS.

S7.1 The illumination levels must provide at least 1 foot-candle at the 5-foot perimeter distance from the ambulance on left, right and rear of the patient compartment. At the 10-foot perimeter grid points, the readings for the lights on each individual side must provide at least 0.3 foot-candle.

S7.2 Attach raw data and analysis to the report of this test work as verification of compliance to this standard.
S1. SCOPE. This standard establishes the requirements for measuring the minimum acceptable
dimension for an occupant workspace based on static considerations.

S2. PURPOSE. The purpose of this standard is to insure that measurement of the occupant
workspace is performed correctly. Each finished vehicle shall be tested.

S3. APPLICABILITY. This standard applies to all ambulances intended for use in the United
States.

S4. DEFINITIONS.

S4.1 “Designated Seating Position” is the same as defined in Title 49 of the Code of Federal
Regulations (CFR), Part 571.3 and is a seating space that is provided for passengers and is
provided with a lap belt or lap/shoulder belt to show the position of the seated passenger.

S4.2 “Head Protection Zone” is the space above a designated seating area that is to be free of
contact surfaces. For purposes of this standard, that is 43” above the unloaded seating
surface.

S4.3 “Test Fixture” is a rectangular parallelepiped constructed of any material that will allow a
single person to easily pick it up and move it. Material used must be stiff enough to preclude
the sides of the test fixture from flexing when they come in contact with surfaces within the
patient compartment. Outside dimensions are to be 43" high, 18" wide and 15" deep. All
dimensions are to be plus nothing and minus 0.125". Maximum weight for the test fixture
may not exceed 60 lbs. For reference see Section S.5.4.2 in Title 49 of the CFR  Part 571.217
as to the utilization of a zone measuring box.

S5. REQUIREMENTS. Each ambulance tested to this standard and demonstrating compliance
will be designated as in compliance with this standard. S6.0 details the measurements and
procedures.

S5.1 Testing to be done on level ground with tires fully inflated.

S5.2 Testing to be done with the prescribed test fixture.

S5.3 Ambient air conditions to be recorded for test period.

S5.4 All seats in the ambulance must be tested for clearance.

S5.5 Pictures of the test procedures are to be taken and kept for reference.

S5.6 Clearance over all patient compartment seats must be at least 43".

S5.7 All clearances to be validated by placing the test fixture in the designated seating position.
Orientation during the test is for the 43” dimension to be perpendicular to the plane of the
surface where the passenger would sit. The test fixture can not extend over the free edge of
the seat plane. If the head protection zone has intrusions from walls, cabinets, oxygen ports,
electrical outlets, lights, etc., into the free space, then the seat cannot be used during transport. Any stationary seating positions shall not have seat belts provided, and must be conspicuously marked for stationary occupation-only in accordance with section 4.4 of Title 49 CFR Part 571.207 as published 10-1-06.

S6. TEST PROCEDURE.

S6.1 Place test vehicle on level surface.

S6.2 Make sure all seat cushions regularly shipped with the unit are in place.

S6.3 Place the test fixture on the plane where a passenger would sit. No surface contacts should be observed.

S6.4 No permanent objects are allowed in the 43-inch head protection zone.

S6.5 Document test and record results.

This space will meet the requirements of the Head Protection Zone.

This is an example of a non-compliant seat as the test fixture cannot hang over the front of the seating position and comes in contact with overhead obstruction.