



# Ambulance Manufacturers Division (AMD)

*An Industry Division of the National Truck Equipment Association*

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## INTRODUCTION

For almost a quarter of a century, the emergency medical services of this country have 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 NTEA provides its 1,500 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 15 years as more and more ambulance manufacturers and industry-related companies realize the value and significance of being an AMD member. Currently composed of

approximately 45 companies, the AMD has consistently maintained representation of over 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:

- Recognition of of the Federal Specification for the Star-of-Life Ambulance, KKK-A-1822 as the minimum specification for the ambulance industry.
- Continued coordination 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 (QVM) Program.
- Continued development, improvement and updating of AMD Standards.

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.

Federal law and regulation require that all motor vehicles, including ambulances, operated on public highways conform and be certified to all applicable Federal Motor Vehicle Safety Standards (FMVSS). Motor Vehicle Safety Standards as originally defined in the National Traffic and Motor Vehicle Safety Act of 1966 “means a minimum standard for motor vehicle performance, or motor vehicle equipment performance, which is practicable which meets the need for motor vehicle safety and which provides objective criteria.” For additional definitions see 49 U.S.C. Chapter 301 – Motor Vehicle Safety.

Development of AMD Standards began almost 25 years ago by AMD members in conjunction with the GSA and are currently cited in KKK-A-1822 (See Paragraph 2.2 – Applicable Documents, Other Publications). KKK-A-1822 requires that all ambulances conform with all FMVSSs and AMD Standards. AMD Standards are meant to enhance KKK-A-1822 and supplement the FMVSSs by providing ambulance purchasers and users with performance standards specific to ambulances. AMD Standards provide a verifiable means by which to help assure safety and reliability.

AMD Standards are developed and revised with input from the GSA, ambulance manufacturers and component suppliers, emergency medical technicians, paramedics, and vehicle maintenance personnel and other interested parties through public comment. All comments are considered and appropriate revisions are made before a standard is voted on for adoption. All of the enclosed AMD Standards have been incorporated into the latest revision of KKK-A-1822.

The AMD welcomes your comments and suggestions regarding improvements and/or corrections to AMD Standards. Written comments and suggestions regarding changes to an existing and/or proposed new standard(s) need to include a reasonable and rational explanation for the change(s) based in sound engineering principles, proposed/ revised language, cost/benefit analysis, verifiable statistics, test results and/or engineering studies where applicable. Suggested changes must be performance based, industry generic and cannot in any way restrict trade or innovation. Comments and suggestions received without the aforementioned information cannot be considered.

Written comments and suggestions received with the required information by the AMD Secretary will be submitted to the AMD Technical Committee for review and comment. The Technical Committee will review the comments and suggestions and send a written response to the writer confirming receipt and status. If the Technical Committee does not consider the

proposed changes appropriate or viable, a written response will be sent explaining why the comments and suggestions do not merit further consideration. If considered appropriate, the Technical Committee will make a recommendation to the full AMD membership for further review and discussion.

If the AMD membership does not consider the proposed changes appropriate or viable, a written response will be sent explaining why the comments and suggestions do not merit further consideration. If approved, with or without changes, by a majority of full AMD members, the proposed revisions will be made available for public comment on the NTEA's Web site, <http://www.ntea.com>.

If, after an appropriate public comment period, no adverse comments are received, the recommended revisions will become final and effective after approval by a majority of full AMD members. If adverse or negative comments are received, those comments will be sent back to the Technical Committee and/or full AMD membership for review and response. The review/revision process will continue until no negative comments are received.

All comments and suggestions must be made in writing and sent to: Ambulance Manufacturers Division, National Truck Equipment Association, 37400 Hills Tech Drive, Farmington Hills, MI 48331-3414, Attn: AMD Secretary.



## **Ambulance Manufacturers Division**

*An Industry Division of the National Truck Equipment Association*

# **STANDARDS**

- AMD STANDARD 001 — **STATIC LOAD TEST FOR AMBULANCE BODY STRUCTURE**
- AMD STANDARD 002 — **BODY DOOR RETENTION COMPONENTS TEST**
- AMD STANDARD 003 — **OXYGEN TANK RETENTION SYSTEM**
- AMD STANDARD 004 — **LITTER RETENTION SYSTEM**
- AMD STANDARD 005 — **AMBULANCE 12 VOLT DC ELECTRICAL SYSTEM**
- AMD STANDARD 006 — **SOUND LEVEL TEST CODE FOR AMBULANCE COMPARTMENT INTERIORS**
- AMD STANDARD 007 — **CARBON MONOXIDE LEVELS FOR AMBULANCE COMPARTMENT INTERIORS**
- AMD STANDARD 008 — **LOAD TEST FOR AMBULANCE PATIENT COMPARTMENT GRAB RAIL**
- AMD STANDARD 009 — **120V AC ELECTRICAL SYSTEMS**
- AMD STANDARD 010 — **WATER SPRAY TEST FOR AMBULANCES**
- AMD STANDARD 011 — **AMBULANCE EQUIPMENT TEMPERATURE TEST**
- AMD STANDARD 012 — **AMBIENT TEMPERATURE TEST**
- AMD STANDARD 013 — **WEIGHT DISTRIBUTION**
- AMD STANDARD 014 — **COOLING SYSTEM TEST**
- AMD STANDARD 015 — **AMBULANCE MAIN OXYGEN SYSTEM TEST**

# AMD STANDARD 001

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## STATIC LOAD TEST FOR AMBULANCE BODY STRUCTURE

- S1. SCOPE. This standard establishes performance requirements for ambulance body structural integrity.
- S2. PURPOSE. The purpose of this standard is to reduce the possibility of injuries and fatalities that could result from the failure of the ambulance body structure that may be encountered in roll over crashes.
- S3. APPLICABILITY. This standard applies to all ambulances.
- S4. DEFINITION.
- S4.1 “Curb Weight” - 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. When a force equal to 1.5 times the curb weight of the vehicle is applied to the roof of the vehicle’s body structure through a force applications plate as specified in S6. Test Procedures:
- The downward vertical movement at any point on the application plate shall not exceed 5.125 inches.
  - 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.
  - No structural or component damage, i.e., torn or broken material, broken welds, popped or sheared 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 the vehicle 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 sill. Remove any components that extend upward from the vehicle roof.
- S6.2 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 inches longer and 5 inches 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.
- S6.3 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, and its rear edge measures a minimum of 2.5 inches from the rear edge of the vehicle roof at the centerline.
- S6.4 With all doors fully closed, apply an evenly distributed vertical force in the downward direction to the force application plate at any rate of not more than 0.5 inches per second, until a force of 500 pounds has been applied.
- S6.5 Record elevation readings of all 4 corners of the roof.

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S6.6 Apply additional vertical force in the downward direction to the force application plate at a rate of not more than 0.5 inches per second until 50% of the force specified in S5. has been applied.

S6.7 Repeat procedure in S6.5

S6.8 Continue to apply a vertical force to the application plate until the total load specified in S5 is recorded.

S6.9 Repeat procedure in S6.5

S7. DOOR CAPABILITIES.

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

S8. CONCLUSION

S8.1 Remove applied load from application plate.

S8.2 Repeat procedure in S6.5 and compare with original readings to determine permanent deformation of roof.

S8.3 Record all results.

## AMD STANDARD 002

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### BODY DOOR RETENTION COMPONENTS TEST

- S1. SCOPE. This standard shall establish requirements for the 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 the adverse forces that can result from a vehicle impact.
- S3. APPLICABILITY. This standard shall apply to Type I and III ambulances only.
- 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:
- Open at any time during the test procedure.
  - Fail at the latch, striker(s), hinge or their points of attachment to the door or the body framework.

<b>Table I: TEST LOAD POUNDS</b>				
<b>Applied to</b>	<b>Side Door</b>		<b>Rear Door</b>	
	<b>Transverse Load</b>	<b>Longitudinal Load</b>	<b>Transverse Load</b>	<b>Longitudinal Load</b>
Fully Latched Position	2,500	2,500	2,500	2,500
Secondary Latched Position	1,500	1,500	1,500	1,500
Hinge	2,500	2,500	2,500	2,500

- 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 0 degrees Fahrenheit (-17.8 degrees Celsius) to 100 degrees Fahrenheit (37.8 degrees Celsius).
- S8. All hinged passenger door latches and striker assemblies must meet Federal Motor Vehicle Safety Standard (FMVSS) 206 as tested under SAE Recommended Practice J839.<sup>1</sup>
- S8.1 Latch and striker assembly must be tested using test fixture prescribed in SAE J839 for longitudinal load, transverse load and inertia load.<sup>2</sup> See Figure 1

<sup>1</sup> Test can be performed by latch and striker manufacturer if single source and a letter of compliance is supplied to the body builder stating that the assembly as furnished meets FMVSS 206.

<sup>2</sup> If 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 by the body builder in accordance with SAE J839.

## AMD STANDARD 003

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### OXYGEN TANK RETENTION SYSTEM

- S1. **PURPOSE AND SCOPE.** This standard specifies requirements for oxygen tank holders to minimize the possibility of their failure by forces acting upon them as a result of vehicle crashes and/or sudden driving maneuvers.
- 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 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):
- The oxygen tank holder components shall not fail and separate along attachment points.
  - The oxygen tank holder or any component thereof shall not separate from the vehicle at any attachment point.
  - The part of the vehicle to which the oxygen tank holder is attached shall not fail and/or separate at any attachment point.
  - 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 It is not required to apply simultaneously the forces required by S5.2.1 and S5.2.2.
- 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 which 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.

## AMD STANDARD 004

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### LITTER RETENTION SYSTEM

- S1. PURPOSE AND SCOPE. This standard establishes requirements for the litter retention system and its installation to minimize possibility of its failure by forces acting upon it as a result of vehicle crashes and/or sudden driving maneuvers.
- 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 a force of 2,200 pounds 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, 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 inches above the floor, at a point representing the center of the litter.
- S6. TEST PROCEDURE
- 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, (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.

## AMD STANDARD 005

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### AMBULANCE 12 VOLT DC ELECTRICAL SYSTEM

- S1. SCOPE. This standard establishes performance requirements for ambulance electrical systems.
- S2. PURPOSE. The purpose of this standard is to establish testing and certification procedures for ambulance 12 volt DC electrical system and to set performance criteria.
- 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: ALL ABOVE LOADS MUST NOT BE DEACTIVATED IF THE VEHICLE IS EQUIPPED WITH A LOAD MANAGEMENT SYSTEM.
- S4.2 The generating system(s) shall produce the maximum required output at the regulated voltage, and minimum under hood temperature of 200 degrees Fahrenheit, 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.

## AMD STANDARD 005 — Page 2

- 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) through (12) 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, items 1 through 12 shall not be deactivated that will allow the maximum electrical load.
- 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 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 12V DC manufacturer’s current rating at 200 F (93C) at 14V  
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
  - (3) Engine speed control setting: \_\_\_\_\_ RPM
  - (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

### SOUND LEVEL TEST CODE FOR AMBULANCE COMPARTMENT INTERIORS

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- S1. SCOPE. This standard establishes maximum sound level for ambulance patient compartments.
- S2. PURPOSE. This standard shall limit the interior sound level in the ambulance patient compartment that could jeopardize an occupant's health and welfare during transport.
- S3 APPLICABILITY. This standard applies to all ambulances.
- S4. REQUIREMENTS. The interior sound level in the patient compartment shall not exceed 80 decibels.
- S5. TEST PROCEDURES. Each ambulance tested shall be capable of meeting requirements of S4 when tested in accordance with procedures set forth below:
- S5.1 Use sound level meter that meets requirements of the American National Standard Institute, Standard ANSI S1.4- Specification for Sound Level Meters, for type 2 meters. Set the meter to A - weighing network, "fast" meter response.
- S5.2 Suspend the microphone vertically 6 inches above the normal position of the patient's head on the primary cot.
- S5.3 Park ambulance at a location so that no large reflecting surfaces, such as other vehicles, signboards, buildings, or hills are within 50 feet of the vehicle being tested.
- S5.4 Set vehicle transmission in neutral gear and accelerate engine to 50% to 60% of the engine manufacturer's RPM rating. Stabilize the engine at that speed and measure the highest sound level.
- S5.5. Return engine speed to idle and repeat the process as specified in S5.4 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 S4 is permitted to allow for variations in test conditions and capabilities of meters.)
- S6. TEST CONDITIONS. The following conditions apply to requirements specified in S4.
- S6.1 Ambulance doors, windows and vents are to be in the closed position.
- S6.2 Air conditioner/heater blower switch in patient compartment shall be placed at the highest speed.
- S6.3 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.)
- S6.4 This test shall be performed during the following weather conditions:
- Temperature not to exceed 95 degrees Fahrenheit.
  - Humidity not to exceed 75%.
  - Wind velocity not to exceed 12 mph.
  - Barometric pressure 29 to 31.
- S7. REFERENCE.
- S7.1 ANSI S1.1— Acoustical Terminology.

## AMD STANDARD 007

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### CARBON MONOXIDE LEVELS FOR AMBULANCE COMPARTMENT INTERIORS

- S1. SCOPE. To collect and evaluate certain data pertaining to the health and safety of Emergency Medical Workers and their patients as it pertains to the presence of carbon monoxide (CO) gas in ambulances.
- S2. PURPOSE. To provide the user with a safe breathing air environment in the patient compartment of an ambulance.
- S3. 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.
- S4. 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 to 100 PPM CO.
- S5. TEST PROCEDURE.
- S5.1 Sample ambient air around vehicle and record.
- S5.2 Close all doors and windows of vehicle, assuring that heating, air conditioning and ventilating systems are off.
- S5.3 Start and idle engine in parked position for 10 minutes.
- S5.4 Monitor CO at head of primary cot for the first 5 minutes and record results.
- S5.5 Monitor CO around doors, windows and floor for the remaining 5 minutes and record results.
- S5.6 With environmental systems remaining off, drive the vehicle for 10 minutes on traffic laden city streets (15 to 30 mph).
- S5.7 Repeat S5.4
- S5.8 Repeat S5.5
- S5.9 With environmental systems remaining off, drive vehicle for 10 minutes on limited access (inter-state) highway (45 to 65 mph).
- S5.10 Repeat S5.4
- S5.11 Repeat S5.5
- S5.12 Stop vehicle and repeat S5.1
- S6. CALCULATION OF RESULTS:
- S6.1 Determine the average reading taken in S5.1 and S5.12.
- S6.2 Deduct result of S5.1 from the highest reading taken in each of the three tests. The resultant levels of carbon monoxide shall not exceed 10 ppm.
- S6.3 Record all results noting time, date, location and route of tests. Record temperature, barometric pressure and humidity at the time of the test.

## **AMD STANDARD 008**

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### **LOAD TEST FOR AMBULANCE PATIENT COMPARTMENT GRAB RAIL**

- S1. SCOPE. This standard establishes minimum static load requirements for ambulance grab rails.
- S2. PURPOSE. The purpose of this standard is to reduce the possibility of injury that could result from the grab rail loosening or becoming detached from the patient compartment ceiling.
- S3. APPLICABILITY. This standard applies to all ambulances.
- S4. REQUIREMENTS. The grab rail shall not detach, loosen or permanently deform during the load application of 300 lbs. in any direction.
- S5. TEST PROCEDURE.
  - S5.1 With the vehicle parked on a flat surface, measure the grab rail for straightness and the space between top sides of rail and ceiling.
  - S5.2 Attach force application device to grab rail at the midpoint between two brackets and incrementally apply the required load in S4 in the vertical plane. Hold that load for 2 minutes and release.
  - S5.3 Repeat S5.2 at three other locations equally spaced along the rail.
  - S5.4 Repeat S5.2 and S5.3 applying the load horizontally.
  - S5.5 Repeat S5.2 and S5.3 applying the load diagonally at any convenient angle.
  - S5.6 Examine and measure the grab rail for loosening or bending and record results.

# AMD STANDARD 009

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## 120V AC ELECTRICAL SYSTEMS

- S1. SCOPE. The provisions of this standard cover the electrical conductors and equipment installed within or on ambulances and the conductors that connect ambulances to 120 or 120/240 volt, nominal, AC electrical supply system(s).
- S2. OTHER ARTICLES. Whenever the requirements of National Electrical Code (NEC) and this standard differ, the requirements of this standard shall apply.
- S3. DEFINITIONS.
- S3.1 “Inverter” means a device that changes energy from one form to another as from direct current to alternating current.
- S3.2 “Converter” means a device that changes electrical energy from one form to another as from alternating current to direct current.
- S3.3 “Low Voltage” means an electromotive force rated 24 volt, nominal, or less, supplied from a transformer, converter or battery.
- S4. 120-VOLT AC NOMINAL SYSTEMS:
- General Requirements. The electrical equipment and material indicated for connection to a wiring system rated 120 volts, nominal, 2-wire with ground, shall be listed and installed in accordance with the requirements of this document. No ungrounded systems shall be used.
  - Materials and Equipment. Electrical materials, devices, appliances, fittings and other equipment installed, intended for use in, or attached to the ambulance shall be listed or recognized. All products shall be used only in the manner for which they were tested and found suitable.
  - Other Sources. Other sources of AC power shall be wired in full conformity with the requirements of this standard.
  - On-Board 120V AC Power Restriction. Transfer equipment, if not integral with the listed power source, shall be installed to ensure that the current carrying conductors from the on board 120-volt AC power source and from the 120-volt AC utility power source are not connected to ambulance electrical circuit at the same time.
  - Grounding. Grounding shall be in accordance with section 250-6 [Portable and Vehicle Mounted Generators] of the National Electrical Code (NEC).
  - Ground Fault Protection for Personnel. All 120-volt AC receptacle outlets of the ambulance shall have ground fault circuit interrupter protection.
- S5. 120-VOLT AC UTILITY POWER.
- Connecting To Utility Power. The ambulance shall include a means for connecting the 120-volt AC electrical system to an external utility power.
  - Utility Power Cable Assembly. The power supply cable assembly may be manufacturer supplied. Unless specified by purchaser, the power supply cable assembly shall have a cord length of 25 feet (minimum) and include a weatherproof female connector body and weatherproof attachment plug.
  - Utility Power Body Connector. The ambulance shall be equipped with a permanently mounted, flanged, weatherproof surface inlet (male recessed type receptacle) wired directly to the distribution panel board by an approved wiring method. The attachment plug and body connector shall be of a listed type.

- (1) Ambulances having only one 15-ampere branch circuit shall have an attachment connector body which shall be two-pole, three-wire grounding type, rated 15 amperes, 125 volts, conforming to the configurations in American National Standards Institute (ANSI) Standard C73.17.1972 or approved NEMA connector for the amperage of the service provided.
  - (2) Ambulances having two 15 or 20-ampere branch circuits shall have an attachment connector body which shall be two-pole, three-wire grounding type, rated 30 amperes, 125 volts, conforming to the configurations in ANSI Standard C73.17.1972 or approved NEMA connector for the amperage of the service provided.
  - (3) Ambulances may be equipped with two separate 15-ampere or 20-ampere circuits each having an attachment body connector that has receptacles rated for the same amperage and voltage as the circuit breakers.
- d. Labeling at Electrical Entrance. Each ambulance shall have permanently affixed to the exterior skin at or near the point of entry of the power supply cord(s): "This connection is for 120V AC, 60 Hz, [ ] ampere supply." The correct ampere rating shall be marked in the blank space. The point of entrance of a power supply assembly shall be specified by the purchaser.
  - e. Power Supply Grounding. The grounding conductor in the supply cord or feeder shall be connected to the grounding bus or other approved grounding means on the distribution panel board.

#### **S6 DISTRIBUTION BOX**

- a. Dead-Front Type. The distribution box shall be of the dead-front type and shall consist of an appropriately sized cutout enclosure, one or more circuit breakers or ground fault circuit interrupters and a distribution panel board.
- b. Location. The distribution box shall be installed in a readily accessible location.
- c. Distribution Panel Board. The distribution panel board shall have a grounding bus with sufficient terminals for all chassis grounding and separate neutral grounding conductors or other approved grounding means.
- d. Insulated Neutral. The grounded circuit conductor (neutral) shall be insulated from the equipment grounding conductors and from equipment enclosures and other grounded parts. The grounded (neutral) circuit terminals in the distribution panel board and in appliances shall be insulated from the equipment enclosure. Bonding screws, straps, or buses in the distribution panel board or on appliances shall be removed.

#### **S7. GENERAL WIRING METHODS**

- a. Wiring Systems. 120-volt AC electrical system shall be limited to the following methods:
  - (1) Rigid metal conduit, intermediate metal conduit, Type SO cord (600 V and 90 degrees Celsius minimum) covered in 300-degree Fahrenheit minimum flame retardant loom of moisture resistant type, electrical metallic tubing, rigid non-metallic conduit, flexible metal conduit, flexible non-metallic conduit, or liquid tight flexible conduit.
  - (2) Only stranded copper conductors shall be used.
  - (3) An equipment grounding means shall be provided in accordance with Section 250-91 [Grounding Conductor Material] of the NEC.
  - (4) Where rigid metal conduit or intermediate metal conduit is terminated at an enclosure with a lock-nut and bushing connection; two lock-nuts shall be provided, one inside and one outside of the enclosure. All cut ends of conduit shall be reamed or otherwise finished to remove rough edges.
- b. Non-Metallic Boxes. Non-metallic boxes shall be acceptable only with non-metallic conduit.

- c. Mounting. Boxes shall be mounted in accordance with Article 370 [OUTLET, DEVICE, PULL AND JUNCTION BOXES, CONDUIT BODIES AND FITTINGS] of the NEC.
- d. Bends. No bend shall have a radius of less than five times the cable or conduit diameter, whichever is greater.
- e. Cable Supports. When connected with cable connectors or clamps, tubing conduit, and loom shall be supported within 12 inches of outlet boxes, distribution panel boards and splice boxes on appliances. Supports shall be provided every 4.5 feet (1.37 meters) at other places.
- f. Physical Damage. Where subject to physical damage, exposed type SO cable may be protected by guard strips, raceways or other means.
- g. Branch Circuits. Each ambulance containing a high-voltage electrical system shall contain one of the following:
  - (1) One 15-Ampere Circuit. One 15-ampere circuit to supply receptacle outlets and fixed appliances. Such ambulance shall be equipped with one 15-ampere switch and fuse or 15-ampere circuit breaker. All circuits shall be GFI protected.
  - (2) Two 15 or 20-Ampere Circuits. Two 15 or 20-ampere circuits to supply receptacle outlets and fixed appliances. Such ambulances shall be equipped with a 30-ampere minimum rated main power supply assembly. See Section 210-23(a) [Permissible Loads] of the NEC for permissible loads. All circuits shall be GFI protected.
- h. Branch Circuit Protection. The branch circuit over current devices shall be rated:
  - (1) Not more than the circuit conductors and
  - (2) Not more than 150% of the rating of a single appliance rated 13.3 amperes or more and supplied by an individual branch circuit, or according to the appliance manufacturer, but
  - (3) Not more than the over current protection size marked on motor-operated appliances.

**S8. ON-BOARD GENERATOR/INVERTER POWER SUPPLY**

- a. Separate Over Current Protection. When an onboard 120-volt AC power source is installed, the output from that power source shall be protected by an over current protective device.
- b. Multiple Power Source Transfer Switch. Where a multiple supply system consisting of an alternate power source and a utility power supply are installed, a means for automatically or manually selecting the power source shall be provided. Equipment shall be installed to ensure that the current-carrying conductors from the onboard power source and from the utility power source are not connected to an ambulance 120-volt AC electrical circuit at the same time.
- c. Mounting. On-board inverters/generators shall be mounted in such a manner as to be effectively bonded to the ambulance chassis and in accordance with the instructions provided by the manufacturer of the on-board generator set or inverter.
- d. Supply Conductors. The supply conductors from the on-board power source to the first termination on, or in, the ambulance shall be of the copper-stranded type. The point of first termination shall be (1) a transfer switch, (2) a junction box with a blank cover, (3) a junction box with a receptacle, or (4) a receptacle assembly listed in conjunction with the on-board generator/inverter. (5) a Panel Board.
- e. Transfer Switch Location. When required, the transfer switch may be mounted on the distribution panel, in a separate junction box or be an integral part of the generator/inverter. A receptacle assembly listed in conjunction with the on-board generator/inverter shall be mounted in accordance with its listing.
- f. Additional Generator Requirements. Section 445 [GENERATORS] of the NEC shall be complied with.

**S9. SWITCHES.** Switches shall be listed and rated as follows:

- a. **Lighting Circuits.** For lighting circuits, switches shall be rated not less than 10 amperes, 120-125 volts and in no case, less than the connected load.
- b. **Motors or other loads.** For motors or other loads, switches shall have ampere or horsepower ratings, or both, adequate for loads controlled. (An AC general use snap switch shall be permitted to control a motor 2 HP or less with full load current not over 80% of the switch ampere rating.)
- c. **Marking.** All switches shall be labeled with their function.

**S10. RECEPTACLES**

- a. All exterior receptacle outlets shall be weatherproof and be grounding type and installed in accordance with Section 210-7 [Receptacles and Cord Conductors] of the NEC. See the ANSI Standard # C73.17.1972 for proper configurations.
- b. All interior outlets shall be of the lighted grounding type installed in accordance with Section 210-7 (Receptacles and Cord Conductors) of the NEC.
- c. **Face-up Position Restriction.** No receptacle shall be installed in a face-up position.

**S11 INTERIOR EQUIPMENT GROUNDING**

- a. **Exposed Metal Parts.** In the electrical system, all exposed metal parts, enclosures, frames, fixtures, canopies, etc., shall be effectively bonded to the grounding terminals or enclosure of the distribution panel board.
- b. **Equipment Grounding Conductors.** Only bare wires, green colored, or green wires with yellow stripes shall be used for equipment grounding conductors.
- c. **Grounding of Electrical Equipment.** Grounding of electrical equipment shall be provided as follows:
  - (1) Connection of metal raceway, i.e., conduit or electrical metallic tubing.
  - (2) A connection between the one or more equipment grounding conductor and a metal box by means of a grounding screw (which shall be used for no other purpose) or a listed grounding device.
  - (3) The equipment grounding conductor shall be permitted to be secured under a screw threaded into the fixture canopy other than a mounting screw or cover screw or attached to a listed grounding means (plate) in a non-metallic outlet box for fixture mounting (grounding means shall also be permitted for fixture attachment screws).
- d. **Grounding Connection in a Non-metallic Box.** A connection between the one or more equipment grounding conductors brought into a non-metallic outlet box shall be so arranged that a connection can be made to any fitting or device in that box which requires grounding.
- e. **Grounding Continuity.** Where more than one equipment grounding conductor or branch circuit enters a box, all such conductors shall be in good electrical contact with each other and the arrangement shall be such that the disconnection or removal of a receptacle, fixture, or other device fed from the box will not interfere with or interrupt the grounding continuity.
- f. **Cord-Connected Appliances.** Cord-connected appliances shall be grounded by means of an approved cord with equipment grounding conductor and grounding attachment plug.

**S12. BONDING OF NON-CURRENT-CARRYING METAL PARTS**

- a. **Required Bonding.** All exposed non-current carrying metal parts that may become energized shall be effectively bonded to the grounding terminal or enclosure of the distribution panel board.

- b. Bonding Chassis. A bonding conductor shall be connected between the distribution panel board and an accessible terminal on the chassis. Aluminum or coppered aluminum conductors SHALL NOT be used. Any ambulance that employs a unitized metal chassis-frame construction to which the distribution panel is securely fastened with a bolt and nut shall be considered to be bonded.
- c. Bonding Conductor Requirements. Grounding terminals may be of the solderless type and listed as pressure terminal connectors recognized for the wire size used. The bonding conductor shall be copper strand and equal in amperage capacity to the main supply cables.
- d. Metallic Body and Exterior Bonding. The ambulance body and exterior covering shall be considered bonded where:
  - (1) The metal panels overlap one another and are securely attached to the metal frame parts by metal fasteners or welding and
  - (2) The lower panel of the metal exterior covering is secured by metal fasteners at each cross member of the chassis, or the lower panel is bonded to the chassis by a metal strap.
- e. Metal Air Duct. Metal circulating air ducts shall be bonded.
- f. Compressed Gas Pipe Bonding. The compressed gas pipes shall be considered bonded if they are bonded to the chassis.

S13. APPLIANCE ACCESSIBILITY AND FASTENING. All electrical appliances shall be accessible for inspection, service, repair and replacement without removal of permanent construction. Means shall be provided to securely fasten appliances in place.

- S14. FACTORY ELECTRICAL TESTS. Each ambulance shall be subjected to the following tests:
- a. Dielectric Breakdown Test. The 120-Volt AC electrical system shall withstand the applied potential without breakdown of a 1-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.
  - c. Operational Test. Operational tests are to be performed to demonstrate that all equipment is properly connected and in working order.
  - d. Polarity Test. A polarity test is to be performed to ensure that all electrical connections have been properly made.

## **AMD STANDARD 010**

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### **WATER SPRAY TEST FOR AMBULANCES**

- 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.
- 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, specified in S6.
  - S4.1 There shall be no water leakage into the cab, any exterior compartments, patient compartment, nor through any vent, 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 degrees Fahrenheit (4 degrees Celsius) to 100 degrees Fahrenheit (38 degrees Celsius).
  - S5.3 Air velocity shall be less than 10 miles per hour (16 kilometers per hour).
  - S5.4 Water spray test facility shall similar to Figure 1, capable of maintaining a minimum of 25 to 35 pounds per square inch (1.75 to 2.45 kilograms per square centimeter) water pressure at each nozzle with each water spray nozzle flowing at a minimum rate of approximately 4 gallons per hour (18.9 liters per hour) and producing a fine droplet conical spray over the entire vehicle.
- S6. TEST PROCEDURES.
  - S6.1 All windows and doors should be closed, and ventilation heating and air conditioning systems turned off.
  - S6.2 Commence water spray test and check for water leaks inside the cab and patient compartment for 15 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.

# AMD STANDARD 011

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## AMBULANCE EQUIPMENT TEMPERATURE TEST

- S1. SCOPE AND PURPOSE. This standard establishes requirements for the ambulance and ambulance equipment to operate satisfactorily over a specified ambient temperature range.
- 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 -30 degrees Fahrenheit (-34 degrees Celsius) to 125 degrees Fahrenheit (52 degrees Celsius) 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 0 degrees Fahrenheit (-18 degrees Celsius) to 110 degrees Fahrenheit (43 degrees Celsius).
- S4. TEST CONDITIONS.
- S4.1 Ambulance shall have all patient compartment entry doors, cabinet doors, cab doors and exterior compartment doors open throughout the entire test.
- S4.2 Air velocity of at least 5 miles per hour (8 kilometers per hour) 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 room. Turn off all power. Open all doors to the patient compartment, cabinets, exterior compartments and cab.
- S5.2 Soak at -30 degrees Fahrenheit (-34 degrees Celsius) with an air velocity of at least 5 miles per hour (8 kilometers per hour) for six (6) hours.
- S5.3 Soak at 0 degrees Fahrenheit (-18 degrees Celsius) for one (1) hour.
- S5.4 While maintaining 0 degrees Fahrenheit (-18 degree Celsius), the engine shall be started and all vehicle systems shall be tested and operate properly.
- S5.5 With all doors open and power off, soak ambulance and all components and equipment at 125 degrees Fahrenheit (52 degrees Celsius) for six (6) hours.
- S5.6 Soak ambulance for one (1) hour at 110 degrees Fahrenheit (43 degrees Celsius).
- S5.7 While maintaining 110 degrees Fahrenheit (43 degrees Celsius), all vehicle systems shall then be tested and operate satisfactorily for one (1) hour.

**NOTE:** Vehicle systems include all permanently attached equipment such as oxygen and suction systems.

## AMD STANDARD 012

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### AMBIENT TEMPERATURE TEST

- S1. SCOPE. This standard establishes the ambulance engine starting and the heater/air conditioning performance requirements.
- S2. PURPOSE. The purpose of this standard is to reduce the possibility of the engine failing to start, and/or inadequate heater performance in an ambulance.
- 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 temperature to a minimum of 68 degrees Fahrenheit (24 degrees Celsius) within 30 minutes from 0 degrees Fahrenheit (-18 degrees Celsius). The air conditioner in each compartment shall lower the thermocouple temperatures to a maximum of 78 degrees Fahrenheit (26 degrees Celsius) within 30 minutes from 95 degrees Fahrenheit (35 degrees Celsius) and 30% to 70% relative humidity.
- S5. TEST CONDITIONS.
- S5.1 The Ambulance shall have all patient compartment doors, cabinet doors, cab doors, hood, and exterior compartment doors open throughout S6.4B.
- S5.2 Air velocity of at least 5 mile per hour (8 kilometers per hour) shall be maintained over the vehicle throughout the entire test.
- S6. TEST PROCEDURE.
- S6.1 Place the ambulance in the cold room. Turn off all power. Open all doors and hood.
- S6.2 Place nine (9) thermocouples along the centerline of the patient compartment, equally spaced longitudinally from the back of the primary patient EMT seat to the rear doors and with three (3) thermocouples seven (7) inches (18 centimeters) above the floor, three (3) thermocouples seven (7) inches (18 centimeters) below the ceiling and three (3) thermocouples located midway between the floor and ceiling. Thermocouples should be located so they are not directly under any domelight.
- S6.3 Place three (3) thermocouples in the cab, located to give representative temperatures.
- S6.4 Cool the ambulance by one of the following procedures:
- A. Cool to -30 degrees Fahrenheit (-34 degrees Celsius) with an air velocity of at least 5 miles per hour (8 kilometers per hour) for three (3) hours) then soak at 0 degrees Fahrenheit (-18 degrees Celsius) for one (1) hour while maintaining air temperature.
  - B. Cool to 0 degrees Fahrenheit (-18 degrees Celsius) with an air velocity of at least 5 miles per hour (8 kilometers per hour) for three (3) hours.
- S6.5 Close all doors, hood, partition door (if present) and patient compartment/cab partition window (if present).
- S6.6 Set heaters in cab and patient compartments to maximum heating setting (maximum temperature; maximum blower speed; recirculating air).

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S6.7 Perform the heater test as follows:

- A. Start engine and maintain transmission in neutral or park and engine high idle on.
- B. Patient compartment dome lights should be off.
- C. Record the thermocouple temperatures at the start of the test; after 10 minutes; and after 20 minutes.

S6.8 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 degrees Fahrenheit (35 degrees Celsius) with a relative humidity of 30% to 70% and an air velocity of at least 5 miles per hour (8 kilometers per hour) for three (3) hours.

S6.10 Close all doors, hood, partition door (if present), and patient compartment/cab partition window (if present).

S6.11 Reduce room air velocity to less than 3 miles per hour (4.8 kilometers per hour).

S6.12 Set air conditioners in cab and patient compartment to maximum cooling setting (maximum blower speed; coldest temperature setting; recirculating air).

S6.13 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.
- B. Record the thermocouple temperature at the start of the test; after 10 minutes; and after 20 minutes.

## **AMD STANDARD 013**

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### **WEIGHT DISTRIBUTION**

- S1. SCOPE. This standard establishes ambulance curb weight distribution.
- S2. PURPOSE. The purpose of this standard is to assure vehicle weight is proportionally distributed to each wheel.
- S3. APPLICABILITY. This standard applies to all ambulances.
- S4. REQUIREMENTS. The weight on any given axle shall be the same from side to side within 5% when tested per S5.
- S5. TEST PROCEDURES.
  - S5.1 With the ambulance at curb weight and on level ground, find the curb weight on each wheel.
  - S5.2 Divide the curb weight on the left front wheel by the sum of the curb 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.
  - S5.3 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.
  - S5.4 Use the procedures outlined in S5.2 and S5.3 to determine the weight distribution on the rear axle.

## **AMD STANDARD 014**

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### **COOLING SYSTEM TEST**

- S1. SCOPE. This standard establishes performance requirements for 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.
- 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; recirculating air), engine on high idle, and an ambient temperature of 95 degrees Fahrenheit (35 degrees Celsius), the cooling system should maintain the engine at a safe operating temperature for one (1) hour.
- 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 degrees Fahrenheit (38 degrees Celsius) with a relative humidity of 30% to 70% and an air velocity of at least 5 miles per hour (8 kilometers per hour) for three (3) 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 miles per hour (4.8 kilometers per hour).
  - S5.5 Set air conditioners in cab and patient compartment to maximum cooling setting (maximum blower speed; coldest temperature setting; recirculating air).
  - S5.6 With all other ambulance equipment off, operate the engine at high idle for one (1) hour.

# AMD STANDARD 015

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## AMBULANCE MAIN OXYGEN SYSTEM TEST

- S1. SCOPE. This standard establishes the main oxygen system sealing integrity for ambulances.
- S2. PURPOSE. The purpose of this standard is to reduce the possibility of a severe oxygen leak that could cause a fire.
- S3. APPLICABILITY. This standard applies to all ambulances.
- S4. REQUIREMENTS. When subjected to a proof pressure of 150 pounds per square inch (10.5 kilograms per square centimeter), the oxygen system for each ambulance shall retain a pressure of at least 145 psi (10.15 kg/sqcm) for four (4) hours.
- S5. 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 150 psi (10.5 kg/sqcm) of dry air or 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 and 4 hours.
- S5.7 Required test results.
- A. Pressure a gauge "A" at 0 psi.
  - B. Pressure at gauge "B" at 145 psi minimum.
- S5.8 At the completion of a satisfactory test, the oxygen line shall be sealed and the certification label attached.
- S6. CERTIFICATION.
- S6.1 The initial temperature and system pressure, final temperature and pressure, date, and test operator's signature shall be recorded on the certification label (S6.2) 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.
- S6.2 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.
- |                                    |  |
|------------------------------------|--|
| <b>Initial Conditions:</b>         | <b>Final Conditions:</b>               |
| Pressure: _____psi (_____kg/sq cm) | Pressure: _____psi (_____kg/sq cm)     |
|                                    | Pressure Loss: _____psi (_____g/sq cm) |
- Maximum Allowable Pressure Loss: 5psi (351 g/sqcm)
- Signature of operator performing test: \_\_\_\_\_
- Date of test: \_\_\_\_\_

# AMD STANDARD 002

## FIGURE 1

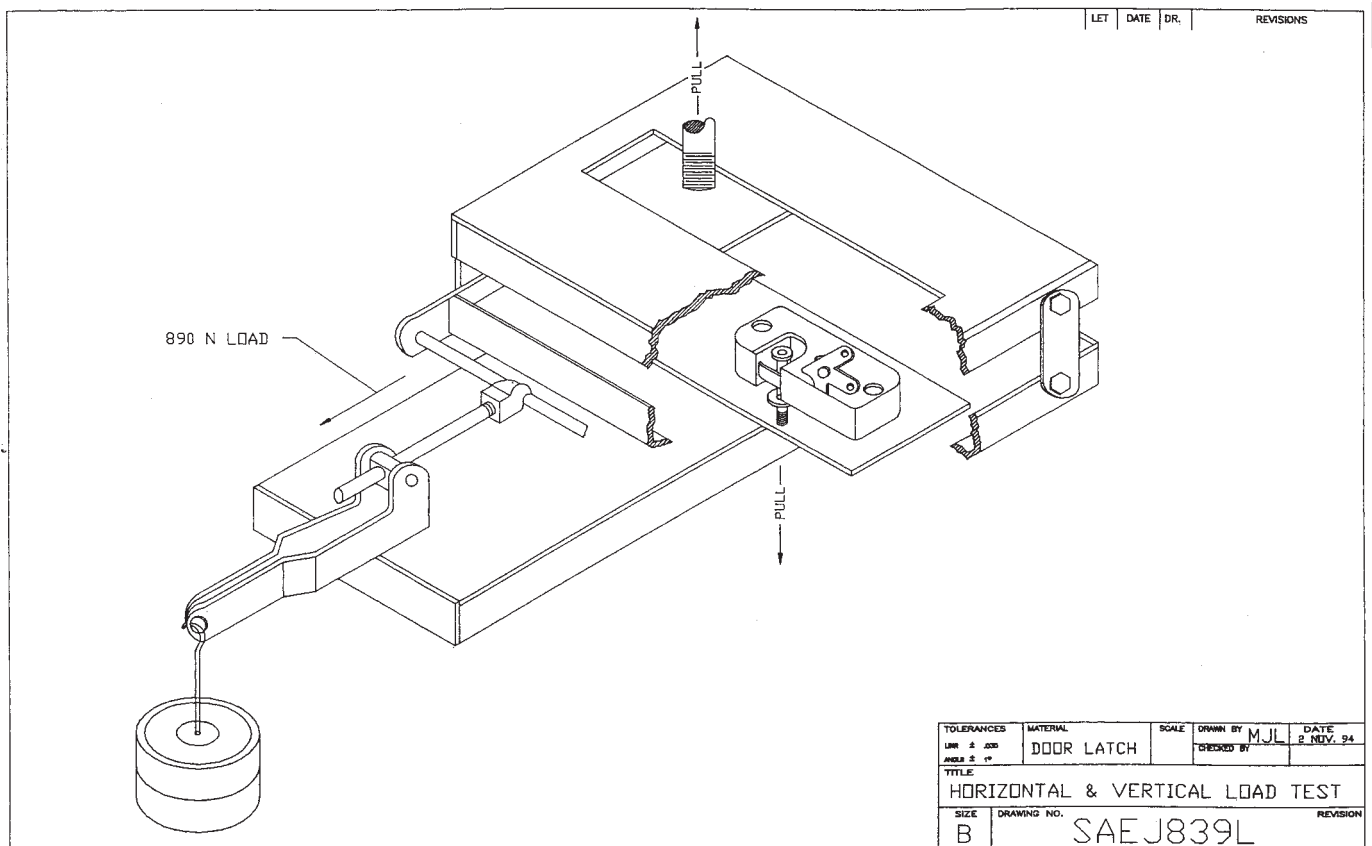
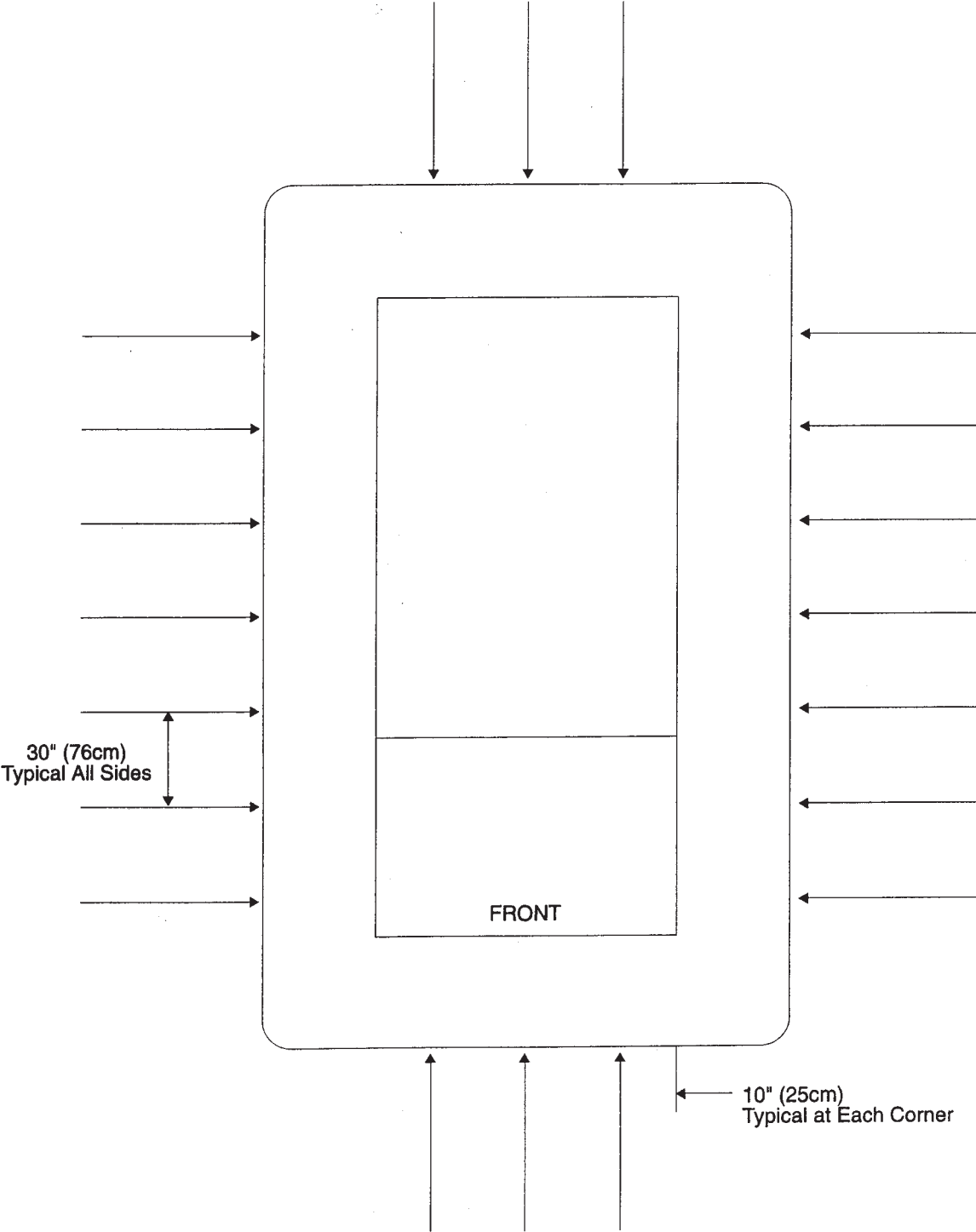
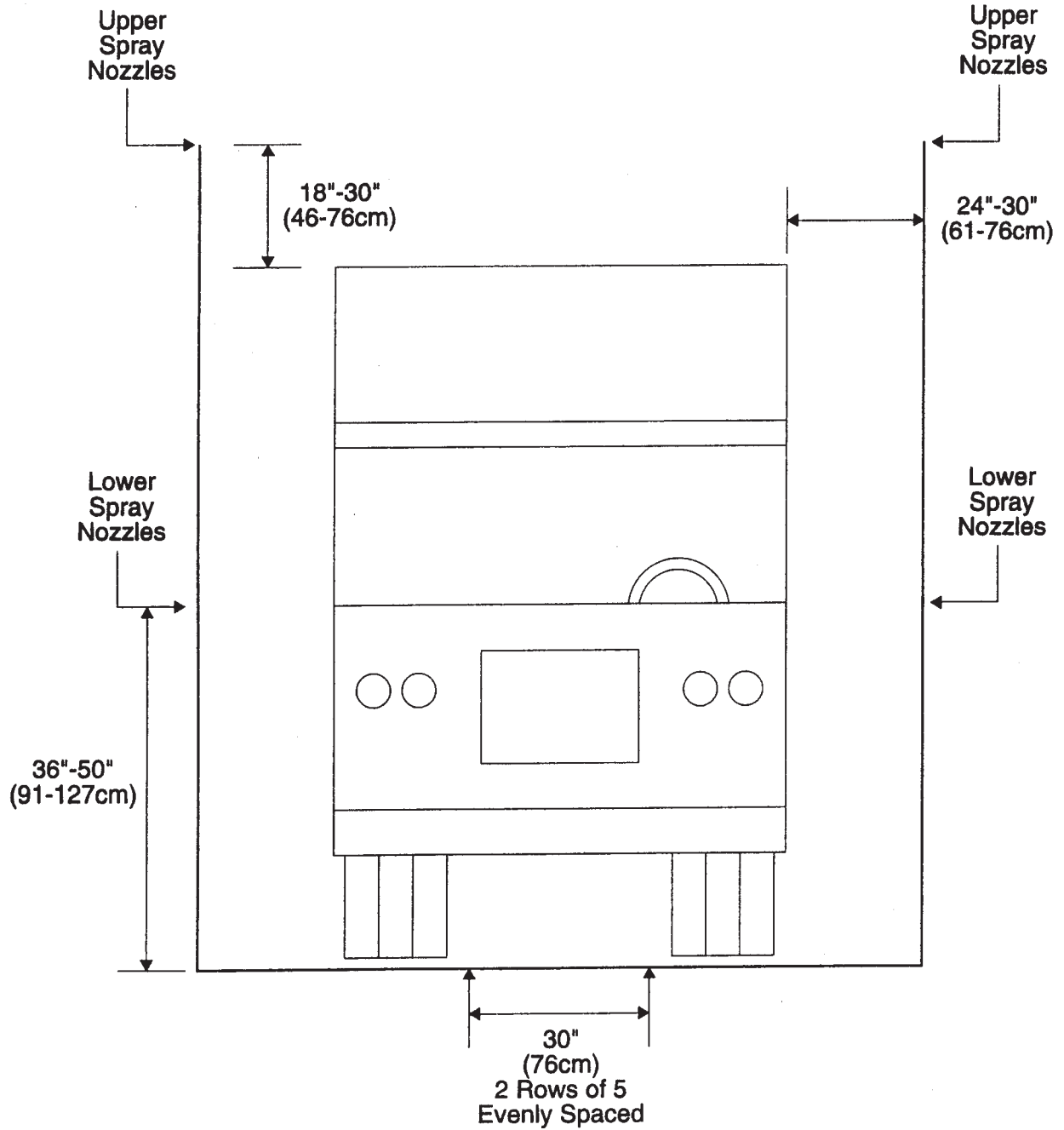


FIGURE 1

TOP VIEW  
Upper & Lower Spray Nozzles



# END VIEW Spray Nozzles



**AMD STANDARD 015**

**FIGURE 1**

