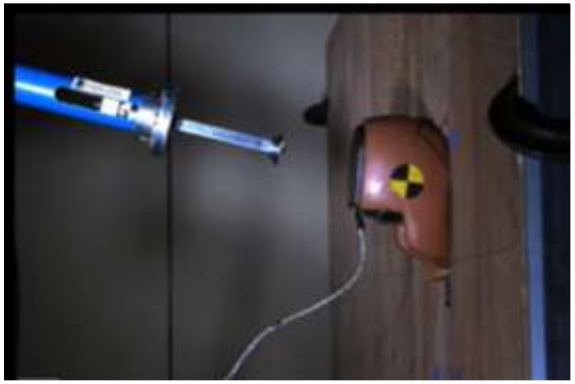
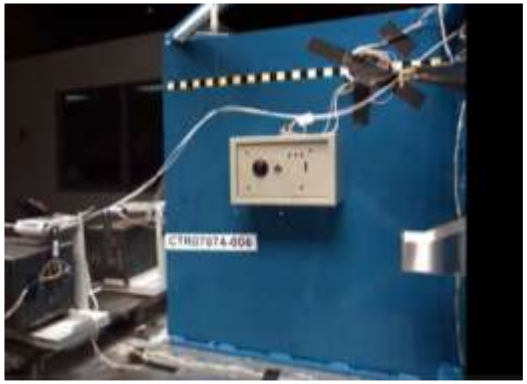
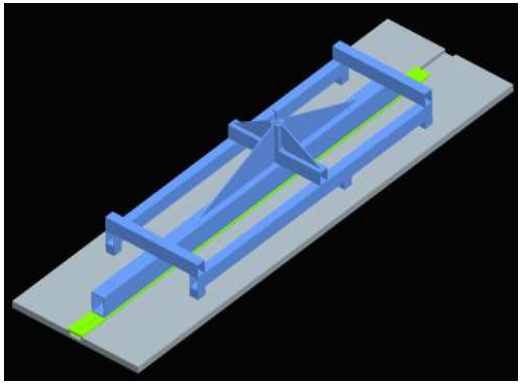
SAE Recommended Practices: NIOSH-AMD Committee Updates



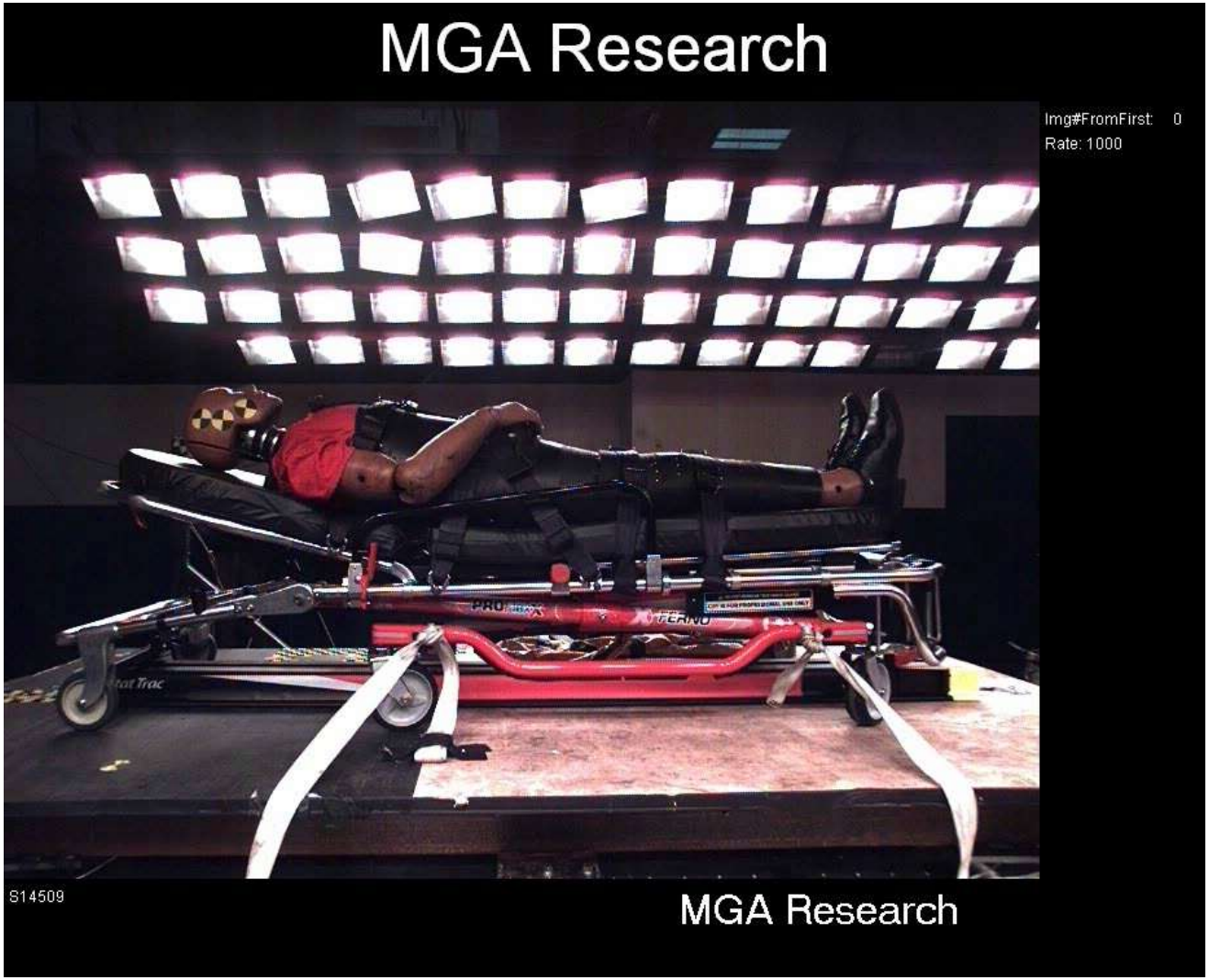
Presented by: Jim Green, NIOSH, Safety Engineer
New England Council for EMS, Newport, RI
November 23, 2015

Crash Testing – External Views

Frontal Crash Test – Interior View

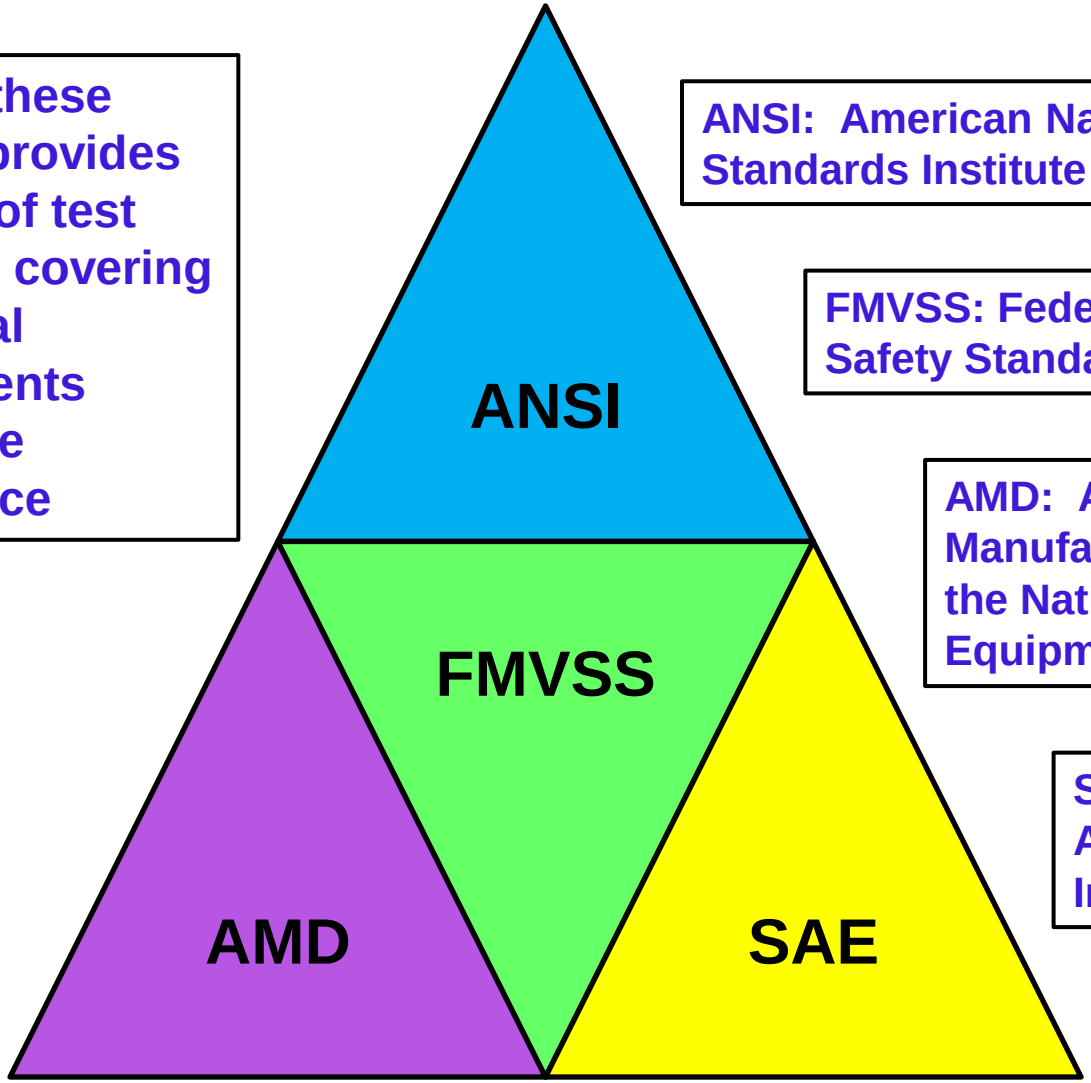
Interior View – Patient Cot

Interior View – Improved Patient Cot



GSA, NFPA, CAAS, AMD, SAE, FMVSS, & ANSI : What do they all mean?

Each of these entities provides a family of test methods covering individual components within the ambulance



ANSI: American National Standards Institute

FMVSS: Federal Motor Vehicle Safety Standards

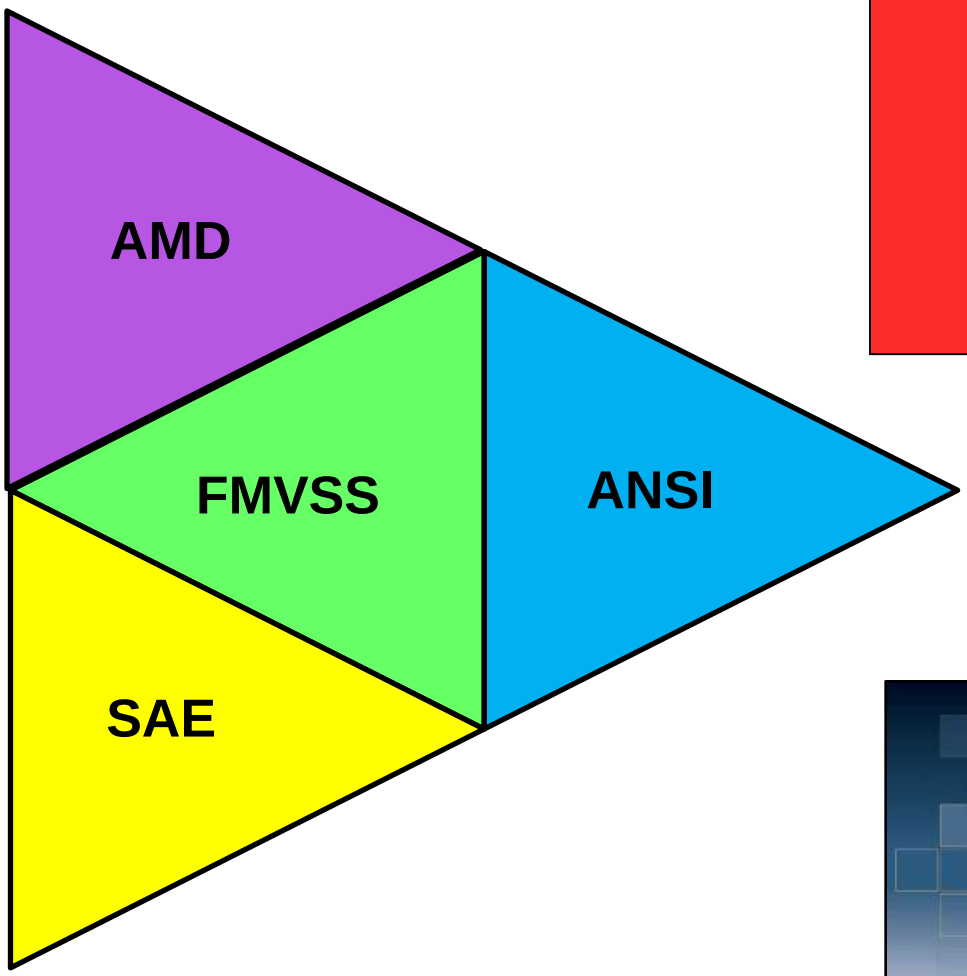
AMD: Ambulance Manufacturers Division of the National Truck Equipment Association

SAE: Society of Automotive Engineers International

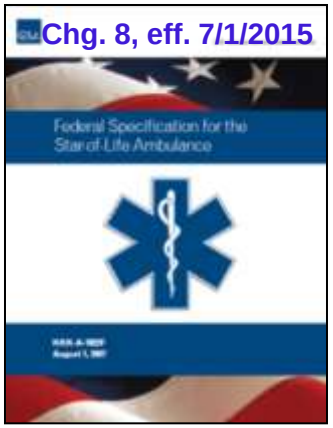
CDC

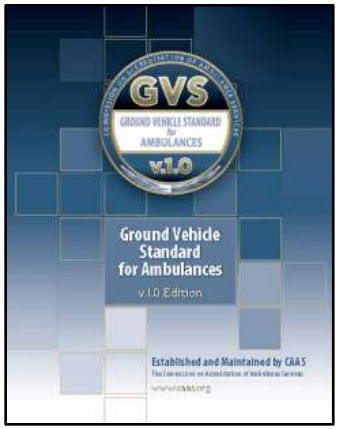
NIOSH

Specs and Standards Today



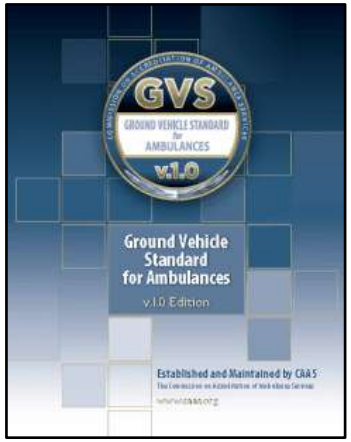
NFPA 1917 Standard for Automotive Ambulances Effective 2015 2nd Edition





Specs and Standards Tomorrow

NFPA 1917
Standard for
Automotive
Ambulances
Effective 2015
2nd Edition



Society of Automotive Engineers (SAE)

New Recommended Practices

(Test Methods)

Developed Under Industry – Government Partnership

SAE Documents Referenced So Far

Document	Document Name	GSA 1822	NFPA 1917	CAAS GVS 2016
SAE J3027	Patient Litter	Yes	Yes	Yes
SAE J3026	Seating and Restraints	Yes	Yes	Yes
SAE J2917	Frontal Crash Pulse	Yes	Yes	Yes
SAE J2956	Side Impact Crash Pulse	Yes	Yes	Yes
SAE J3043	Equipment Mount Test	No	Yes	Partially

Equipment Mounting: Static and Dynamic Test Options

SAE J3043 Published in July 2014

SAE INTERNATIONAL

SURFACE VEHICLE RECOMMENDED PRACTICE

J3043 JUL2014

Issued 2014-07

Ambulance Equipment Mount Device or Systems

RATIONALE

This SAE Recommended Practice was developed by members of the SAE Truck Crashworthiness Committee in support of the ambulance industry's need to apply science to the design and testing of the equipment mount devices or systems used in the ambulance patient compartment. The Recommended Practice was validated collaboratively by industry and government partners through extensive testing funded and managed by the National Institute for Occupational Safety and Health, the Department of Homeland Security and the Ambulance Manufacturers Division of the NTEA. Input loading for the dynamic testing was generated using the vehicle specific crash pulses described in SAE J2917 and SAE J2956, respectively. An independent analysis of the testing methodology and resulting data was performed by government and private members of the automotive testing community.

1. SCOPE

This SAE Recommended Practice describes the dynamic and static testing procedures required to evaluate the integrity of an equipment mount device or system when exposed to a frontal or side impact (i.e., a crash impact). Its purpose is to provide equipment manufacturers, ambulance builders, and end-users with testing procedures and, where appropriate, acceptance criteria that, to a great extent, ensure equipment mount devices or systems meet the same performance criteria across the industry. Prospective equipment mount manufacturers or vendors have the option of performing either dynamic testing or static testing. Descriptions of the test set-up, test instrumentation, photographic/video coverage, test fixture, and performance metrics are included.

2. REFERENCES

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1 Applicable Documents

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-606-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

SAE J211-1 Instrumentation for Impact Test - Part 1: Electronic Instrumentation

SAE J211-2 Instrumentation for Impact Test - Part 2: Photographic Instrumentation

SAE J2917 Occupant Restraint and Equipment Mounting Integrity - Frontal Impact System-Level Ambulance Patient Compartment

SAE J2956 Occupant Restraint and Equipment Mounting Integrity - Side Impact System-Level Ambulance Patient Compartment

SAE values your input. To provide feedback on this Technical Report, please visit

Key Elements in Recommended Practice

- Goal is to key equipment attached to vehicle throughout crash
- Dynamic testing based on published pulses is an option
- Static test in lieu of dynamic test is also an option
- Innovative conversion from dynamic to static test loading offered

Outreach – Improving Awareness of SAE J3043

Frequently Asked Questions

Question: "How do the new Equipment Mount Testing requirements described in SAE J3043 impact me?"

Answer: If SAE J3043 becomes a part of a state regulation, the seller will be responsible for certifying the product or products he/she sells have been tested and do, in fact, meet the criteria provided in SAE J3043*. As a seller or manufacturer, you should expect a buyer to ask you for your certification.

Question: "What must be tested?"

Answer: If changes to NFPA 1917 and CAAS GVS are adopted by individual states as drafted, **each will require any device or equipment that weighs 3 pounds or greater to be in a tested and certified mount.** The goal is prevent loose equipment from becoming a hazardous flying object during a crash or hard breaking event. To date, the GSA has not set a weight limit on those items that must be mounted and certified.

Question: "What types of equipment and or equipment mounts would require testing?"

Answer: If individual states adopt SAE J3043 as drafted, all devices and equipment used in the patient compartment that are not stowed in a cabinet or drawer in transit and exceed the weight threshold established by the applicable national standard (NFPA, CAAS, or GSA) require testing. These include, but are not limited to: heart monitor/ AED, fire extinguishers, portable oxygen cylinders, suction units, laptops, bariatric winches, narcotics safes, and hard or soft shelled portable supply bags.

Question: "Who certifies that a mounting system has passed SAE J3043?"

Answer: Per SAE J3043, the manufacturer or seller is responsible for certifying that his/her products have successfully met the testing requirements. Manufacturers or sellers may use third party testing facilities to provide this certification.

Question: "What kind of testing is required?"

Answer: SAE J3043 allows a manufacturer to test his/ her product(s) using either a static pull test or a dynamic, simulated crash test. Loading is based upon the weight of the object to be mounted and the intended mount's orientation in the ambulance. Details are provided in SAE J3043 Ambulance Equipment Mount Device or Systems.

*** The decision to adopt SAE J3027 is the sole purview of each individual state through its own unique regulatory processes.**

Adoption of SAE J3043

How Can the New England Council Members Help?

- Provide me with your contact information and I will send you an electronic version of FAQ handout
- Email any comments to JGreen@CDC.GOV
- Distribute the FAQ one page enclosure to EMS providers within your state
- Make a decision to adopt a bumper-to-bumper standard that includes SAE J3043

Summary – Pending SAE Documents

Document	Document Name	Status
SAE J3059	Occupant Excursion	With SAE for review
SAE JXXXX	Interior Surface Softening	June 2016
SAE J3058	Cabinet Testing	Testing Completed: meeting 10/14
SAE J3057	Modular Body Test	Testing Completed: meeting 10/14
SAE J3102	Floor Sub-Structure Test	Testing Completed: meeting 11/20

Mapping Occupant Excursion

SAE J3059: Submitted to SAE for Review & Approval

SAE International	SURFACE VEHICLE RECOMMENDED PRACTICE	~~SAE~~J3059 PropDft Aug 28, 2014
		Issued Date (OrigDate)

Ambulance Patient Compartment Seated Occupant Excursion Zone Evaluation

RATIONALE

This SAE Recommended Practice was developed by members of the SAE Truck Crashworthiness Committee in support of the ambulance industry's need to apply science to the design and testing of the occupant seating and occupant restraint systems for workers and civilians transported in the patient compartment of an ambulance. The Recommended Practice was validated collaborstively by industry and government partners through extensive testing funded by the National Institute for Occupational Safety and Health, the Department of Homeland Security and the Ambulance Manufacturers Division of the NTEA. Input loading was generated using the vehicle specific crash pulses described in SAE J2917 and SAE J2956, respectively. An independent analysis of the testing methodology and resulting data was performed by government and private members of the automotive testing community.

1. SCOPE

This SAE Recommended Practice describes the testing and reporting procedures that may be used to evaluate and document the excursion of a worker or civilian when transported in a seated and restrained position in the patient compartment of a ground ambulance when exposed to a frontal or side impact. Its purpose is to provide seating and occupant restraint manufacturers, ambulance builders, and end-users with testing procedures and documentation methods needed to identify ~~potential head impact locations and/or~~ head travel paths in crash loading events. This is a component level test. The seating system is tested in free space to measure maximum head travel paths. The purpose is not to develop stay out zones. Rather, the goal is to provide ambulance manufacturers with the data needed to design safer and functionally sound work stations for Emergency Medical Service workers so that workers are better able to safely perform patient care tasks in a moving ambulance. Descriptions of the test set-up, test instrumentation, photographic/video coverage, text fixture, and reporting requirements are included.

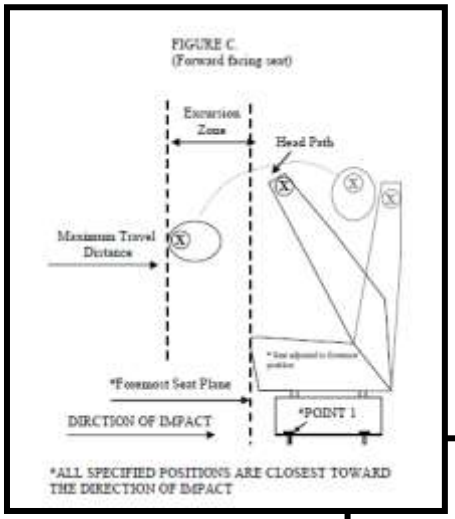
2. REFERENCES

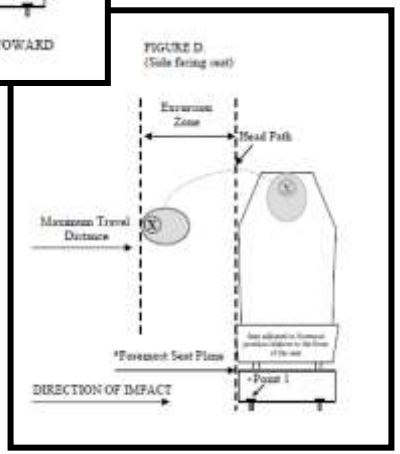
The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1 Applicable Publications

Available from SAE International, 400 Commonwealth Drive, Warrendale, PA 15096-0001, Tel: 877-806-7323 (inside USA and Canada) or 724-776-4970 (outside USA), www.sae.org.

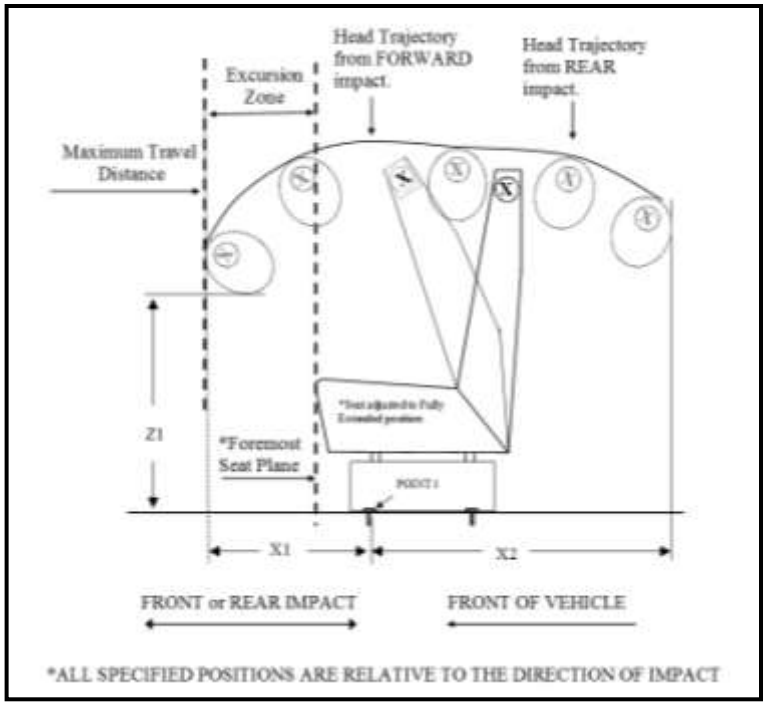
SAE J211-1 Instrumentation for Impact Test—Part 1: Electronic Instrumentation

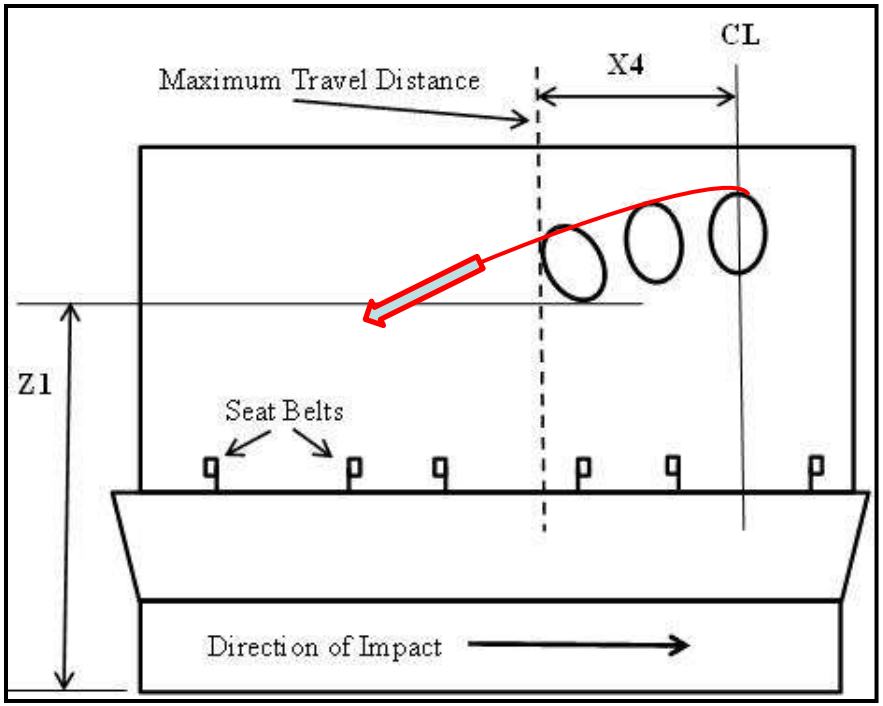




Sample: Head Excursion into Cabinet

Seating and Restraint Excursion Data



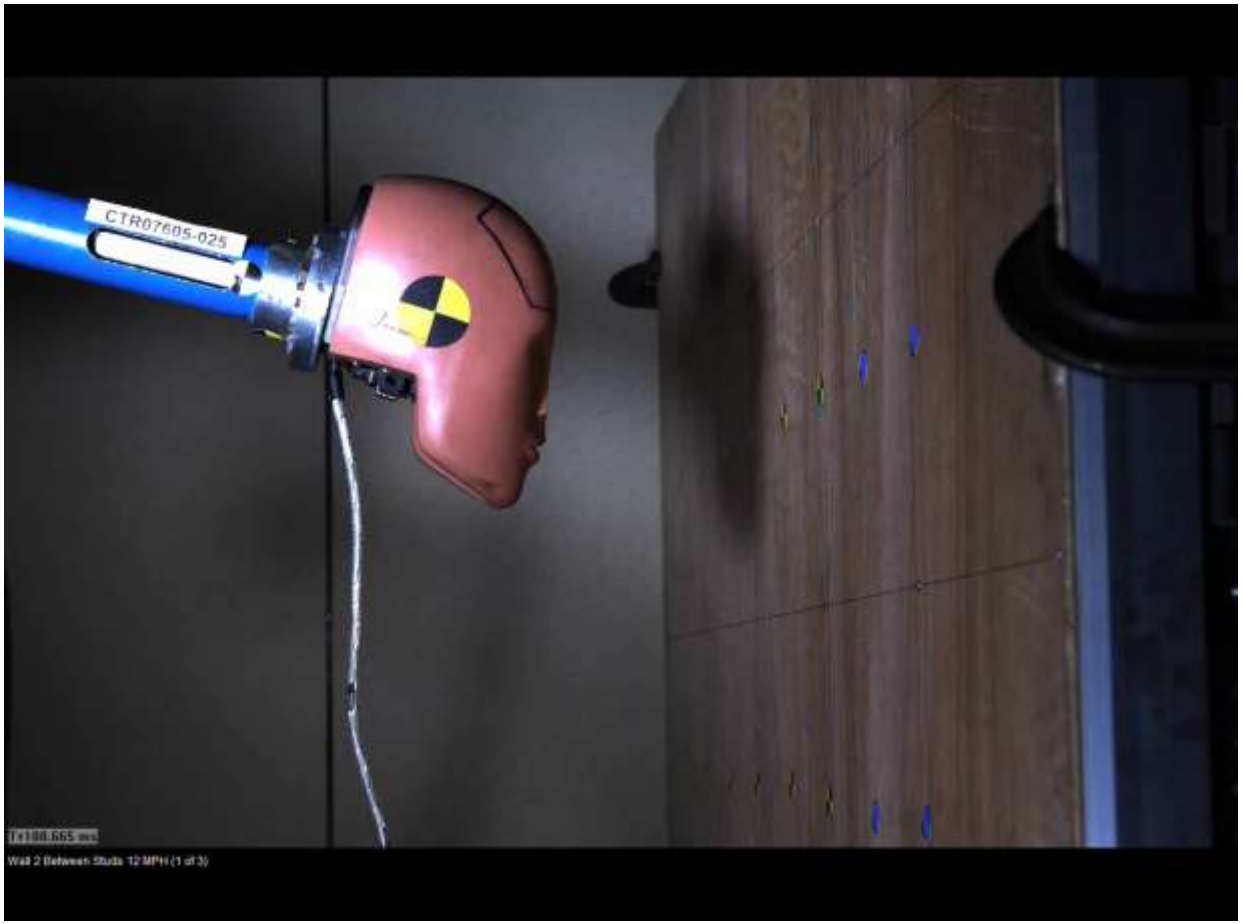


Mapping excursion goes hand-in-hand with the goals of the Ambulance Design Guidebook

Informational Document Development

Interior Surface Softening

Interior Surface Delethalization: Patient to Overhead Cabinet Contact



Initial Data Review – Why is construction important?

Head Injury Criteria (HIC 36) Values with FMVSS limit of 1000:: 0.25" Thick Composite wall over 2" x 2" x 0.125 " Aluminum Studs						
	On Stud	Btw Studs	On Stud	Btw Studs	On Stud	Btw Studs
	15 MPH		18 MPH		21 MPH	
Unprotected	934	364	1714	680	2590	1025
Standard Foam	536	185	824	403	1410	557
Impaxx 300 30 mm	300	208	547	434	729	568
Impaxx 300 40 mm	355	165	475	314	577	558
Impaxx 500 40 mm	420	166	595	353	941	338

Cabinet Dynamic Testing – SAE J3058

SAE J3058: Ready for AMD Member Review in Fall 2015

SAE INTERNATIONAL

SURFACE VEHICLE RECOMMENDED PRACTICE	J3058	Prop/Dft Feb2015
	Issued xxxx-xx Revised xxxx-xx Reaffirmed xxxx-xx Superseded xxxx-xx Cancelled xxxx-xx Superseding Jxxxxx Date	
Ambulance Interior Storage Compartment Integrity		

RATIONALE

This SAE Recommended Practice was developed by members of the SAE Truck Crashworthiness Committee in support of the ambulance industry's need to apply science to the design and testing of the equipment mount devices or systems used in the ambulance patient compartment. The Recommended Practice was validated collaboratively by industry and government partners through extensive testing funded and managed by the National Institute for Occupational Safety and Health, the Department of Homeland Security and the Ambulance Manufacturers Division of the NTEA. Input loading for the dynamic testing was generated using the vehicle specific crash pulses described in SAE J2917 and SAE J2956, respectively. An independent analysis of the testing methodology and resulting data was performed by government and private members of the automotive testing community.

1. SCOPE

This SAE Recommended Practice describes the dynamic and static testing procedures required to evaluate the integrity of an equipment mount device or system when exposed to a frontal or side impact (i.e. a crash impact). Its purpose is to provide equipment manufacturers, ambulance builders, and end-users with testing procedures and, where appropriate, acceptance criteria that, to a great extent, ensure equipment mount devices or systems meet the same performance criteria across the industry. Prospective equipment mount manufacturers or vendors have the option of performing either dynamic testing or static testing. Descriptions of the test set-up, test instrumentation, photographic/video coverage, test fixture, and performance metrics are included.

2. REFERENCES

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SAE J211-1 Instrumentation for Impact Test—Part 1: Electronic Instrumentation

SAE J211-2 Instrumentation for Impact Test—Part 2: Photographic Instrumentation

SAE J2917 Occupant Restraint and Equipment Mounting Integrity – Frontal Impact System-Level Ambulance Patient Compartment

SAE values your input. To provide feedback on this Technical Report, please visit

Basic Testing Parameters

Manufacturer to determine cabinet loading capacity

- **Utilized both front and side impact pulses**
- **Weights placed 4 inches from each door face**
- **Have now tested more than 30 cabinets from 9 manufacturers**
- **Weights were directed at door surfaces and cabinets ends**

CDC

NIOSH

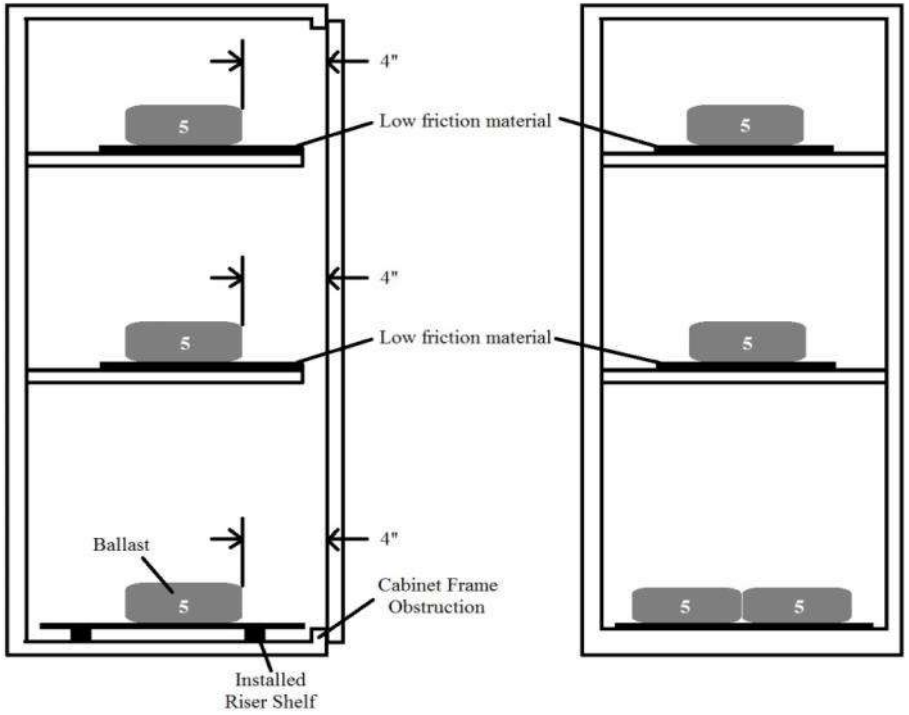
Cabinet Contents Can Be A Hazard Too!

Post crash (rollover) equipment and gurney positions drastically changed

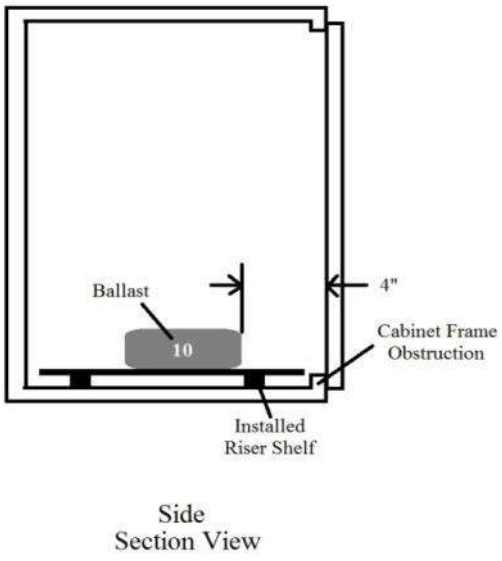
CDC

NIOSH

Cabinet Dynamic Testing: 4” behind door face

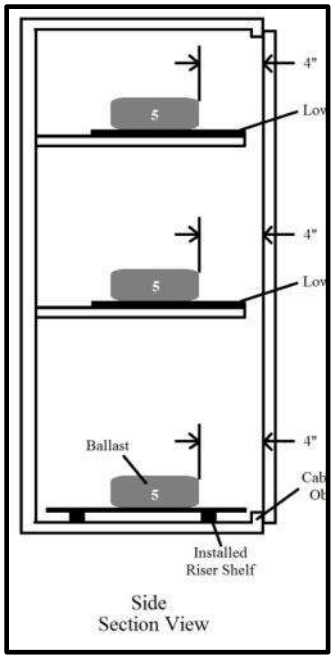


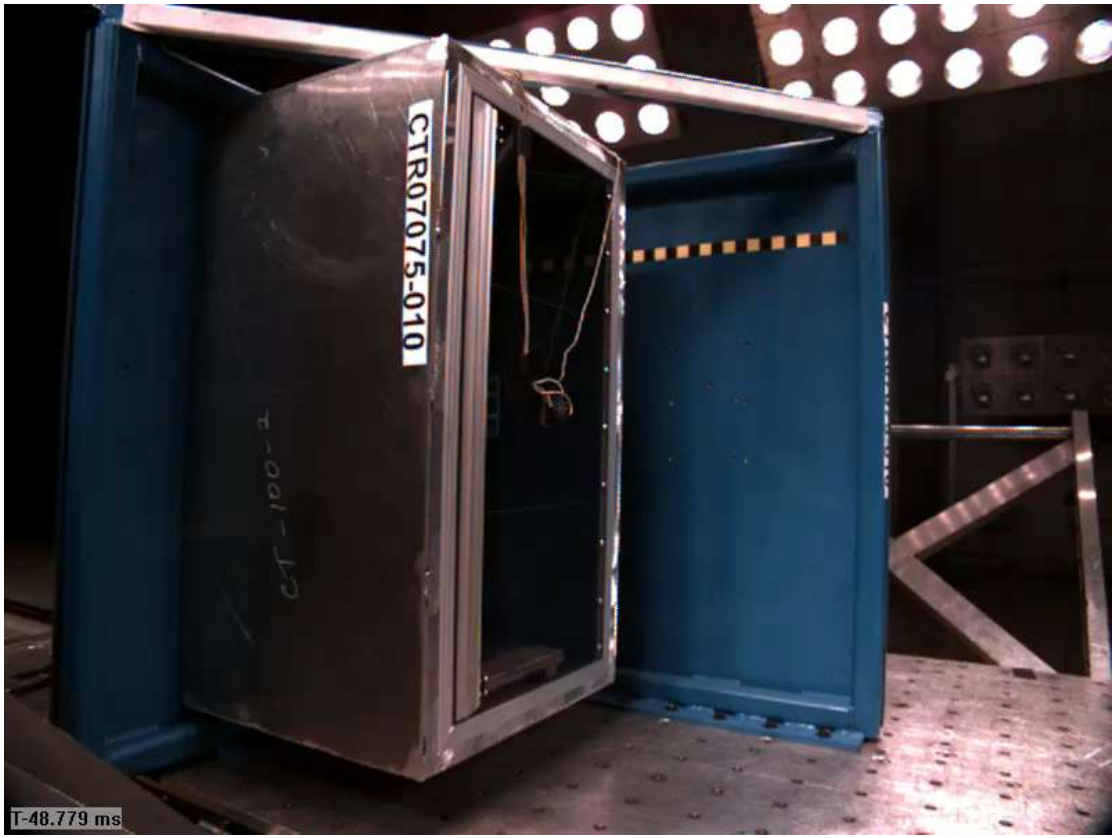
Multiple Shelf Cabinet



Single Cabinet

Cabinet Dynamic Testing
Aluminum Cabinet 20 lbs. of Shot Bags



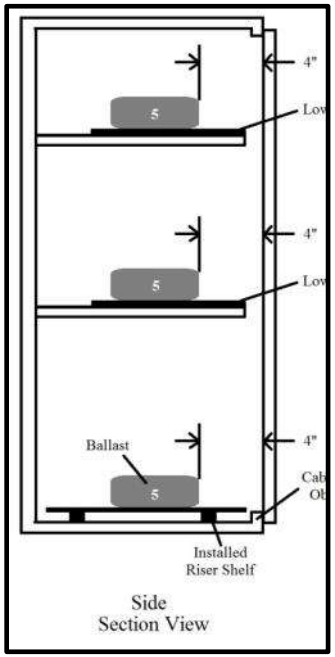


PULSE

SAE J2917

Compartment	Top Shelf	Mid Shelf	Bottom Shelf
Test Weight	5 lbs.	5 lbs.	10 lbs.

Cabinet Dynamic Testing: Upgraded Cabinet 20 lbs. of Shot Bags



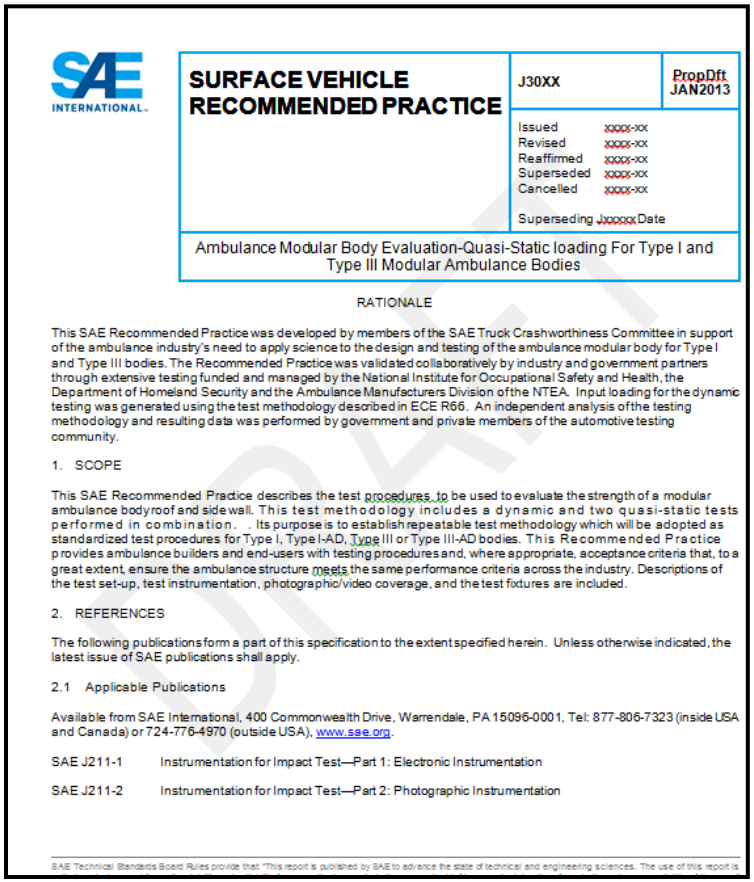
PULSE

SAE J2917

Compartment	Top Shelf	Mid Shelf	Bottom Shelf
Test Weight	5 lbs.	5 lbs.	10 lbs.

Modular Body Structural Integrity: Test Methodology

SAE J3057: Ready for AMD Member Review in Fall 2015



SAE INTERNATIONAL

SURFACE VEHICLE RECOMMENDED PRACTICE

J30XX

PropDft JAN2013

Issued xxxx-xx
Revised xxxx-xx
Reaffirmed xxxx-xx
Superseded xxxx-xx
Cancelled xxxx-xx

Superseding Jxxxxx Date

Ambulance Modular Body Evaluation-Quasi-Static loading For Type I and Type III Modular Ambulance Bodies

RATIONALE

This SAE Recommended Practice was developed by members of the SAE Truck Crashworthiness Committee in support of the ambulance industry's need to apply science to the design and testing of the ambulance modular body for Type I and Type III bodies. The Recommended Practice was validated collaboratively by industry and government partners through extensive testing funded and managed by the National Institute for Occupational Safety and Health, the Department of Homeland Security and the Ambulance Manufacturers Division of the NTEA. Input loading for the dynamic testing was generated using the test methodology described in ECE R66. An independent analysis of the testing methodology and resulting data was performed by government and private members of the automotive testing community.

1. SCOPE

This SAE Recommended Practice describes the test procedures to be used to evaluate the strength of a modular ambulance body roof and sidewall. This test methodology includes a dynamic and two quasi-static tests performed in combination. . Its purpose is to establish repeatable test methodology which will be adopted as standardized test procedures for Type I, Type I-AD, Type III or Type III-AD bodies. This Recommended Practice provides ambulance builders and end-users with testing procedures and, where appropriate, acceptance criteria that, to a great extent, ensure the ambulance structure meets the same performance criteria across the industry. Descriptions of the test set-up, test instrumentation, photographic/video coverage, and the test fixtures are included.

2. REFERENCES

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

2.1 Applicable Publications

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SAE J211-1 Instrumentation for Impact Test—Part 1: Electronic Instrumentation

SAE J211-2 Instrumentation for Impact Test—Part 2: Photographic Instrumentation

SAE Technical Standards Board Rules provide that: "This report is published by SAE to advance the state of technical and engineering sciences. The use of this report is

Key Elements in 2 Phase Recommended Practice

- **Phase 1 is a dynamic test where patient compartment is impacted by 28,000 ft-lbf**
- **Phase 2 is a quasi-static test evaluating side wall and roof strength by loading damaged body at 2.5 x curb weight**
- **Doors must open after each test**

Patient Compartment Integrity – SAE J3057
Phase 1: Slowed Video Clip

Cart weight 14,170 lbs. with Impact Velocity of 7.69 mph

Phases 2 and 3:
Quasi-Static Load on Side and Roof

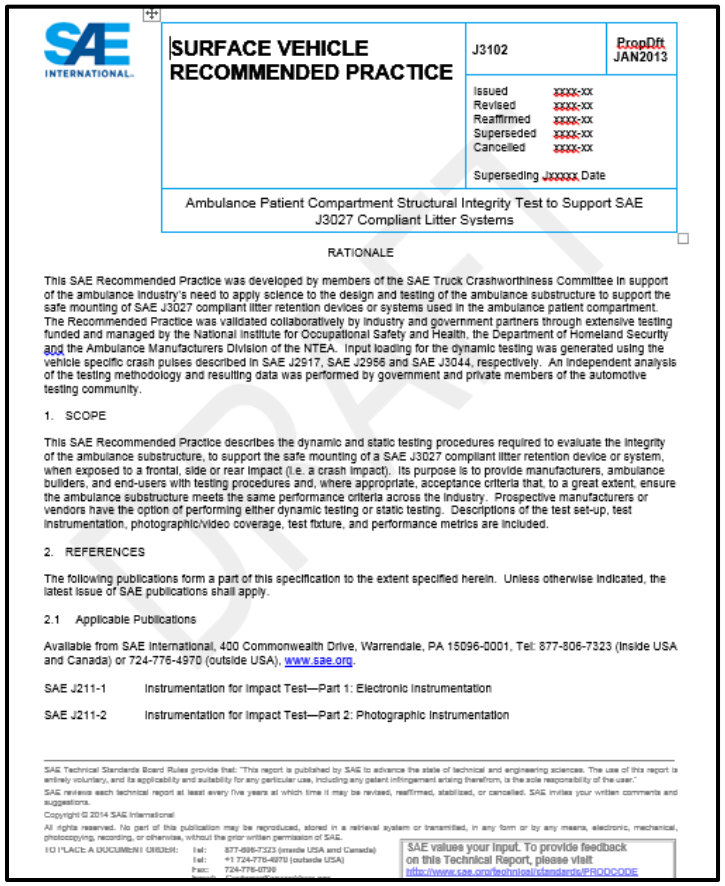
Applied Load Equals 2.5 times GVWR first on one side then vehicle rolled and load applied to roof again all using the same previously impacted modular body

CDC

NIOSH

Sub-Floor Structural Integrity: Test Methodology

SAE J3102: Ready for AMD Member Review in Fall 2015



SAE INTERNATIONAL

SURFACE VEHICLE RECOMMENDED PRACTICE

J3102

PropDft JAN2013

Issued xxxx-xx
Revised xxxx-xx
Reaffirmed xxxx-xx
Superseded xxxx-xx
Cancelled xxxx-xx

Superseding Jxxxxx Date

Ambulance Patient Compartment Structural Integrity Test to Support SAE J3027 Compliant Litter Systems

RATIONALE

This SAE Recommended Practice was developed by members of the SAE Truck Crashworthiness Committee in support of the ambulance industry's need to apply science to the design and testing of the ambulance substructure to support the safe mounting of SAE J3027 compliant litter retention devices or systems used in the ambulance patient compartment. The Recommended Practice was validated collaboratively by industry and government partners through extensive testing funded and managed by the National Institute for Occupational Safety and Health, the Department of Homeland Security and the Ambulance Manufacturers Division of the NTEA. Input loading for the dynamic testing was generated using the vehicle specific crash pulses described in SAE J2917, SAE J2956 and SAE J3044, respectively. An independent analysis of the testing methodology and resulting data was performed by government and private members of the automotive testing community.

1. SCOPE

This SAE Recommended Practice describes the dynamic and static testing procedures required to evaluate the integrity of the ambulance substructure, to support the safe mounting of a SAE J3027 compliant litter retention device or system, when exposed to a frontal, side or rear impact (i.e. a crash impact). Its purpose is to provide manufacturers, ambulance builders, and end-users with testing procedures and, where appropriate, acceptance criteria that, to a great extent, ensure the ambulance substructure meets the same performance criteria across the industry. Prospective manufacturers or vendors have the option of performing either dynamic testing or static testing. Descriptions of the test set-up, test instrumentation, photographic/video coverage, test fixture, and performance metrics are included.

2. REFERENCES

The following publications form a part of this specification to the extent specified herein. Unless otherwise indicated, the latest issue of SAE publications shall apply.

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SAE J211-1 Instrumentation for Impact Test—Part 1: Electronic Instrumentation

SAE J211-2 Instrumentation for Impact Test—Part 2: Photographic Instrumentation

TO PLACE A DOCUMENT ORDER: Tel: 877-606-7323 (inside USA and Canada)
Tel: +1 724-776-4970 (outside USA)
Fax: 724-776-0790

SAE values your input. To provide feedback on this Technical Report, please visit http://www.sae.org/technical/standards/PRODCODE

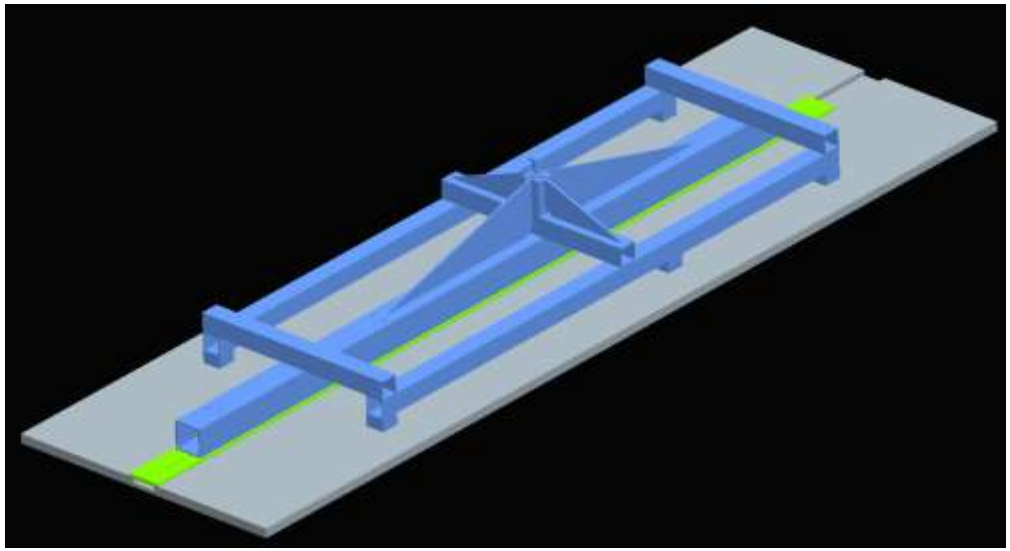
Key Elements in this Recommended Practice

- Testing can be completed statically or dynamically
- Testing must be completed for front, side, and rear loading
- Validates design for both modular body and van style bodies

CDC

NIOSH

Sub-Floor Structural Integrity – SAE J3102



- A rigid test device was used to pass loading into floor sub structure
- Loading in the frontal plane exceeded 18,000 lbs.
- Current AMD 004 Standard only requires 2,200 lb. pull

Contact Information

Jim Green

NIOSH

304-285-5857

jgreen@cdc.gov

Disclaimer: *The findings and conclusions in this presentation have not been formally disseminated by the National Institute for Occupational Safety and Health and should not be construed to represent any agency determination or policy.*