

# Ground Vehicle Standards Newsletter

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**SAE**International®

Creating harmonized standards solutions. Moving the on- and off-road vehicle industry forward.

## SAE International publishes standards for emergency personnel responding to hybrid, electric vehicle accidents

SAE International's **Hybrid-EV Technical Committee** has completed the technical standard "J2990: Hybrid and EV First and Second Responder Recommended Practice," which offers recommended practices for emergency personnel responding to incidents involving hybrid or electric vehicles.

As hybrid and electric vehicles become more prevalent on the roads and highways, emergency responders must be aware of the proper procedures for responding to accidents and emergency situations involving vehicles equipped with high voltage electrical systems. "As electric vehicles enter the marketplace in greater numbers, it's an appropriate time to recognize best practices that facilitate a safe response when these vehicles are in an accident," said **SAE committee chairman Todd Mackintosh**.

Among the recommended practices contained in the standard are:

- A procedure for OEM vehicle badging (labeling) placed at standardized, consistent locations on the exterior and/or interior of the vehicle identifying that a vehicle contains high voltage systems for first or second responders arriving at an incident. This guide would enable first-responders to quickly identify the involved vehicle powertrain type and determine if it contains a high voltage electrical system. Parameters for the visual content of the badging are also defined in the standard.
- A quick reference guide. "Think of this as a cheat sheet for first-responders," said Mackintosh. "This will help emergency personnel identify the location of high-voltage components, high-strength steel, and high voltage and supplemental restraint system disabling procedures to ensure the safest response methods for both themselves and vehicle occupants."
- A recommendation that OEMs follow common standards for disabling

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**Editorial Director:** Jack Pokrzywa

### Supplement to J2990 in progress

**The SAE Fuel Cell Standards Committee** began work in January on a recommended practice for emergency personnel responding to accidents involving hydrogen and fuel cell vehicles.

"J2990/1: Gaseous Hydrogen and Fuel Cell Vehicle First and Second Responder Recommended Practice," will be a document which supplements the recently-published

"J2990: Hybrid and EV First and Second Responder Recommended Practice."

The new document will address the potential consequences associated with hydrogen vehicle incidents and suggest common procedures to help protect emergency responders (and tow, recovery, storage, repair and salvage personnel) after an incident has occurred.

The increased use of hydrogen as an alternative fuel for vehicles creates additional procedures that are not already addressed in the parent document, J2990.

If you are interesting in contributing to the development of this new document, contact Pat Ebejer at [pebejer@sae.org](mailto:pebejer@sae.org).

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high-voltage circuits and that vehicle OEMs provide a minimum of two methods of initiating the disconnection and isolation of the high voltage system from the vehicle.

- OEM guidelines for the creation of second responder (i.e. tow truck operators) safety instructions for the inspection and handling of damaged or inoperable hybrid or electric vehicles, with a focus on the high voltage systems. "We want to see OEMs create a set of steps to follow so second-responders use safe practices. The second responder community should be made aware of proper procedures when towing, handling and/or storing a damaged or inoperable electric vehicle," Mackintosh said.

The National Highway Safety Transportation Administration participated in discussions and raised concerns over post-accident response. "Safety is our top priority. The entire industry wants to ensure that first and second responders are prepared for accidents involving electric vehicles," Mackintosh said.

## Two Hyundai engines receive SAE International Horsepower Certification

For the first time, SAE International has certified engines for passenger cars from non-U.S. automotive companies through the "SAE J1349®: Engine Power Test Code - Spark Ignition and Compression Ignition - As Installed Net Power Rating" technical standard.

Hyundai submitted two engines used in the Elantra and Genesis models. Both engines were certified and are now included in SAE International's database. That database now includes nearly 250 engines – including 210 from passenger cars and 37 from small utility vehicles.

Engine certification is based on a series of self-certification tests conducted by the manufacturer that are witnessed and verified by an SAE International-qualified observer. The procedure for certification is outlined in SAE International's standard J2723 ("Engine Power Test Code – Engine Power and Torque Certification"). The actual horsepower testing procedure is described in J1349.

Engine manufacturers are free to cite power and torque figures derived from testing conducted outside the scope of the SAE International standards, but in those cases they may not claim those figures are "SAE J1349 Certified Power®."

SAE International's Horsepower Certification Program was created in 2005. Small engines were added to be covered by the program in 2011 under the standard J1995, "Engine Power Test Code-Spark Ignition and Compression Ignition- Gross Power Rating."

The full list of certified engines can be accessed by visiting [www.sae.org/certifiedpower](http://www.sae.org/certifiedpower).

### Delivery options for SAE Technical Standards

The more than 10,000 standards in the SAE database now include historical standards, and can be accessed through one of the targeted solutions below:

- **SAE Digital Library** is the industry's most comprehensive resource, encompassing 175,000+ technical papers, standards, and related publications from SAE and other renowned organizations. A customizable corporate solution! [digitallibrary.sae.org](http://digitallibrary.sae.org)
- **SAE Subscriptions** are online portfolios of SAE standards or technical papers focused on targeted technologies and industries. [subscriptions.sae.org](http://subscriptions.sae.org)
- **SAE JPaks** let you decide how many ground vehicle standards you need and when you need them. Choose from packages that provide up to 10, 15, 25, 35, or 50 downloads per year. [sae.org/jpaks](http://sae.org/jpaks)
- **SAE Ground Vehicle Standards on DVD** provides convenient, portable access to more than 2,400 individual standards, recommended practices, and information reports. [sae.org/gvcd](http://sae.org/gvcd)

## New viscosity grade to be included in new J300 revision

The publication of a revision to "SAE J300: Engine Oil Viscosity Classification," is imminent. This revision will introduce as new viscosity grade, SAE 16.

The revision of J300 was requested by a consortium of passenger car OEMs to provide a new viscosity grade lower than SAE 20.

"The main driving force for using lower viscosity oils is to lower hydrodynamic friction, thereby increasing fuel economy," according to **Michael Covitch of Lubrizol, Chair of the SAE Engine Oil Viscosity Classification Task Force**. "The new grade will be specified in the future by OEMs for cars specifically designed to use new low viscosity oils. It is not deemed to be suitable for use with older engines or newer vehicles not designed for such low viscosity oils."

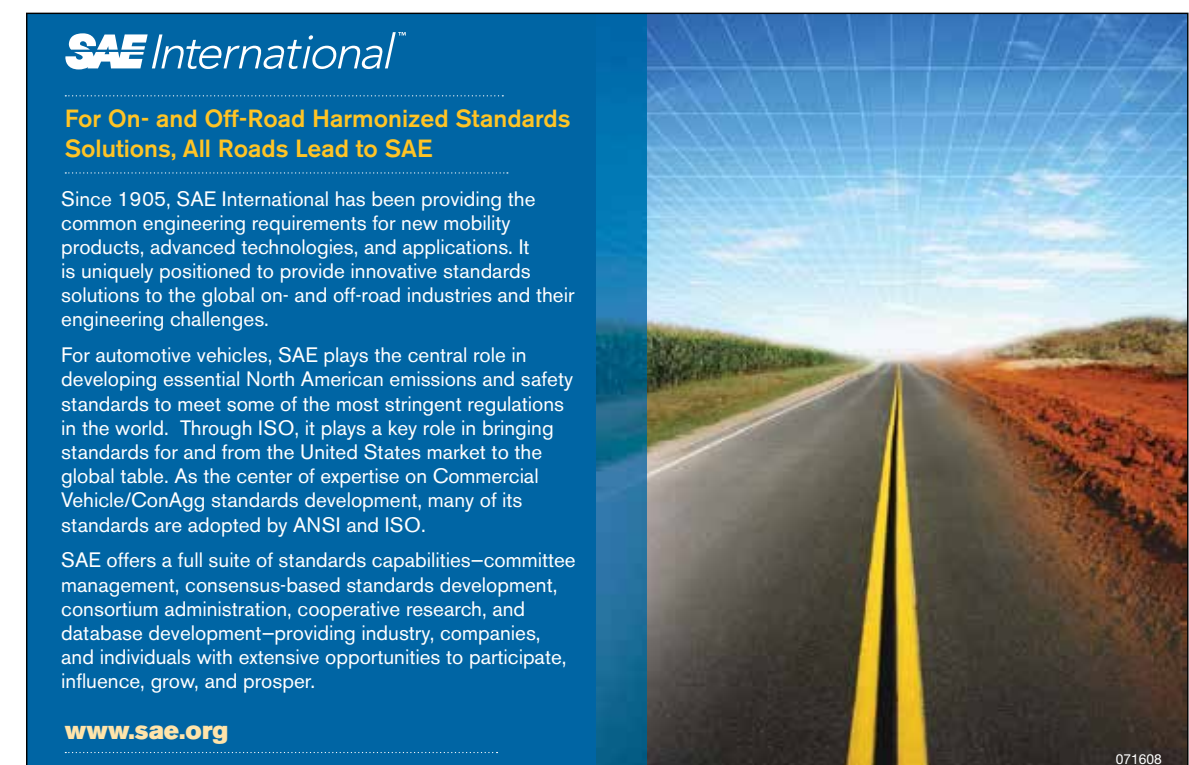
Lower viscosity lubricants are expected to help OEMs meet Corporate Average Fuel Economy (CAFE) regulations, and help vehicle owners reduce costs.

SAE J300 is used world-wide to classify engine oils in terms of viscosity grade. OEMs recommend specific viscosity grades in the owners' manuals to ensure that their engines will perform throughout the lifetime of the vehicle. Most engine oil standards set by organizations such as the American Petroleum Institute and individual OEMs include requirements for oils to meet the limits found in J300.

## Battery labeling guidelines standard published

A new Recommended Practice that covers labeling guidelines for electrical storage devices was issued by the **SAE International Battery Standards Labeling Committee** in December 2012.

"J2936: SAE Electrical Energy Storage Device Labeling Recommended Practice," provides labeling guidelines at all levels of component, subsystem and system level architectures describing content, placement and durability of requirements of labels throughout the total product lifecycle. It addresses dimensional, positioning, and copy nomenclature, product description, voltage and manufacturing information, as well as end-of-life disposal, shipping and electrical connection data.



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Since 1905, SAE International has been providing the common engineering requirements for new mobility products, advanced technologies, and applications. It is uniquely positioned to provide innovative standards solutions to the global on- and off-road industries and their engineering challenges.

For automotive vehicles, SAE plays the central role in developing essential North American emissions and safety standards to meet some of the most stringent regulations in the world. Through ISO, it plays a key role in bringing standards for and from the United States market to the global table. As the center of expertise on Commercial Vehicle/ConAgg standards development, many of its standards are adopted by ANSI and ISO.

SAE offers a full suite of standards capabilities—committee management, consensus-based standards development, consortium administration, cooperative research, and database development—providing industry, companies, and individuals with extensive opportunities to participate, influence, grow, and prosper.

[www.sae.org](http://www.sae.org)

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## Safety studies of R1234yf use in automobiles continue

Adapted from an article originally appearing in *Automotive Engineering International Online*, authored by Paul Weissler

The decision by Daimler to halt conversion to R1234yf—the low-global-warming-potential (GWP) but mildly flammable air-conditioning refrigerant—has led to a vigorous defense of the product's safety by the joint-venture suppliers, Honeywell and DuPont. Where does the industry go from here?

The first step, a review and possible expansion of the existing refrigerant-use risk assessments by an SAE Cooperative Research Program (CRP) of 13 OEM members, is under way. The SAE International Cooperative Research Project team (CRP1234-4), which was formed in 2012 to perform an updated engineering review of the R-1234yf refrigerant, met in early February.

The CRP continues its process of carefully reviewing the use of R-1234yf by using universally accepted engineering methods, including analysis of recent OEM testing from actual vehicle crash data, on-vehicle simulations, laboratory simulations, bench tests, and over 100 engine compartment refrigerant releases. Based on this testing the CRP has found that the refrigerant is highly unlikely to ignite and that ignition requires extremely idealized conditions.

German carmakers, Volkswagen in particular, had urged the close look at the Daimler data. But only Daimler actually faced a regulatory issue with the European Commission. Daimler's decision to stop R-1234yf installations and retrofit cars already using the refrigerant back to R-134a reflected the manufacturer's concern. Other (non-German) carmakers selling in Europe have made limited installations of R-1234yf.

General Motors is the only U.S. maker currently installing R-1234yf, and to date only in Cadillac XTS and ATS. The Honda Fit electric vehicle also is equipped.

Only limited data has been released publicly on the Daimler test. It reportedly simulated a head-on collision, following a drive cycle in a small car, that got turbocharger and exhaust surfaces very hot. At some point the radiator fan had been turned off, simulating a fan failure and further raising of turbo/exhaust temperatures. A modified refrigerant line permitted engineers to simulate a puncture that allowed R-1234yf to be sprayed onto the turbo/exhaust. The R-1234yf, reportedly mixed with some oil, produced a refrigerant flame.

Daimler called the test a "real world" scenario, and cited formation during the flame of hydrogen fluoride (HF), which etched the windshield milky white. HF, a toxic, corrosive gas that can result from decomposition of fluorine-content gas, was evaluated in the CRP studies, and potential exposure was considered similar to or below other fire-related exposures more frequently encountered.

DuPont and Honeywell said tests similar to the Daimler one were done in risk assessments performed by laboratories working for SAE CRPs. Honeywell additionally has shown tests it performed at 600°C (1112°F), which it said was the highest it encountered in an engine compartment, and the refrigerant did not burn.

The CRP assessments concluded the refrigerant was safe, in the same risk category as riding in an elevator.

The CRP continues to meet regularly to review and share test information completed since the close of the original CRP1234-3 in 2009. The original CRP1234-3 concluded that R-1234yf is a safe and acceptable alternative refrigerant for mobile air conditioning systems that can be used to meet new environmental standards and consumer needs. The CRP is targeting the second quarter of 2013 for the completion of its work and the publication of a final report.



Label on Cadillac ATS says it's R-1234yf equipped. Note flame symbol in orange section at left. (Paul Weissler)

## New Recommended Practice provides common approach to DRBFM methodology

"SAE J2886: Design Review Based on Failure Modes (DRBFM)," developed by the **Automotive Quality and Process Improvement Committee**, was published in March.

This Recommended Practice explains the DRBFM process and its recommended steps. It includes examples of how to conduct the process and discusses how DRBFM can fit with activities such as product and process development, validation, production, and change management.

DRBFM has been adopted by both automotive and non-automotive companies. There is a growing demand for DRBFM information, as companies also expect their global supply base to utilize the process. As with FMEA, companies tend to use slight variations of the process which can cause complexity for suppliers that support multiple companies. Development of a J2886, which provides a common approach to the implementation of the methodology, has been supported by users of DRBFM from both manufactures and suppliers.

## After serving the industry well for 25 years, airbag noise standard revised

A revised version of SAE J247 – the standard's first revision since 1987 – was published in November 2012.

"J247: Procedure and Instrumentation for Measuring Acoustic Impulses from Deployment of Automotive Inflatable Devices" provides guidelines for the selection of transducers, data acquisition systems, and other instrumentation (as well as analysis methods) to help ensure proper measurement and evaluation of acoustic impulses in automobiles. This recommended practice primarily focuses on automotive inflatable devices such as airbags.

"We were able to make revisions to bring the standard up to date," said **Dr. Stephen Rouhana, Chairman of the Impulse Noise Task Force of the SAE Inflatable Restraints Standards Committee** (which was responsible for issuing the standard). "With advances in computer programs and improvements in instrumentation, we were able to do more detailed analyses and better predict the risk of injuries."

Rouhana, Senior Technical Leader for Safety, and Group Leader, Biomechanics and Occupant Protection Passive Safety Research and Advanced Engineering at Ford Research and Advanced Engineering, personally spent 25 years working on this project as chair of this committee.

"I had an earlier experience in which I had hearing damage when an inflatable belt misfired during test preparations," he said. "This gave me an added personal interest in this issue."

The Task Force, which included participants from OEMs, airbag suppliers, testing equipment manufacturers, and universities, was able to use the U.S. Army's mathematical model of a human ear, to better predict the risk of injury.

"Airbags can be designed so they have less chance of producing hearing loss," said Rouhana, who has also written numerous SAE papers on this subject over the last two decades. "This revised standard points out that we can preserve the function of the airbag and reduce hearing loss. Hopefully, this will make some people's lives better. The group was dedicated to this."

## New SAE committee chairs – thank you for your important volunteer efforts!

### New SAE International Committees and Chairs

Lightweight Vehicle Design Materials & Assembly Technology Committee, **Jwo Pan**, University of Michigan—Chair; Yung Li Lee, Vice Chair, Chrysler—Vice Chairman

Fuel and Lubricants EOVC Sub-group (of the Fuel & Lubricants EOVC Task Force/F&L TC1 Engine Lubrication Committee), **Mike Brown**, SK Lubricants—Chair

Truck and Bus 12-24V Task Force (of the Truck and Bus Electrical Systems Committee), **Steve Nadig**, Daimler Trucks North America LLC—Chair

Scan Tool Interface Anomaly Task Force (of Vehicle EE System Diagnostic Standards Committee), **Mark Zachos**, DG Technologies—Chair

On-Road Automated Vehicle Safety Testing Working Group (of the On-Road Automated Vehicle Standards Committee), **Steve Underwood**, University of Michigan – Dearborn—Chair

On-Road Automated Vehicle Definitions Working Group (of the On-Road Automated Vehicle Standards Committee), **Barb Wendling**, Volkswagen Group of America—Chair

On-Road Automated Vehicle Planning Working Group (of the On-Road Automated Vehicle Standards Committee), **Bryant Walker Smith**, Stanford University—Chair

Truck and Bus J2547 Performance Requirements Task Force (of the Air Brake Tubing and Tube Fitting Committee), **Jordan Kiesser**, PACCAR Technical Center—Chair

J1828 Working Group (of the Collision Repair Committee), **Frank Wassilak**—Chair

Chassis Controls Committee (Crash Imminent Braking – Active Safety), **Thomas Klingler**, General Motors LLC—Chair

Truck and Bus J267 and Biaxial Testing Task Force (of the Truck and Bus Wheel Committee), **Stephen Phillips**, Accuride Corp.—Chair

Driver Assistance Systems Steering Committee, **Dan Selke**, Mercedes-Benz—Chair

Driver Perception Steering Committee, **Paul Perrone** (Perrone Robotics) and **Michael Carpenter** (General Motors LLC)—Co-chairs

Occupant Protection and Biomechanics Steering Committee, **Dr. Annette Irwin** (General Motors LLC) and Doug Stein (Autoliv)—Co-chairs

Truck Crashworthiness Advisory Task Force (of the Truck Crashworthiness Committee), **Roger Lackore**, Oshkosh Corporation—Chair

Disc DTV Measurement Standard Task Force (of the Brake NVH Committee), **Mark Riefe**, General Motors LLC—Chair

### New Chairs

**Christopher Jones**, BAE Systems Inc., J1939 Hybrid Communication Task Force

**Chuck Trueman**, PACCAR Technical Center, Truck and Bus Brake and Stability Control Systems Steering Committee

**Greg Dvorchak**, Hendrickson, Truck and Bus Brake Systems Committee

**Dan Pridemore**, Afton Chemical Corp., Fuels and Lubricants Council (Chair)

**Don Smolenski**, Evonik Oil Additives, Fuels and Lubricants Council (Vice Chair)

**Ed Heck**, Retired, Common Tests Technical Steering Committee

**Jeremy Harms**, Bobcat, Co., Machine Technical Steering Committee

**Donald Cuthbert**, Goodyear Tire & Rubber Co., Tire and Rim Committee

**Larry Revelino**, Al-Ko Kober Corp., Trailer Braking Standard Task Force

## J2534 gains acceptance for automotive reprogramming and diagnostics

*Adapted from an article which previously appeared in Automotive Engineering International Online*

The SAE International standard J2534, which enables communication between a computer and the onboard electronic data buses, got a boost last November, when Massachusetts voters endorsed the nation's first "right to repair" (R2R) law, which specifically named J2534 as a protocol to enable independent garages to reprogram and diagnose problems in motor vehicle computers. J2534 is used not only for reprogramming modules throughout the vehicle but also for an increasing amount of OE advanced diagnostics.



The SAE J2534 device cable plugs into PC and under-dash OBD II connector.

The impetus for J2534 ("Recommended Practice for Pass-Thru Vehicle Programming") came from the U.S. EPA and CARB (California Air Resources Board), which sought an affordable way for independent garages to reprogram onboard computers. The overall goal was improved vehicle emissions compliance. Prior to J2534 (issued by the **SAE Vehicle EE System Diagnostic Standards Committee**), each automaker had its own programming system and device. Thus, it was costly for independent garages to own all—or even most—devices.

With J2534, an OE application is loaded into a Windows PC, which enables the revised OE vehicle software to "Pass-Thru" from the PC. It continues through the J2534 device, and finally through the under-dash OBD II connector to the appropriate vehicle modules, which for emissions typically are the engine and transmission computers. With J2534, the Pass-Thru route for vehicle software also protects an automaker's intellectual property.

Issued in 2002, J2534 now has three sections. J2534-1, consisting of the emissions-related reprogramming protocols, is referenced in EPA regulations. All cars and light trucks sold in the U.S. are J2534-compatible for reprogramming, and emissions-software compliance (access to the software) is covered in federal regulations imposed on automakers.

J2534-2 is a "living document," subject to new OE features, hardware, and software, prepared with instructions on introducing them in a way that fits the requirements of the standard. So updating devices is not a reverse-engineering project. With the new Massachusetts law, most device makers are likely to update coverage in J2534-2.

J2534-3 is a compliance test for a J2534-1 device, to ensure it is likely to work with an OE application.

When it comes to diagnostics, the primary alternative to an OE scan tool has been the "generic" OBD II tools, which display emissions-related trouble codes and data items, such as sensor readings. Many "professional" tools add some OE "enhanced" trouble codes and data items, but because they provide multiple-makes diagnostics, coverage is spotty.

However, automakers also have been developing their latest diagnostics to run through a PC and J2534 device. Toyota and Volvo diagnostics already do. BMW/MINI is close (except for security systems) and GM's latest (Global Diagnostic System) is compliant. Other makers, particularly Ford and Honda, reportedly are close.

It is predicted that J2534 gradually will become the primary approach for OE diagnostics. And if the current Toyota and GM two-day subscription rates (\$55) for diagnostic or reprogramming access are typical, independent garages will find the price is right.

## Nominate a deserving individual for an SAE award

As our most valued resource, those engaged in SAE's mission are best qualified to identify outstanding achievements made by their peers. Look closely at those with whom you work. Honor their excellence and celebrate their dedication and consider nominating them for an SAE award related to the work of the SAE Standards Development process. Submit nominations at [www.sae.org/awards](http://www.sae.org/awards). Need assistance with an award nomination? Contact the SAE Awards staff at [awards@sae.org](mailto:awards@sae.org), 1-877-606-7323 (U.S. and Canada only) or 1-724-776-4970 (outside U.S. and Canada).

### Arch T. Colwell Cooperative Engineering Medal

*Nomination Deadline: July 1*

This award recognizes a unique and outstanding contribution over a period of time to the work of the technical committees under the SAE Technical Standards Board in developing standards, specifications, technical reports, and data through cooperative research.

### SAE Foundation's Stefan Pischinger Young Industry Leadership Award

*Nomination Deadline: March 31*

### Cliff Garrett Turbomachinery Engineering Award

*Nomination Deadline: March 31*

### Max Bentele Award for Engine Technology Innovation

*Nomination Deadline: July 1*

### J. Cordell Breed Award for Women Leaders

*Nomination deadline: July 31*

## US DOT webinar highlights work of SAE Fuel Cell Standards Committee

The U.S. Department of Energy (DOE) conducted a live webinar on February 22 on "Hydrogen Refueling Protocols." The webinar focused on the SAE Technical Information Report J2601, developed by the Fuel Cell Standards Committee, and published in 2010.

The webinar, developed by the DOE's Office of Energy Efficiency and Renewable Energy (Fuel Cell Technologies Office), highlighted fuel cell electric vehicle hydrogen refueling protocols, which allow for a fast and safe fill at hydrogen refueling stations. J2601 standardized hydrogen refueling protocols, allowing for safe fueling of all vehicles. The webinar covered how the document's guidelines, developed using OEM hydrogen storage systems and third-party laboratory testing, establish a table-based approach that allows all OEMs to safely fuel vehicles within a few minutes.

SAE TIR J2601 establishes safety limits and performance requirements for gaseous hydrogen fuel dispensers. The criteria include maximum fuel temperature at the dispenser nozzle, the maximum fuel flow rate, the maximum rate of pressure increase and other performance criteria based on the cooling capability of the station's dispenser. The document establishes fueling guidelines for "non-communication fueling" in the absence of vehicle communication and guidelines for "communication fueling" when specified information is transmitted from the vehicle and verified at the dispenser. The process by which fueling is optimized using vehicle-transmitted information is specified. The document also provides details of the communication data transmission protocol.

### Upcoming Standards Technical Committee Meetings

A current schedule can be found on the SAE website.

<http://www.sae.org/standards/>



## SAE Ground Vehicle Standards "On the Road"

*A re-cap of recent and upcoming events at which SAE will participate*

Keith Wilson, Ground Vehicle Standards Technical Project Manager, presented a synopsis of standard development activities within the 19 SAE battery committees and an overview of the Rechargeable Energy Storage System Cooperative Research Project for development of lithium ion battery safety standards at the **National Alliance for Advanced Technology Batteries** on January 17, 2013 in Austin, Texas. He did the same at the **Advanced Automotive Battery Conference** on February 4-8 in Pasadena, California.

Peter Byk and Keith Wilson, Ground Vehicle Standards Technical Project Managers, attended the **SAE Government/Industry meeting** in Washington D.C., January 30 - February 1, to discuss SAE standards development activities and technical projects with both government and industry representatives.

**Jesse Schneider, Chair of the SAE Wireless Charging (J2954) Committee**, presented an overview of the SAE standard development activities pertaining to wireless EV/Hybrid vehicle charging at the **Conference on Electric Roads and Vehicles** in Park City, Utah on February 4-5.

Gary Pollak, Ground Vehicle Standards staff member, attended the annual **Mobile Air Conditioning Society Worldwide Conference** in Orlando, Florida, February 5-8, and spoke at their Automotive Aftermarket Board panel session, presenting the SAE MAC Database Conformance Program. He also participated in the SAE R1234yf CRP meetings and presented SAE patent policy and MACdb Program details to the members at the SAE ICCSC Standards Group meeting (both of which were held in conjunction with the MACS Worldwide Conference).

**Robert Galyen, Chairman of the SAE Vehicle Battery Standards Steering committee** will discuss committee activities at **Lithium Battery International Summit** in Shenzhen, China on April 11.

Gary Pollak will attend the **SAE Lighting Forum** in Savannah, Georgia, April 30 - May 1, and present the paper "SAE Ground Vehicle Conformance Programs - Framework and Overview."

Peter Byk and Keith Wilson will attend the **U.S. Department of Energy's 2013 Annual Merit Review and Peer Evaluation Meetings** for the Hydrogen and Fuel Cells Program and the Vehicle Technologies Program, May 13-17, 2013, in Arlington, Virginia. They will discuss SAE standards development activities and technical projects with both government and industry representatives.

Keith Wilson will attend the **NHTSA Enhanced Safety of Vehicles Conference**, May 27-30, in Seoul, Korea. He will discuss SAE advanced safety standards development activities and technical projects with both government and industry representatives.

### An economical pathway for joint venture research: the Cooperative Research Program of SAE

Cooperative research ventures serve to bring more minds to the challenges and issues faced by industry. The result is a more robust project than each participating organization could complete independently. The pooling of financial resources also affords each participant more efficient use of their research budgets and eliminates duplication of efforts. Whether moving forward on the development of fuel cell standards...researching alternative refrigerants...or developing a database of human body measurements to foster ergonomic designs, SAE's Cooperative Research Program can assist your company in its collaborative research needs.

To learn more contact Gary Pollak, Program Manager +1-724-772-7196; [gary@sae.org](mailto:gary@sae.org)



*Thank you...* **for your corporate contributions to the 2012 SAE Ground Vehicle Standards Development Program**

SAE International acknowledges the following organizations that have funded the standards program this past year—supporters who acknowledge the benefits common engineering requirements bring to industry and their business.

- |                                   |  |
|-----------------------------------|--|
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| Chrysler Group LLC                | Yamaha Motor Corp. USA                 |
| American Honda Motor Co. Inc.     | Coleman Cable Inc.                     |
| Delphi Corp.                      | AM General LLC                         |
| BMW of North America LLC          | Transportation Safety Tech Inc.        |
| Toyota Motor Corp.                | Association of Equipment Manufacturers |
| Nissan                            | L E Jones Co.                          |
| DENSO International America Inc.  | Grote Industries LLC                   |
| Navistar Inc.                     | Ford Motor Co.                         |
| East Penn Mfg. Co. Inc.           | BorgWarner Inc.                        |
| Curt Manufacturing                | TARDEC                                 |
| Elite Electronic Engineering Inc. | Bendix Commercial Vehicle              |
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**SAE standards and papers no longer “locked down” by DRM security**

Effective Feb. 14, customers purchasing SAE International technical papers, standards and some eBooks, no longer will need to have the Digital Rights Management (DRM) FileOpen plug-in to access the documents.

“This is a natural progression in SAE International’s digital information strategy,” Michael Thompson, Manager of Electronic Publishing for SAE International, said. “SAE International offers a tremendous amount of useful and relevant technical information for mobility engineering professionals, and we want to make it more easily accessible.”

All electronic document purchases can be downloaded directly from the SAE website without the need to install FileOpen Plugin. As an additional benefit, SAE will retain copies of your purchased document in a personalized MyLibrary account, available via our website. This will enable customers to recover any documents lost due to hardware replacements or files being corrupted.

Available documents include: SAE Technical Papers – 1906-present; all current SAE Ground Vehicle Standards (SAE J-Reports); all current Aerospace Material Specifications (SAE AMS); and all current Aerospace Standards. The next step in this process will be the launch of SAE International’s “MyLibrary Mobile App,” which should be available in the March/April timeframe. The new app will offer a new delivery channel for customers to access products and services via mobile-friendly technology.

**Standards Consortium Administration**

With over a century of experience providing the common engineering requirements for new mobility vehicles, SAE can be a key component in developing any consortium-based activity, providing the expertise and worldwide technological and human resources to help you turn your vision into a successful operating reality.

Each client maintains its desired degree of autonomy, flexibility, and control. Client/project-tailored services include:

- A legal framework
- Fiscal oversight
- Policy and procedure development
- Publishing and distribution services
- Marketing and public relations activities

**SAE standards harmonization projects discussed at transatlantic roundtable**



Jack Pokrzywa, Director of SAE Ground Vehicle Standards Business Unit, participated in a Transatlantic Roundtable organized by the European Committee for Standardization (CEN), the European Committee for Electrotechnical Standardization (CENELEC), and the American National Standards Institute (ANSI), in Brussels, Belgium, on November 28-29, 2012.

The event brought together technical experts from industry, government, and other stakeholders to discuss standardization priorities for electric vehicles (EVs). The cooperative efforts among groups such as SAE International, the International Electrotechnical Commission (IEC), the International Organization for Standardization (ISO), and Underwriters Laboratories, Inc. (UL) were discussed.

SAE standardization and harmonization projects covered at the meeting included the SAE J1772™ combo coupler for AC and DC charging, a common standard supported by most global automakers, which involves close cooperation between SAE, ISO, and IEC. Work that is underway to harmonize relevant IEC and SAE standards on vehicle to grid communications was also covered.

**SAE: A Global Partner in Standards Development**

In addition to the maintenance and development of its family of technical standards, SAE International is also an active partner with other standards development organizations, government agencies, and regulatory bodies to support the newest, most robust, and comprehensive standards products for a changing global marketplace.

- US Department of Transportation
- Society of Automotive Engineers of Japan (JSAE)
- German Electrical and Electronic Manufacturers Association (ZVEI)
- US Federal Highway Administration
- China Automotive Technology & Research Center (CATARC)
- National Highway Traffic Safety Administration
- Korean Agency for Technology and Standards (KATS)
- US Department of Energy
- Japan Automobile Research Institute (JARI)
- US Environmental Protection Agency
- Brazilian National Standards Organization (ABNT)
- American National Standards Institute (ANSI)
- Automotive Electronics Council (AEC)
- International Organization for Standardization (ISO); US representative



## Volunteer recognition: document sponsors (Jan 1 – Mar 1, 2013)

These following individuals have served as active committee members and have dedicated their time and talent in guiding the development of standards documents from the preparation of all drafts through balloting and publication.

*Thank you.*

**Carlos Agudelo**, Link Engineering Company

**Dave Archer**, Archetype Joint LLC

**Joe Badger**, JBI Corp

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**Scott Willis**, Ford Motor Co

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**Garold Yurko**, TE Connectivity

**Mark Zachos**, DG Technologies

## SAE standards development committees seek members

The **Truck and Bus Active Safety Systems Committee** of the Truck and Bus Council is looking for suppliers of lane departure systems for heavy vehicles, members of academia related to advanced/active safety systems, and those in the motor coach (highway coach, urban transit, city bus) area to become members of the committee.

This committee is responsible for developing, reviewing, and approving Recommended Practices, Standards, Draft Technical Reports, Technical Data Reports and Information Reports related to all types of active safety systems and their interfacing with operators and other vehicle systems. Active safety systems include vehicle/operator warning systems (such as lane departure, collision warning, pedestrian/object recognition systems) and proactive safety systems (such as adaptive cruise control, pre-crash system actuation, collision mitigation systems, and automatic system control systems).

The initial committee focus will be on vehicle/operator collision warning systems, collision mitigation and the collision intervention systems.

If you are interested in participating in this committee, or for more information, contact Jana Wright at [giysta@sae.org](mailto:giysta@sae.org).

**Also looking for experts** involved in Vehicle Connectivity; Electric Vehicles; Automated Vehicles; and Safety/Human Factors (i.e., Driver Vehicle Interface, HMI, Cybersecurity, Collision Avoidance). For specific opportunities related to these areas contact SAE at <http://www.sae.org/standardsdev/participationReq.htm>

## Volunteer spotlight: SAE Awards – Congratulations!

### 2012 Arch T. Colwell Cooperative Engineering Medal

**Dr. David A. Lamb**, US Army TARDEC

This award recognizes a unique and outstanding contribution over a period of time to the work of the technical committees under the SAE Technical Standards Board in developing standards, specifications, technical reports, and data through cooperative research. Dr. Lamb has or is serving on the following SAE standards committee: Quality, Reliability and Robust Design Committee; Materials, Processes and Parts Council; Ground Vehicle Reliability Committee (Chair); Terrain Modeling Task Force (Liaison); Software System Reliability Subcommittee; Unmanned Ground Vehicle Reliability Task Force (Liaison); Condition Based Management Subcommittee (Liaison); On-road Automated Vehicle Standards Committee; and G-11 Reliability, Maintainability, Supportability and Probabilistic Methods. He will be presented the award at the 2013 SAE International World Congress in April.

### CONAGG Council Certificates of Appreciation

**John Koutsky**, Sears Mfg Co., HFTC4, Operator Seating and Ride Committee

**Chuck Crowell**, Caterpillar, Inc., Human Factors Technical Advisory Group

**Walter Ross**, Retired, Construction Agricultural and Off-road Machinery Council and Committees

**Leland Warren**, Cambric Corporation, Construction Agricultural and Off-road Machinery Council and Committees

### Engineering Aids from SAE

SAE provides products that support testing procedures set forth in SAE standards, Recommended Practices, Information Reports, and other SAE documents including the **OSCAR H-Point Machine**, which is used in the design of seating and interior packages and in conjunction with SAE J 826 (rev. 1995), FMVSS regulations, and ISO standards—making it the required design and auditing tool for current production.

Also available is the newly designed **HPM II H-Point Machine**, which includes enhancements over the OSCAR H-Point machine for use in advance design applications.

Available at <http://store.sae.org/ea/>



## New, revised & stabilized SAE standards (Dec – Mar 1, 2013)

Committee	Doc	Title	Status	Pub Date
<b>CONSTRUCTION, AGRICULTURAL AND OFF-ROAD MACHINERY COUNCIL</b>				
Hydraulic Systems				
	J1227_201302	Assessing Cleanliness of Hydraulic Fluid Power Components and Systems	Revised	02/11/13
	J744_201302	Hydraulic Pump and Motor Mounting and Drive Dimensions	Revised	02/04/13
Electrical Components and Systems				
	J1299_201302	Electrical Propulsion Control - Off-Road Dumpers	STABILIZED	02/21/13
	J1317_201302	Electrical Propulsion Rotating Equipment - Off-Road Dumper	STABILIZED	02/21/13
	J1811_201301	Power Cable Terminals	STABILIZED	01/18/13
	J1908_201302	Electrical Grounding Practice	STABILIZED	02/21/13
Machine Displays and Symbols				
	J115_201211	Safety Signs for Off-Road Work Machines	Revised	11/09/12
Machine Technical Steering Committee				
	J1116_201301	Categories of Off-Road Self-Propelled Work Machines	Revised	01/02/13
Loaders, Crawlers, Scrapers and Mounted Attachments				
	J326_201211	Nomenclature - Hydraulic Backhoes	Revised	11/01/12
Forestry and Logging Equipment				
	J1824_201302	Specification Definitions - Clam Bunk Skidder	STABILIZED	02/11/13
Trenching and Horizontal Earthboring Machines				
	J2520_201301	Classification, Nomenclature, and Specification Definitions for Directional Drilling Tracking Equipment	Revised	01/02/13
	J2583_201302	Directional Drilling Planning and Mapping Nomenclature	Revised	02/13/13
<b>FUELS AND LUBRICANTS COUNCIL</b>				
Fuel and Lubricants TC2 Industrial Lubricants				
	MS1000_201302	Lubricants, Industrial Oils, and Related Products - Classification	Revised	02/11/13
	MS1010_201212	Lubricants, Industrial Oils, and Related Products Type T Turbine Oils - Specification	Revised	12/18/12
<b>MATERIALS, PROCESS, AND PARTS COUNCIL</b>				
Surface Enhancement Committee				
	J442_201302	Test Strip, Holder, and Gage for Shot Peening	Revised	02/18/13
Fasteners Committee				
	J1199_201302	Mechanical and Material Requirements for Metric Externally Threaded Steel Fasteners	STABILIZED	02/18/13
	J476_201302	Dryseal Pipe Threads	STABILIZED	02/01/13
	J493_201302	Rod Ends and Clevis Pins	STABILIZED	02/25/13
	J82_201301	Mechanical and Quality Requirements for Machine Screws	STABILIZED	01/08/13
	J933_201302	Mechanical and Quality Requirements for Tapping Screws	STABILIZED	02/25/13
Hydraulic Hose and Hose Fittings Committee				
	J1467_201302	Clip Fastener Fitting	Revised	02/13/13
	J517_201302	Hydraulic Hose	Revised	02/04/13
	J518/1_201301	Hydraulic Flanged Tube, Pipe, and Hose Connections, 4-Screw Flange Connection Part 1: 3.5 MPa to 35 MPa (Code 61)	Issued	01/02/13
	J518/2_201301	Hydraulic Flanged Tube, Pipe, and Hose Connections, 4-Screw Flange Connection Part 2: 42 MPa (Code 62)	Issued	01/02/13
Metallic Tubing Committee				
	J2551/1_201302	Recommended Practices for Fluid Conductor Carbon, Alloy and High Strength Low Alloy Steel Tubing Applications-Part 1: Design and Fabrication	Issued	02/21/13
	J2551/2_201302	Recommended Practices for Fluid Conductor Carbon, Alloy and High Strength Low Alloy Steel Tubing Applications-Part 2: General Specifications and Performance Requirements	Issued	02/21/13
	J2551/3_201302	Recommended Practices for Fluid Conductor Carbon, Alloy and High Strength Low Alloy Steel Tubing Applications - Part 3: Procurement	Issued	02/21/13

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Committee	Doc	Title	Status	Pub Date
<b>MOTOR VEHICLE COUNCIL</b>				
Brake Linings Standards Committee				
	J160_201302	Swell, Growth, and Dimensional Stability of Friction Materials and Noise Insulators when Exposed to Elevated Temperatures	Revised	02/13/13
	J661_201211	Brake Lining Quality Test Procedure	STABILIZED	11/01/12
Brake Dynamometer Standards Committee				
	J2522_201301	Dynamometer Global Brake Effectiveness	Revised	01/21/13
Seat Belt Systems Standards Committee				
	J140_201302	Seat Belt Hardware Test Procedures	Revised	02/13/13
	J141_201302	Seat Belt Hardware Performance Requirements	Revised	02/13/13
	J1803_201301	Seat Belt Restraint System Hardware - Glossary of Terms	Revised	01/08/13
Interior Climate Control Steering Committee				
	J2911_201301	Procedure for Certification that Requirements for Mobile Air Conditioning System Components, Service Equipment, and Service Technician Training Meet SAE J Standards	Revised	01/14/13
Interior Climate Control Service Committee				
	J2788_201301	HFC-134a (R-134a) Recovery/Recycle/Recharging Equipment for Mobile Air-Conditioning Systems	Revised	01/14/13
	J2791_201301	HFC-134a Refrigerant Electronic Leak Detectors, Minimum Performance Criteria	Revised	01/14/13
	J2843_201301	R-1234yf [HFO-1234yf] Recovery/Recycling/Recharging Equipment for Flammable Refrigerants for Mobile Air-Conditioning Systems	Revised	01/14/13
	J2845_201301	R-1234yf [HFO-1234yf] and R-744 Technician Training for Service and Containment of Refrigerants Used in Mobile A/C Systems	Revised	01/14/13
	J2888_201301	R-1234yf Service Hose, Fittings and Couplers for Mobile Refrigerant Systems Service Equipment	Revised	01/14/13
Glazing Materials Standards Committee				
	J1796_201212	Spectral Transmission Test	Revised	12/07/12
	J2134_201212	Luminous Reflectance in Safety Glazing Materials for Road Vehicles	Revised	12/07/12
Inflatable Restraints Committee				
	J2238_201211	Airbag Inflator Ballistic Tank Test Procedure Gas Generating Devices Used In Inflatable Restraint Systems	Revised	11/01/12
	J247_201211	Procedure and Instrumentation for Measuring Acoustic Impulses from Deployment of Automotive Inflatable Devices	Revised	11/01/12
Interior Climate Control Fluids Committee				
	2297_201301	Ultraviolet Leak Detection: Stability and Compatibility Criteria of Fluorescent Refrigerant Leak Detection Dyes for Mobile R-134a and R-1234yf (HFO-1234yf) Air-Conditioning Systems	Revised	01/14/13
	J2776_201301	Refrigerant Purity and Container Requirements for New HFC-134a 1,1,1,2 -Tetrafluoroethane Refrigerant Used in Mobile Air-Conditioning Systems	Revised	01/14/13
	J2844_201301	R-1234yf (HFO-1234yf) New Refrigerant Purity and Container Requirements for Use in Mobile Air-Conditioning Systems	Revised	01/14/13
Vehicle Architecture For Data Communications Committee				
	J2602/1_201211	LIN Network for Vehicle Applications	Revised	11/19/12
	J2602/2_201211	LIN Network for Vehicle Applications Conformance Test	Revised	11/19/12

### Upcoming Standards Technical Committee Meetings

A current schedule can be found on the SAE website.

<http://www.sae.org/standards/>





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Committee	Doc	Title	Status	Pub Date
Automotive Electronic Systems Reliability Committee	J1211_201211	Handbook for Robustness Validation of Automotive Electrical/Electronic Modules	Revised	11/19/12
Fuel Cell Committee	J2600_201211	Compressed Hydrogen Surface Vehicle Fueling Connection Devices	Revised	11/19/12
Fuel Systems Committee	J2045_201211	Performance Requirements for Fuel System Tubing Assemblies	Revised	11/01/12
	J398_201211	Rated (Advertised) Fuel Capacity - Passenger Car, Multi-Purpose Passenger Vehicles, and Light Duty Trucks	STABILIZED	11/01/12
Automotive Brake and Steering Hose Committee	J1401_201302	Road Vehicle - Hydraulic Brake Hose Assemblies for Use With Nonpetroleum-Base Hydraulic Fluids	Revised	02/05/13
Hydraulic Brake Components Committee	J1118_201212	Hydraulic Valves for Motor Vehicle Brake Systems Test Procedure	STABILIZED	12/03/12
	J1137_201212	Hydraulic Valves for Motor Vehicle Brake Systems - Performance Requirements	STABILIZED	12/03/12
	J1713_201302	Structural Testing of Passenger Car and Truck Disc Brakes	Revised	02/13/13
Hybrid - EV Committee	J2836/3_201301	PEV Communicating as a Distributed Energy Resource	Issued	01/03/13
	J2990_201211	Hybrid and EV First and Second Responder Recommended Practice	Issued	11/19/12
Test Methods and Equipment Committee	J2357_201211	Application Guidelines for Electronically Driven and/or Controlled Exterior Automotive Lighting Equipment	Revised	11/01/12
Human Biomechanics and Simulations Steering Committee	J1460_201302	Human Mechanical Response Characteristics	STABILIZED	02/21/13
Dummy Testing and Equipment Committee	J2921_201301	H-III5F Chest Jacket Harmonization	Issued	01/22/13
Belt Drive (Automotive) Systems Committee	J2432_201211	Performance Testing of PK Section V-Ribbed Belts	Revised	11/19/12
	J636_201211	V-Belts and Pulleys	Revised	11/01/12
Battery Safety Committee	J2929_201302	Safety Standard for Electric and Hybrid Vehicle Propulsion Battery Systems Utilizing Lithium-based Rechargeable Cells	Revised	02/11/13
Battery Materials Testing Committee	J2983_201212	Recommended Practice for Determining Material Properties of Li-Battery Separator	Issued	12/03/12
Battery Labeling Committee	J2936_201212	SAE Electrical Energy Storage Device Labeling Recommended Practice	Issued	12/07/12
Battery Starter Battery Committee	J1495_201302	Test Procedure for Battery Flame Retardant Venting Systems	Revised	02/11/13
	J240_201212	Life Test for Automotive Storage Batteries	STABILIZED	12/03/12
Vehicle Dynamics Committee	J2705_201211	Tire Quasi-Static Envelopment of Triangular/Step Cleats Test	Revised	11/06/12
Event Data Recorder Committee	J1698/2_201301	Event Data Recorder - Retrieval Tool Protocol	Revised	01/14/13
<b>MOTOR VEHICLE SPECIALIZED EQUIPMENT COUNCIL</b>				
Motorcycle Technical Steering Committee	J2825_201211	Measurement of Exhaust Sound Pressure Levels of Stationary On-Highway Motorcycles	Revised	11/19/12
Marine Engine Fuel Systems Committee	J2006_201302	Marine Exhaust Hose	Revised	02/01/13

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Committee	Doc	Title	Status	Pub Date
Snowmobile Technical Committee	J192_201301	Maximum Exterior Sound Level for Snowmobiles	Revised	01/10/13
Small Engine and Powered Equipment Committee	J2996_201301	Small Diameter Fuel Line Permeation Test Procedure	Issued	01/14/13
Ship Systems - Fasteners Committee	J2484_201212	Fastener Part Standard - Machine Screws	Revised	12/07/12
	J2485_201212	Fastener Part Standard - Machine Screw Nuts (Metric and Inch)	Revised	12/20/12
<b>TRUCK AND BUS COUNCIL</b>				
Truck and Bus Brake Actuator Committee	J1817_201212	Long-Stroke Air-Brake Actuator Marking	Revised	12/03/12
Truck and Bus Brake Supply and Control Components Committee	J2384_201211	Air Dryer Test Procedure	Revised	11/09/12
	J702_201301	Brake and Electrical Connection Locations - Truck-Tractor and Truck-Trailer	STABILIZED	01/04/13
	J849_201301	Connection and Accessory Locations for Towing Multiple Trailers - Truck and Bus	STABILIZED	01/04/13
Air Brake Tubing and Tube Ftg Committee	J844_201212	Nonmetallic Air Brake System Tubing	STABILIZED	12/19/12
Truck and Bus Advanced and Hybrid Powertrain Steering Committee	J1463_201211	Pull-Type Clutch Transmission Installation Dimensions	STABILIZED	11/09/12
	J1479_201211	Automotive Pull-Type Clutch Terminology	STABILIZED	11/09/12
	J1540_201211	Manual Transmission Efficiency and Parasitic Loss Measurement	STABILIZED	11/09/12
Truck and Bus Wheel Committee	J2535_201302	Setting Preload in Heavy-Duty Wheel Bearings	Revised	02/11/13
Truck and Bus Hydraulic Hybrid Committee	J2898_201211	Hydraulic Hybrid Terminology and Definitions	Issued	11/21/12
Truck and Bus Windshield Wipers and Climate Control Committee	J1487_201301	Rating Air-Conditioner Evaporator Air Delivery and Cooling Capacities	Revised	01/28/13
	J2234_201211	Equivalent Temperature - Truck and Bus	STABILIZED	11/09/12
	J2348_201212	Electric Windshield Washer Switch - Trucks, Buses, and Multipurpose Vehicles	Revised	12/19/12
	J2349_201211	Electric Windshield Wiper Switch - Trucks, Buses, and Multipurpose Vehicles	Revised	11/27/12
	J2350_201211	Electric Blower Motor Switch - Trucks, Buses, and Multipurpose Vehicles	STABILIZED	11/05/12
Truck and Bus Aerodynamics and Fuel Economy Committee	J1341_201211	Test Method for Measuring Power Consumption of Hydraulic Pumps for Trucks and Buses	Revised	11/19/12
Truck and Bus Electrical Systems Committee	J2394_201302	Seven Conductor Cable for ABS Power - Truck and Bus	Revised	02/01/13
Truck and Bus Low Speed Communication Network Committee	J1587_201301	Electronic Data Interchange Between Microcomputer Systems in Heavy-Duty Vehicle Applications	STABILIZED	01/04/13
Truck Bus Control and Communications Network Committee	J1939/1_201211	On-Highway Equipment Control and Communication Network	Revised	11/27/12

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Standards. The workhorse documents that commonize practices, processes, and products throughout the ground vehicle industry are also paramount to the advancement of technology. Standards documents are more than the practices of today. They account for history and anticipate the future of technology, regulation, and business. The direct benefits of standards are simple in concept but extraordinary in their global impact toward ever-safer, cleaner, more efficient worldwide transportation.

## Technical standards enable and enhance:

- consistent and clear expectations for product performance and reliability
- regulatory compliance
- consistent product quality
- compatibility and interoperability
- more efficient procurement

## Standardization also:

- lowers trade barriers
- lowers purchasing costs
- decreases design time
- promotes innovation
- increases new technology speed to market

Because industry can rely on standards for globally harmonized solutions to common issues, individual companies can devote more time and resources to advance their proprietary technology. In this way, standards help foster competition, which advances the collective technology of industry and in turn, creates the need for new and revised standards. This has been the cycle for ground vehicle standards solutions.

And, at the heart of those solutions is SAE International, the recognized leader in mobility engineering for over 100 years. It plays the central role in developing North American automotive standards and a key role in bringing US documents to the global standards table, working hand-in-hand with the global community to advance industry.

While participation in the standards development process helps the advancement of the industry it can also contribute to the advancement of your company and personal career.

## Corporate Benefits

- Input into the direction of the standards
- Competitive intelligence through advance knowledge of standard direction
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- Peer recognition for advancing your industry's sectors technologies
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- Discover emerging technologies
- Contribute to the industry's body of technical knowledge

To learn more about SAE Technical Standards Development—and for a schedule of Technical Committee meetings—visit us on the web at <http://www.sae.org/standards/>

**Become a better you. Volunteer for an SAE Standards Development Committee.**



## Ground Vehicle Standards Committees & Staff Contacts

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Match your expertise with one of the many SAE Technical Standards Development Committees that are writing the common engineering requirements for the advancement of the ground vehicle industry.

Motor Vehicle Council		Truck & Bus Council	Materials, Processes & Parts Council	Construction, Agricultural & Off-Road Machinery Council
<b>Chassis Systems Group</b> Chassis Controls Technical Committee Automotive Brake and Steering Hose Standards Brake Fluids Standards Hydraulic Brake Components Standards Vehicle Dynamics Standards Wheel Standards <b>Highway Tire Forum Steering Cmt</b> <b>Brake Forum Steering Cmt</b> Brake Linings Standards Brake NVH Standards Brake Dynamometer Standards	<b>Vehicle Safety Systems Group</b> <b>Occupant Protection &amp; Biomechanics SC</b> Restraints System Standards Child Restraints Seat Belt Systems Inflation Restraints Impact & Roll-over Test Procedures Standards Safety Test Instrumentation Standards Human Biomechanics and Simulation Standards Dummy Testing & Equipment Committee <b>Driver Assistance Systems SC</b> On-Road Autonomous Vehicle <b>Driver Perception Steering Committee</b> Driver Vision Standards Safety & Human Factors Vehicle Sound for Pedestrians (VSP) Lane Keeping Assistance Systems Driver Vehicle Interface Adaptive Cruise Control & Forward Collision DRPOD Driving Performance Oper. Definitions <b>Crash Data Collection and Analysis SC</b> Data Analysis Cross-cutting issues Data collection & Archiving	<b>Work Truck Safety Committee</b> <b>Advanced &amp; Hybrid Powertrain SC</b> Alternative Fuels Hybrid Safety Hydraulic Hybrids <b>Body &amp; Occupant Environment SC</b> Truck Crashworthiness Windshield Wipers & Climate Control Human Factors <b>Electrical/Electronic Steering Cmt</b> Low Speed Communications Network Control and Communications Network Event Data Recorder Electrical Systems <b>Brake and Stability Control SC</b> Active Safety Systems Foundation Brake Brake Actuator Brake Systems Hydraulic Brake Wheel Stability Control Systems Air Brake Tubing & Tube Fittings Brake Supply and Control Components <b>Total Vehicle Steering Cmt</b> Tire Pressure Management Systems Corrosion Aerodynamics/Fuel Economy Tire	<b>L1. Weight Vehicle Design Mat'ls and Asy. Tech.</b> Squeak and Ick Compatibility Task Force Automotive Corrosion & Prevention Automotive Adhesives & Sealants Acoustical Materials Fasteners Cmt on Automotive Rubber Specs Surface Enhancement Non-Hydraulic Hose Plastics Textile & Flexible Plastics Vibration Control Hose/Clamp Performance & Compatibility Ground Vehicle Reliability Terrain Modeling Task Force Unmanned Ground Vehicle Reliability TF Software System Reliability SC CBM (Condition Based Management) SC <b>Meats Technical Executive Steering Cmt</b> Carbon & Alloy Steels Metals Test Procedures Automotive Iron & Steel Castings Sheet & Strip Steel Elevated Temp Prop of Ferrous Metals <b>Spring Steering Cmt</b> Coil Spring Leaf Spring Pneumatic Spring Torsion Bar Spring & Stabilizer Bars <b>Fluid Conductors Connectors SC</b> C1 Hydraulic Tube Fittings C2 Hydraulic Hose & Hose Fittings C3 Metallic Tubing <b>Fatigue Design &amp; Eval. Advisory Group</b> Material Properties Structural Analysis Fatigue Lifetime Predictions Road Load Data Acquisition Component Testing & Simulation	<b>Common Tests Technical SC</b> Hydraulics Electrical Components <b>Human Factors Technical Adv. Grp</b> Machine Controls – Operator Machine Displays and Symbols Operator Seating and Ride Operator Accommodation <b>Machine Technical Steering Cmt</b> Loaders, Crawlers, Scrapers & Attachments Sweeper, Cleaner & Machinery Forestry & Logging Equipment Excavators Roadbuilding Machinery Tire & Rim Trenching & Boring <b>Operator Protection Tech Adv. Grp</b> Personal Protection (General) Braking Lighting and Sound Protective Structures
<b>Conform &amp; Convenience</b> Adaptive Devices Controls & Displays Cooling Systems Dedicated Short Range Communications Human Accommodations and Design Devices Interior Climate Control Volatile Organic Compounds <b>Exterior and Performance</b> Dynamical Modeling and Simulation Glazing Materials Light Duty Vehicle Performance & Economy Measurements Light Vehicle Exterior Sound Road Vehicle Aerodynamics Speedometer & Odometer Tow Vehicle Trailer Rating WVIN/WMI Wiper Standards	<b>Electrical Systems Group</b> Vehicle E/E Systems Diagnostic Electronic Design Automation Standards Vehicle Architecture for Data Communications Vehicle Electrical Power Supply Systems Embedded Software Standards Automotive Electronic Systems Reliability Vehicular Flat Panel Display Standards Electromagnetic Compatibility (EMC) Circuit Protection & Switch Devices Functional Safety Automotive OEM EMC Event Data Recorder Vehicle Electrical System Security <b>Electrical Distribution Systems SC</b> Connector Systems Cable Standards Harness Covering	<b>Fluid Conductors Connectors SC</b> C1 Hydraulic Tube Fittings C2 Hydraulic Hose & Hose Fittings C3 Metallic Tubing <b>Fatigue Design &amp; Eval. Advisory Group</b> Material Properties Structural Analysis Fatigue Lifetime Predictions Road Load Data Acquisition Component Testing & Simulation	<b>Common Tests Technical SC</b> Hydraulics Electrical Components <b>Human Factors Technical Adv. Grp</b> Machine Controls – Operator Machine Displays and Symbols Operator Seating and Ride Operator Accommodation <b>Machine Technical Steering Cmt</b> Loaders, Crawlers, Scrapers & Attachments Sweeper, Cleaner & Machinery Forestry & Logging Equipment Excavators Roadbuilding Machinery Tire & Rim Trenching & Boring <b>Operator Protection Tech Adv. Grp</b> Personal Protection (General) Braking Lighting and Sound Protective Structures	
<b>Vehicle Engineering Systems Group</b> Adaptive Devices Controls & Displays Cooling Systems Dedicated Short Range Communications Human Accommodations and Design Devices Interior Climate Control Volatile Organic Compounds <b>Exterior and Performance</b> Dynamical Modeling and Simulation Glazing Materials Light Duty Vehicle Performance & Economy Measurements Light Vehicle Exterior Sound Road Vehicle Aerodynamics Speedometer & Odometer Tow Vehicle Trailer Rating WVIN/WMI Wiper Standards	<b>Electrical Systems Group</b> Vehicle E/E Systems Diagnostic Electronic Design Automation Standards Vehicle Architecture for Data Communications Vehicle Electrical Power Supply Systems Embedded Software Standards Automotive Electronic Systems Reliability Vehicular Flat Panel Display Standards Electromagnetic Compatibility (EMC) Circuit Protection & Switch Devices Functional Safety Automotive OEM EMC Event Data Recorder Vehicle Electrical System Security <b>Electrical Distribution Systems SC</b> Connector Systems Cable Standards Harness Covering	<b>Fluid Conductors Connectors SC</b> C1 Hydraulic Tube Fittings C2 Hydraulic Hose & Hose Fittings C3 Metallic Tubing <b>Fatigue Design &amp; Eval. Advisory Group</b> Material Properties Structural Analysis Fatigue Lifetime Predictions Road Load Data Acquisition Component Testing & Simulation	<b>Common Tests Technical SC</b> Hydraulics Electrical Components <b>Human Factors Technical Adv. Grp</b> Machine Controls – Operator Machine Displays and Symbols Operator Seating and Ride Operator Accommodation <b>Machine Technical Steering Cmt</b> Loaders, Crawlers, Scrapers & Attachments Sweeper, Cleaner & Machinery Forestry & Logging Equipment Excavators Roadbuilding Machinery Tire & Rim Trenching & Boring <b>Operator Protection Tech Adv. Grp</b> Personal Protection (General) Braking Lighting and Sound Protective Structures	
<b>Chassis Systems Group</b> Chassis Controls Technical Committee Automotive Brake and Steering Hose Standards Brake Fluids Standards Hydraulic Brake Components Standards Vehicle Dynamics Standards Wheel Standards <b>Highway Tire Forum Steering Cmt</b> <b>Brake Forum Steering Cmt</b> Brake Linings Standards Brake NVH Standards Brake Dynamometer Standards	<b>Vehicle Safety Systems Group</b> <b>Occupant Protection &amp; Biomechanics SC</b> Restraints System Standards Child Restraints Seat Belt Systems Inflation Restraints Impact & Roll-over Test Procedures Standards Safety Test Instrumentation Standards Human Biomechanics and Simulation Standards Dummy Testing & Equipment Committee <b>Driver Assistance Systems SC</b> On-Road Autonomous Vehicle <b>Driver Perception Steering Committee</b> Driver Vision Standards Safety & Human Factors Vehicle Sound for Pedestrians (VSP) Lane Keeping Assistance Systems Driver Vehicle Interface Adaptive Cruise Control & Forward Collision DRPOD Driving Performance Oper. Definitions <b>Crash Data Collection and Analysis SC</b> Data Analysis Cross-cutting issues Data collection & Archiving	<b>Fluid Conductors Connectors SC</b> C1 Hydraulic Tube Fittings C2 Hydraulic Hose & Hose Fittings C3 Metallic Tubing <b>Fatigue Design &amp; Eval. Advisory Group</b> Material Properties Structural Analysis Fatigue Lifetime Predictions Road Load Data Acquisition Component Testing & Simulation	<b>Common Tests Technical SC</b> Hydraulics Electrical Components <b>Human Factors Technical Adv. Grp</b> Machine Controls – Operator Machine Displays and Symbols Operator Seating and Ride Operator Accommodation <b>Machine Technical Steering Cmt</b> Loaders, Crawlers, Scrapers & Attachments Sweeper, Cleaner & Machinery Forestry & Logging Equipment Excavators Roadbuilding Machinery Tire & Rim Trenching & Boring <b>Operator Protection Tech Adv. Grp</b> Personal Protection (General) Braking Lighting and Sound Protective Structures	
<b>Green Technology Steering Committee</b> Green Bio-Materials Task Force Green Terminology Task Force	<b>Green Technology Groups</b> Gasoline Fuel Injection Standards Fuel System Standards Spark Arrestor Drive Line Standards	<b>Fluid Conductors Connectors SC</b> C1 Hydraulic Tube Fittings C2 Hydraulic Hose & Hose Fittings C3 Metallic Tubing <b>Fatigue Design &amp; Eval. Advisory Group</b> Material Properties Structural Analysis Fatigue Lifetime Predictions Road Load Data Acquisition Component Testing & Simulation	<b>Common Tests Technical SC</b> Hydraulics Electrical Components <b>Human Factors Technical Adv. Grp</b> Machine Controls – Operator Machine Displays and Symbols Operator Seating and Ride Operator Accommodation <b>Machine Technical Steering Cmt</b> Loaders, Crawlers, Scrapers & Attachments Sweeper, Cleaner & Machinery Forestry & Logging Equipment Excavators Roadbuilding Machinery Tire & Rim Trenching & Boring <b>Operator Protection Tech Adv. Grp</b> Personal Protection (General) Braking Lighting and Sound Protective Structures	
<b>Automotive Quality &amp; Process Improvement Committee</b>	<b>Automotive Quality &amp; Process Improvement Committee</b>	<b>Fluid Conductors Connectors SC</b> C1 Hydraulic Tube Fittings C2 Hydraulic Hose & Hose Fittings C3 Metallic Tubing <b>Fatigue Design &amp; Eval. Advisory Group</b> Material Properties Structural Analysis Fatigue Lifetime Predictions Road Load Data Acquisition Component Testing & Simulation	<b>Common Tests Technical SC</b> Hydraulics Electrical Components <b>Human Factors Technical Adv. Grp</b> Machine Controls – Operator Machine Displays and Symbols Operator Seating and Ride Operator Accommodation <b>Machine Technical Steering Cmt</b> Loaders, Crawlers, Scrapers & Attachments Sweeper, Cleaner & Machinery Forestry & Logging Equipment Excavators Roadbuilding Machinery Tire & Rim Trenching & Boring <b>Operator Protection Tech Adv. Grp</b> Personal Protection (General) Braking Lighting and Sound Protective Structures	
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<b>Service Development Steering Committee</b> Collision Repair Graphics Based Service Info	<b>Cooperative Research Projects</b> High Strain Rate Plastics IMAC ITS Projects CAESAR Ergonomics Otolitic Trauma	<b>Standards Derivative Programs</b> Horsepower Certification J2746 Software Assessment Repository On Board Diagnostics Databases MAC Equipment Conformance	<b>Specialized Vehicle &amp; Equipment Council</b> Personal Watercraft Small Engine & Powered Equip Snowmobile Special Purpose Vehicle Trailer Gosseneck & Fifth Wheel TF Trailer Dynamics TF Conventional Towing System TF <b>Motorcycle Technical Steering Cmt</b> Motorcycle Sound Level Electric Motorcycle <b>Marine Technical Steering Cmt</b> Marine Engine Fuel Systems Marine Electrical Systems <b>Ship Systems Technical Steering Cmt</b> Ship Fluid Systems Fasteners	
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