SAE International plays key role in development of Smart Grid infrastructure standards

SAE International has played a key role in developing standards in the development of the Smart Grid, the infrastructure needed to recharge hybrid and electric vehicles.

The Smart Grid Interoperability Panel (SGIP) Governing Board recently approved three key standards, two of which were developed by SAE International.

“This is an important step in the development of the Smart Grid, and SAE International played a critical role,” said Jack Pokrzywa, Manager, Ground Vehicle Standards, for SAE International. “SAE International is the world's preeminent standards organization and our involvement in this effort enhances that reputation.”

The SGIP Board’s approval of the standards signifies that these standards are now ready for inclusion on the SGIP Catalog of Standards, which will guide the development of an interoperable Smart Grid.

The standards receiving Board approval were:

- SAE J1772TM, Electric Vehicle and Plug in Hybrid Electric Vehicle Conductive Charge Coupler. This SAE standard addresses the physical connector used to plug an electric vehicle into an AC charging station. The standard specifies such details as the dimensions, functions, and configurations of the vehicle inlet and mating conductor.

- SAE J2836/1, Use Cases for Communication Between Plug-in Vehicles and the Utility Grid. This SAE standard establishes use cases, specifying the electronic information the vehicle will exchange with the grid. This information could include, for example, the identity of the specific vehicle and owner, the location of the charging station, the amount of electricity used, and the price of the electricity at different times of day.

- Internet Protocols for the Smart Grid. This document describes a set of key protocols needed to set up an Internet network for Smart Grid applications. The standard was created by the Internet Engineering Task Force.

SAE International was identified in Phase 1 by the National Institute of Standards and Technology to create Framework and Roadmap for Smart Grid Interoperability Standards - "Interoperability Standards to Support Plug-In Electric Vehicles.”

SAE International Ground Vehicle Standards Technical Committees are leading the vehicle transportation industry in the development of standards to provide the safe and effective implementation of hybrid/electric vehicles. SAE International standards play a key role in market access, reducing costs, increasing productivity, improving market position and advancing new technologies. To find out more about how SAE International is addressing the challenges of transportation connectivity visit the new vehicle electrification portal at http://www.EVSAE.COM
Zigbee Alliance and SAE International accelerate electric vehicle connection to the Smart Grid

The ZigBee® Alliance, a global ecosystem of companies creating wireless solutions for use in energy management, commercial and consumer applications, and SAE International announced their collaboration on ZigBee Smart Energy™ standard development in February. Their efforts will make ZigBee Smart Energy the preferred technology supporting Plug-In Electric Vehicles (PEV) and enabling essential vehicle to grid (V2G) communication and power capabilities.

ZigBee Smart Energy is the market leading home area network and advanced metering infrastructure standard for the Smart Grid. The collaboration recognizes the important role SAE International plays as the focal point for integrating automobile communication with emerging energy management requirements. Using ZigBee Smart Energy to define how PEVs and the grid interact, whether at the consumer’s home or at a remote location, will be one of the goals the two groups address. Ultimately, this initiative will provide future PEV drivers the real-time information needed to control their transportation energy use, manage their charging costs and receive utility incentives for participating in PEV programs. It also provides the essential control functions necessary to safely manage the charging of PEVs while maintaining grid integrity.

Adding ZigBee Smart Energy to PEVs will give automakers and utilities a common language to manage the charging, storage and use of energy in PEVs,” said Richard Scholer, SAE Hybrid Vehicle Communications Task Force Committee Chair. “SAE International’s formidable task is to help coordinate the urgent efforts of many different companies, industries and disciplines. It realizes the faster standards appear, the sooner electric-powered vehicles can gain consumer acceptance as a new and reliable mode of transportation.”

Work between the groups is already underway with completion targeted for next year when ZigBee Smart Energy version 2.0 is scheduled for completion. SAE International joins ZigBee SmartEnergy development efforts led by some of the largest utilities, suppliers and technology companies in the world.

“With an estimated 40 million smart meters integrated with ZigBee Smart Energy in homes, SAE International’s involvement will give consumers an effective way to manage their PEV energy needs,” said Bob Heile, chairman of the ZigBee Alliance. “With SAE International and ZigBee working together to create the needed standardized infrastructure, millions of consumers will be able to take advantage of rechargeable vehicles, speeding their adoption and allowing everyone to benefit.”

SAE International announces new technical standards for HFO-1234yf refrigerant

The has announced the publication of new SAE International documents covering the use of HFO-1234yf refrigerant in mobile air conditioning systems. This refrigerant was evaluated in 2009 within an SAE Cooperative Research project and deemed safe for use by the industry group which worked together in the SAE CRP 1234.

Over the last several years, this committee’s membership and extensive industry efforts, including SAE Cooperative Research Projects has resulted in the development of revision of 18 SAE International J standards for this new refrigerant. New vehicles entering production later this year will be equipped with this new low Global Warming Potential (GWP) refrigerant.

These SAE International standards cover MAC systems using HFO-1234yf refrigerant design requirements, service equipment and certification procedures for system components, service equipment and technician training.

Over the years, SAE International J Standards have been referenced by regulatory authorities, such as J639 Safety Standards for Motor Vehicle Refrigerant Vapor Compression Systems, which cover system design, components and service equipment for refrigerants used in MAC systems.

SAE standards cited in new EPA rule on refrigerants

The U.S. Environmental Protection Agency (EPA) recently issued a “Final Rule for HFO-1234yf as an Automotive Refrigerant.” This document references many SAE standards, most prominently J639, Safety Standards for Motor Vehicle Refrigerant Vapor Compression Systems.

The rule states that HFO-1234yf HVAC systems must adhere to all of the safety requirements of SAE J639 (adopted 2011), including requirements for a flammable refrigerant warning label, high-pressure compressor cutoff switch and pressure relief devices, and unique fittings.

The rule also requires connections with refrigerant containers of 20 lbs or greater to use fittings consistent with SAE J2844, R-1234yf (HFO-1234yf) New Refrigerant Purification and Container Requirements for Use in Mobile Air-Conditioning Systems.

Other SAE standards cited include J2766, Life Cycle Analysis to Estimate the CO2-Equivalent Emissions from MAC Operation and J1739, Potential Failure Mode and Effects Analysis in Manufacturing and Assembly Processes (Process FMEA).

The rule also frequently cites the work of SAE’s Cooperative Research Program (CRP), particularly 2000 CRP reports assessing the risks of HFO-1234yf, which the EPA used as background information.

The rule was issued under the EPA’s Significant New Alternatives Policy (SNAP) program, which evaluates and regulates substitutes for ozone-depleting chemicals that are being phased out under the stratospheric ozone protection provisions of the Clean Air Act.
SAE International to promote usage of the Michigan Intellidrive Test Bed Operations for USDOT Federal Highway Administration

SAE International has been awarded a contract to work with Science Applications International Corporation (SAIC) to provide support in coordinating promotion of the USDOT Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) Technology Test Bed Operation research program. The V2V and V2I Test Bed with roadside equipment is located in Oakland County, Michigan. The Test Bed is available for testing safety, mobility and environmental applications, services and components in an environment using the latest technology standards and architecture. The Test Bed provides the capability for companies to test applications that have the potential to save lives and provide continuous real-time connectivity among users. Safely applications will have the potential to reduce crashes through advisories and warnings. For instance, vehicles operators may be advised of a school zone, sharp ramp curve, or slippery patch of roadway ahead. Mobility applications will provide a connected, data-rich travel environment based on information transmitted anonymously from thousands of vehicles that are using the transportation system at a particular time. Environmental applications will provide travelers with real-time information about traffic congestion and other travel conditions to help them make more informed decisions that can make trips more fuel-efficient and eco-friendly.

The V2V and V2I Test Bed enables network users to send SAE J2735, Dedicated Short Range Communications Message Set Dictionary, compliant road sign, advisory and probe data messages to vehicles, and enables the distribution of J2735 compliant probe data from vehicles through roadside equipment to network user subscribers.

To learn more about the V2V and V2I Test Bed, contact Walter Fehr, Systems Engineering and Test Bed Manager, ITS Joint Program Office at (202) 366-0278 or Walton/fehr@dlt.gov. Or speak directly with Mr. Fehr at the Experts session during the SAE 2011 World Congress Wednesday, April 13th at 4-5 p.m., Room DD-03C. Visit too the DOT/ITS booth in the exhibit hall.

New committees and chairs

The following committees have recently been formed: Vehicle Electronics Embedded Security Committee; Small Task Oriented Vehicle Batteries Task Force; Battery Materials Testing Task Force; and the Battery Terminology Task Force. Those interested in volunteering their expertise to any of these efforts may direct their inquiry to http://www.sae.org/standardsdev/participationReq.htm

Paul Aurand, Performance Friction Corp., replaces Chip Evans as Chair, Brake Lining Standards Committee. SAE wishes to thank Chip on his leadership of the committee over the past eight years and welcomes Paul to the role.

Register your company in the SAE Wheel Conformance Program & Database

Wheel manufacturers: Gain the competitive advantage this new program offers!

This online registry allows companies to further distinguish themselves and their aftermarket wheels to meeting wheel identification criteria specified within SAE standard J-2530. Developed in response to industry requests, it is sure to be a vital resource for the wheel industry, retailers, and consumers seeking manufacturers who meet this important standard.

SAE International 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. 1996), FMVSS regulations, and ISO standards—making it the required design and auditing tool for current production.

Revision of airborne sound barrier standard issued

A revised version of SAE J1400, Laboratory Measurement of the Airborne Sound Barrier Performance of Flat Materials and Assemblies was issued in August 2010.

Issued by the Acoustical Materials Committee, this Recommended Practice presents a test procedure for determining the airborne sound barrier performance of materials and composite assemblies commonly installed in surface vehicles and marine products. The document provides a means of rank ordering barrier materials according to their sound transmission loss.

The Recommended Practice was significantly modified to improve inter-laboratory reproducibility based on the results and recommendations of a round robin study conducted by the Acoustical Materials Committee. The revision improves the accuracy of reference sample field incident STL calculations, particularly for low surface density materials. Additionally, the materials and construction of a simple and robust control sample with target STL values is now defined to allow individual laboratories to check their correlation.

Committee develops safety standards for rechargeable cells

SAE International’s Battery Standards Committee has created safety performance standards for lithium ion battery systems. These are the first minimum base standards for safety performance expectations—i.e., pass-fail criteria—for lithium ion battery systems.

The document, J2929, Electric and Hybrid Vehicle Propulsion Battery System Safety Standard - Lithium-based Rechargeable Cells, provides a common foundation from which all battery and vehicle manufacturers can create safe battery systems. The standards will build consumer confidence in the safety of lithium ion battery systems.

“There’s no doubt lithium-ion battery technology will continue to play a vital role in the alternative powertrain systems of the future,” said Galen E. Ressler, chair of the Battery Safety Standards Task Force. “As with any propulsion system, we need to assure that all of our systems are safe for our vehicle occupants. The adoption of new technologies such as advanced battery systems, require the industry to adopt new standards to increase vehicle safety and this standard will play a vital role in making that a reality. The committee already is working on the second version of the standard which will expand and enhance the standard to include additional aspects related to thermal propagation, flammability, toxicity, EMC and impact resistance.”

SAE International battery committees are working to limit the potential for danger by developing standards that cover all aspects, from battery design, testing, storage, shipping and recycling of lithium-ion batteries.

...continued on page 4
large advanced-technology batteries used in electric vehicles (EVs) and hybrid-electrics. Battery standards are useful for several reasons, but safety is paramount.

SAE International also is working with other organizations such as the National Fire Protection Association to recognize opportunities for improving EV battery safety knowledge, training, communications and vehicle designs for the community. In addition, the committees are supporting ISO/12405 (electrically propelled road vehicles – test specification for Lithium-Ion traction battery packs and systems) [GER1] standards development. Robert Galyen, Chair of the Vehicle Battery Standards Committee, commented on the collaboration of the document. “From project initiation to publication, these standards were completed in 13 months, a significant achievement given the sensitivity of the subject. More than 35 industry professionals from the U.S., Asia and Europe actively participated in the process, representing vehicle manufacturers, battery system and component suppliers, and other interested organizations. The diversity of this organization helps to make it a true global industry standard,” he said. Lithium ion batteries are used in hybrid and electric vehicles. Their usage is expected to grow as more of the vehicles are introduced. Market size estimates for electric and hybrid vehicle batteries range widely from $2.3 billion to $10 billion by 2015. The U.S. will have the capacity to produce 20 percent of the world’s advanced batteries by 2012 and up to 40 percent by 2015 (DOE).

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A new smartphone app which allows electric vehicle owners to share information on the availability of electric outlets references SAE J1772, Electric Vehicle and Plug in Hybrid Electric Vehicle Conductive Charge Coupler.

The PlugShare app for iOS devices, created by Xatori, Inc in Palo Alto, California, enables electric vehicle owners to share their outlets and to designate whether they have J1772 compliant connectors or standard 120 volt outlets. J1772 plugs are compatible with the latest electric vehicle models such as the Chevy Volt and Nissan Leaf.

New standard on keyless ignition control issued

A new Recommended Practice that establishes guidelines for the operation of automotive keyless ignition systems was issued in January. Developed by the Controls and Displays Standards Committee, SAE J2948, is designed to help minimize user errors by providing design recommendations pertaining to uniform labeling, indication of vehicle ignition/control status, and physical control characteristics of keyless ignition systems.

The standard’s goal is to minimize user errors including:

• The inability to start and stop the vehicle propulsion system;
• Exiting the vehicle with the automatic transmission in a non-parking gear;
• Exiting the vehicle while the vehicle propulsion system is enabled; and
• Exiting the vehicle while the vehicle propulsion system is disabled, but the accessory or electrical systems are active.

This Recommended Practice applies to keyless ignition controls permanently mounted in passenger cars, multipurpose vehicles, and light trucks up to 19,500 lb. GCWR (Class 5).

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 to HFC 134a…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
SAE Ground Vehicle Standards “On the Road”
A re-cap of recent and upcoming events at which SAE will participate

- SAE International’s Motor Vehicle Council met with John Maddox, Associate Administrator, Office of Vehicle Safety Research, National Highway Traffic Safety Administration (NHTSA) at SAE Automotive Headquarters on February 17 to discuss vehicle safety initiative activities.
- SAE Ground Vehicle Standards staff members Peter Byk and Keith Wilson attended the University of Michigan Transportation Research Institute Automotive Safety Conference on February 16 in Ann Arbor, Michigan.
- Jack Pokrzywa, SAE International Director of Ground Vehicle Standards represented SAE International at a U.S. Department of Commerce International Trade Administration meeting on the Asia Pacific Economic Cooperation (APEC) project on Smart Grid Interoperability Standards on February 25 in Washington, D.C.
- Dr. David L. Schutt, Chief Executive Officer, SAE International and Jack Pokrzywa represented SAE at the Fully Networked Car Conference in Geneva, Switzerland on March 2-3. Dr. Schutt served on a panel to discuss government-industry partnerships. Pokrzywa served as panel moderator and session chairman on information and communication technologies and electric vehicles.
- Keith Wilson represented SAE International at the EV Charging Infrastructure Conference on March 1 in San Diego, California. He presented an overview of SAE standards on electric vehicle charging and smart grid interoperability.
- Gery Kissel, Vice Chair of the SAE Hybrid Vehicle Committee and Tim Mellon, SAE staff, represented SAE International at an American National Standards Institute (ANSI) meeting on Smart Grid Interoperability Standards on March 4 in Washington, D.C.
- Robert Gaylen, Chair of the SAE Battery Standardization Steering Committee, will speak at the EV Battery Tech Global Cost Reduction Initiative event on March 25-27. Dr. Schutt served on a panel to discuss government-industry partnerships.

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 (January – March 2011)
The SAE Standards Development Program thanks its Document Sponsors. These individuals have served not only as active committee members but 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.

Mohamed Abdelhamid, Robert Bosch LLC
Ward Atkinson, Sun Test Engineering
James Baker
Paul Beggeman, Wayne State University
Brent Birch, Champion Laboratories Inc.
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Roger Reini, Ford Motor Co.
Galen Ressler, General Motors Company
Lawrence Rice, Osram Sylvania
Walter Ross
Thomas Soupal, Meritor Wabco
Douglas Steir, Autoliv ASP
Daniel Stern
Bart Terburg, Osram Sylvania
Jim Vizbanks, Yamaha Motor Corp. USA
Garold Yukko, Tyco Electronics

Standards development committees seeking volunteers
Powertrain specifically Battery Standardization; Gasoline Fuel Injection, Belt Drive, Vehicle and Engine Emissions Standards

Chassis Systems specifically Electric Power Steering; Hydraulic Brake Components; Brake Linings Standards

Truck and Bus specifically Truck and Bus Wheel

*Electrical Systems specifically Vehicle E/E Systems

Powertrain Diagnostics; Electrical Distribution Systems Steering; Electrical Connectors; Electrical Harness Covering; Electromagnetic Compatibility (EMC/GMR); Vehicle Network for Multiplex & Data Communications; Automotive Electronic Systems Reutilization; Vehicle Flat Panel Display; Circuit Protection; Vehicle Electric Power Supply

*Metallics specifically Acoustical Materials; Automotive Adhesives and Sealants; Carbon and Alloy Steels; Metals Technical; Plastics; Spring Committee: Vibration Control

Vehicle Safety Systems specifically Seat Belt Systems Standards; Inflatable Restraints Standards

Fuel Cells specifically Fuel Cell Performance

Vehicle Engineering Systems specifically Odometer / Speedometer

Express interest at http://www.sae.org/standardsdev/participationReq.htm

Going to the SAE 2011 World Congress?
The SAE Standards TechXchange Place—Room D3-19 co-located with the Safety and Testing Lounge—is where committee members and those interested in becoming involved in creating industry standards can meet informally with one another and SAE staff representatives during the SAE World Congress. There is currently a heightened need for experts in the asterisked (*) areas noted above. Stop by to learn more about your technical expertise can help industry’s standards initiatives.

April 12-14, Detroit, MI USA
**New, revised & stabilized SAE Technical Standards**

(January – March 2011)

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<td>Truck and Bus Communications Network</td>
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<td>Medium/Heavy-Duty/E/E Systems Diagnosis Nomenclature</td>
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<td>Test Device Head Contact Duration Analysis</td>
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<td><strong>Specialized Vehicle &amp; Equipment Council</strong></td>
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<td>Human Mechanical Impact Response Characteristics - Response of the Human Neck to Inertial Loading by the Head for Automotive Seated Posture</td>
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<td>Guidelines for Evaluating Out-of-Position Vehicle Occupant Interactions with Deploying Frontal Airbags</td>
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<td>Human Tolerance to Impact Conditions as Related to Motor Vehicle Design</td>
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<td>Hybrid III 3-1 Year Old Child Dummy User’s Manual</td>
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<td>Electric and Hybrid Vehicle Propulsion Battery System Safety Standard - Lithium-based Rechargeable Cells</td>
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**Motor Vehicle Council**

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<td>Keyless Ignition Control Design</td>
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| **documents in progress** (January – March 2011)

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Helping industry engineer safe vehicles

- In-Vehicle Networks and Software, 2011 SAE Paper Collection 14 papers, online April 2011, COLL-TP-00127
- Intelligent Vehicle Initiative (IVI) Technology Advanced Controls and Navigation Systems, 2011 SAE Paper Collection 12 papers, online April 2011, COLL-TP-00129
- Driver-Vehicle Interaction SAE Standards Subscription SUB-STD-00010
- SAE J2364, J2365 & J2378™, In-Vehicle Navigation and Route Guidance Standards while Driving
- SAE J2831™, Development of Design and Engineering Standards for In-Vehicle Text Messages
- SAE J2944™, Operational Definitions of Driving Performance Measures and Statistics Standard
- What Engineers and Managers Need to Know About Human Factors, book R-331
- Performance Metrics for Assessing Driver Distraction: The Quest for Improved Road Safety, book R-402
- A Holistic Introduction to Commercial Telematics seminar, C3947
- Panels/technical sessions like “The Challenges of Implementing New Technologies While Improving Safety” and “Crash Avoidance I—Crash Causation, ESC, Lane Keeping, and Other Avoidance Technologies” at such annual events as SAE Government Industry Meeting and SAE World Congress
- SAE Convergence® 2012 Conference & Exhibition
- Driver Vehicle Interface Technical Standards Development Committee
- Visual Behavior and Metrics Technical Standards Development Committee

Look for all information, events, and standards initiatives related to Driver Vehicle Interface technologies at www.sae.org

1-877-606-7323 (outside US, Canada)

Standards & Resources from SAE

The National Highway Traffic Safety Administration (NHTSA) has identified it as one of its top priorities with the long-term goal of significantly reducing crashes attributable to driver inattention and workload. New laws and regulations are being passed at the state and local levels. Yet, solutions to safe, connected vehicles are as complex as the speed at which new mobile devices and in-vehicle technologies are introduced to the market.

SAE International can help the automotive OEM in finding those solutions. It offers a neutral forum for industry to develop needed DVI guidelines. Presently, the collective wisdom and thought leadership of industry volunteers involved in SAE’s technical standards development committees are working on defining “hands free” and providing guidance on voice recognition principles as well as timely comprehension. And with one of the largest libraries of intellectual property focused on mobility technology, the past and current work of the global engineering community can be referenced for designing and developing ways in which to best manage driver workload.
Ground Vehicle Standards Committees & Staff Contacts

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

### Powertrain Systems Group
- Air Changer Test Code Standards
- All Wheel Drive Standards
- Automatic Transmission Friction
- Automatic Transmission Transaxle
- Battery Committee
- Testing
- Transportation
- Safety
- Recycling
- Truck and Bus

### Motor Vehicle Council
- Diesel Fuel Injection Equipment
- Driveline
- Engine Power Test Code
- Filter Test Methods
- Fuel Systems
- Gasoline Fuel Injection
- Hybrid Electric Motor Rating
- Connector Communications
- Emissions
- Lift II Filter Pipe Assembly
- Manual Transmission Transaxle
- Permeation
- Piston Ring
- Power Test Code
- Transmission Axle Driveline

### Chassis Systems Group
- Brake Forum Steering Cmte
- Brake Lining Standards
- Dynamometer Test Code Standards
- Road Test Procedure Standards
- Brake NVH Standards
- Highway Tire Forum Steering Cmte
- Vehicle Trailers Standards
- Wheel Standards
- Brake/Pad Standards
- Automotive Brake & Steering Hose
- Hydraulic Brake Components

### Vehicle Safety Systems
- Accident Investigations & Reconstruction
- Active Safety Systems
- Restraints System Standards Steering
- Child Restraints
- Belt Systems
- Inflatable Restraints
- Safety Systems Components Advisory Group
- Human Biomechanics & Simulation
- Steering Cmte
- Dummy Testing & EQ
- Dummy Dev Eval Advisory Grp
- Impact & Rollover Test Procedures
- Safety Test Instrumentation

### Vehicle Engineering Systems
- Comfort & Convenience
- Adaptive Devices
- Advanced Traveler Information Systems
- Grills & Displays
- Cooling Systems
- Dedicated Short Range Communications
- Human Accommodations and Design Devices
- Interior Climate Control
- Sound Signaling Advisory Group
- Speedometer & Odometer
- Volatile Organic Compounds

### Electrical Systems Group
- Vehicle E/E Systems Diagnostic
- Electrical Design Automation
- Vehicle Arch. for Data Communications
- Vehicle Electric Power Supply
- Embedded Software
- Automotive Electronic Systems Reliability
- Vehicle Flat Panel Display
- Electromagnetic Compatibility (EMC)
- Electrical Distribution Systems Steering
- Connectors Systems
- Cable Standards
- Harness Covering
- Circuit Protection & Switch Devices
- Functional Safety
- Automotive OEM EMC
- Event Data Recorder

### Green Technology Systems Group
- Green Bio-Materials Test Force
- Green Technology Test Force

### Construction, Agricultural & Off-Road Machinery Council
- Common Tests Technical Steering Cmte
- Hydraulics
- Electric Components
- Cold Weather Operations

### Materials, Processes & Parts Council
- Automotive Corrosion & Prevention
- Acoustical Materials
- Fasteners
- Metals Technical Executive Steering Cmte
- Carbon & Alloy Steels
- Metal Test Procedures
- Automotive Iron & Steel Castings
- Steer & Ship Steel
- Elev. Tip Prod Prop of Ferruts Mots
- Automotive Adhesives & Sealants
- Plastics
- Spline 882
- Spring Steering Cmte
- Coil Spring
- Leaf Spring
- Pneumatic Spring
- Tension Bar Spring & Stabilizer Bars
- Textile & Flexible Plastics /IPA
- Vibration Control
- Fluid Conductors Steering Cmte
- C1 Hydraulic Tube Fittings
- C2 Hydraulic Hose & Fitting
- C3 Metallic Tube
- Cmte on Automotive Rubber Spec

### Specialized Vehicle & Equipment Council
- Personal Watercrafts
- Small Engine & Powered Equip
- Snowmobiles
- Special Purpose Vehicle
- Motorcycle Sound
- Marine Technical Steering Cmte
- Marine Engine Part Standards
- Marine Electrical Systems
- Trailer
- Goseck & Fifth Wheel
- Trailer Dynamics
- Conventional Towing to 20,000 lbs
- Trailer Terminology
- Ship Systems & Equipment Steering Cmte
- Fluid Systems & Components
- Fasteners
- System Cleanliness & Filter

### Cooperative Research Projects
- MAC Refrigerant Blends (OMR CRP)
- Alternative Refrigerants
- CIRP12-4y-4 Refrigerant Assessment
- CRPS0 Low GWP Refrigerant Assessment
- CAESAR
- High Temperature Battery Study
- Ergonomics
- Emergency Vehicle Lighting
- Gage R&R of HPM
- Truck Cab Anthropometric Studies
- Vehicle Sound Level for Passengers
- Plastic Suitable for use with H3, H4 Fuel Cell
- Standard Breakaway, Hoses, Fittings and Nozzles

### Contact Information:
- SAE International
  - (248) 273-2465
- www.sae.org

03/2011