Safety and Human Factors Steering Committee addresses full range of driver-vehicle interface issues

The National Highway Traffic Safety Administration's (NHTSA) proposed guidelines on driver distraction became front-page news in February. Several SAE International standards were cited in the NHTSA proposal document, and the SAE Safety and Human Factors Steering Committee has been at the forefront of technical standards development in this area.

The proposed NHTSA voluntary guidelines encourage automobile manufacturers to limit the distraction risk from in-vehicle electronic devices (including communications, entertainment, information gathering, and navigation devices.)

The Safety and Human Factors Steering Committee currently has four task forces working to develop information reports directly related to DVI (driver-vehicle interface) issues. Four Information Reports on the following subjects are expected to be published by the end of 2012:

- An overall definition of “distraction”
- J2972: Definition of Automotive Hands-Free Operation of a Person-to-Person Voice and/or Data Wireless Communication System, which will provide the definition of “hands-free”
- J2988: Voice-User Interface (VUI) Principles and Guidelines, which will provide a set of high-level principles for voice-user interfaces as a means for controlling select vehicle features and functions especially the appropriate application of voice-user interfaces, their general operation, their relation to other interfaces, and other aspects of these interfaces. While not a comprehensive guideline, these high level principles will establish a general framework to promote consistency in user experiences and expectations for operation of voice-user interfaces.
- A distraction taxonomy, detailing different types of distractions.

These four Information Reports may become Recommended Practices in the future.

Also, “J2831: Development of Design and Engineering Recommendations for In-Vehicle Alphanumeric Messages,” developed by the committee and published in late April, was cited in the NHTSA guidelines document.

Other SAE standards cited in the NHTSA document were “J2364: Navigation and Route Guidance Function Accessibility While Driving,” which is currently being reviewed and updated by the Steering Committee, and “J941: Motor Vehicle Drivers’ Eye Locations,” which was developed and recently updated by the SAE Driver Vision Committee.

Participants in the Safety and Human Factors Steering Committee include representatives from OEMs, suppliers, academia, institutes, consulting firms, government, and other organizations.

“*The committee was formed so that there was a go-to group that could provide scientific input on these issues from a technical perspective,*” said Daniel J. Selke, Steering Committee Chairperson. “Because the committee represents a very broad...continued on next page
spectrum of experts, SAE can facilitate dialog and establish a good working relationship with agencies such as NHTSA on a technical level.

Another recent addition under the Steering Committee was the formation of the Crash Warning Interface Performance (CWIP) Committee. The new committee met with NHTSA to discuss their current Crash Warning Interface Metrics (CWIM) research publications and provided initial feedback on NHTSA’s CWIM human factors research tasks. It is expected that the newly formed CWIP Committee will begin to develop, at a minimum, information reports after reviewing the technical aspects of the government’s CWIM research.

Future documents also being developed under the auspices of the steering committee include:

- J2889-1: Measurement of Minimum Noise Emitted by Road Vehicles.

This published recommended practice is being updated and establishes the technique that should be used to test vehicle sound for pedestrians. It is expected that NHTSA will possibly cite this document in their upcoming Notice of Proposed Rulemaking sometime in early July 2012. (Its parent document, “J2889: Vehicle Sound Measurement at Low Speeds,” is also currently being worked on and is the “rationale” for conducting this topic.)


This Recommended Practice will define performance measures and statistics concerned with on-road driving of both left- and right-hand drive wheeled vehicles having a steering wheel, accelerator pedal, and a brake pedal. Only measures and statistics pertaining to driver responses, and lateral and longitudinal control of a road vehicle are included. This document will define and attempt to harmonize the technical definitions for human factors terms such as "longitudinal control" operational definitions for driver’s pedal responses, and vehicle-based measures, as well as "lateral control" operational definitions for driver steering responses to events, and vehicle-based measurements.

- J2399: Adaptive Cruise Control (ACC) Operating Characteristic and User Interface was recently re-balloted and updated to specify the basic minimum human factors requirements for ACC systems.
SAE standards applicable to new air conditioning refrigerant

We’re almost ready for R-1234yf, the new low global warming automotive A/C refrigerant that is being used in place of R-134a to meet European regulations and gain U.S. EPA fuel economy credits. The refrigerant has already been installed in a number of small cars in Europe, and the Cadillac XTS, being introduced in late spring, will be the first U.S. car with R-1234yf.

Numerous SAE standards developed by the Interior Climate Control Standards Committee, are applicable in conjunction with the introduction of the refrigerant:

- The EPA has referenced “SAE J2788: R-134a Recovery/Recycle/Recharging Equipment for Mobile A/C Systems” as the applicable standard regarding how the refrigerant is recovered, recycled, and recharged (RRR) into vehicle systems.
- The EPA still has to accept the SAE-specified fitting on the refrigerant tanks for R-1234yf service equipment. Ward Atkinson, chairman of the SAE Interior Climate Control Standards Committee has asked EPA for expedited review so equipment and tanks already engineered can be used.
- Per the forthcoming EPA regulations, which will be tied to the Clean Air Act, R-1234yf will have to be serviced with new RRR machines that meet “J2843: R-1234yf Recovery/Recycle/Recharge Equipment for Flammable Refrigerants in Mobile A/C Systems, or the refrigerant recovery-only, “J2851: R-1234yf Refrigerant Recovery Equipment for Mobile A/C Systems.”
- All J2843-compliant machines must have a built-identifier or a USB port for a valid R-1234yf signal from a handheld identifier before they will allow refrigerant recovery. These identifiers are covered by two SAE standards: “J2912: Performance Requirements for R134a and R1234yf Refrigerant Diagnostic Identifiers for Use with Mobile A/C Systems,” which is for handhelds, and “J2927: R-1234yf Refrigerant Identifier Installed in Recovery and Recycling Equipment for Use with Mobile A/C Systems,” for built-ins.
- All new R-1224yf service equipment and some components (such as hoses and evaporators) must be certified to their applicable standards and to “SAE J2911: Procedure for Certification That Requirement for Mobile Air Conditioning System Components, Service Equipment, and Service Technician Training Meet SAE J Standards” a new overarching standard that covers certification to 11 SAE standards at this point. All key laboratory results for certification testing to one of the standards must be provided to SAE for posting on the new MAC Conformance Registration website (http://macdb.sae.org).

Adapted from an article in the February 14th edition of AEI Online.

SAE International standards collections now available on DVD

SAE International’s technical standards collections now are available on DVD. Previously available on CD, the change in format provides an upgrade to this popular product and uses the latest version of the powerful Folio Views search engine, which is compatible with Windows 7 and 64-bit systems. In addition, the DVD format allows storage of more content, reducing the number of disks needed for each collection.

Each DVD contains:

- Full-text PDFs of all current, industry-specific standards. The number of standards currently on each DVD is as follows:
  - Aerospace Materials Specifications: 3,210
  - Ground Vehicle Standards: 2,492
  - Aerospace Standards: 5,010
- Full-text PDFs of any standards cancelled after January 1, 2002.
- A common index of all documents contained in the three standard DVDs. The index is fully searchable and displays summary information for each document (e.g., title, document number, scope).
- The Folio Views search engine, which allows a user-friendly, efficient way to locate SAE standards.

SAE International Standards on DVD are updated every quarter. For more information, regarding content, pricing, or usage, contact a SAE Customer Sales Representative at 1-888-675-3976 (U.S. & Canada) or 1-724-772-4086, or email customersales@sae.org.

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
Battery committees approach includes engagement at earlier stages of field maturity

In his fourth update from the SAE Battery Safety Standards Committee, Chair Bob Galen provides insight into how a "lean and mean standards producing machine" is charging ahead to a much better—and more productive—battery future thanks in a few steps from the past. 

Featured in the current issue of Batteries International Magazine.

I've done a bit of gripping in past columns about how we—both the US and the SAE International Battery Technology Standards Committee—were not moving quickly enough. But we are beginning now to "get it." SAE International recently added two new committees: the Ultracapacitor for Automotive Applications and Battery Field Discharge and Disconnect Committees that mark a new way of thinking.

Both committees are examples of a new SAE International approach to emerging technologies where engagement occurs at earlier stages of maturity in the fields in order to develop high-value tools for use in the market, as well as to develop shared standards that can benefit other committees.

The Ultracapacitor Committee was formed because the energy storage industry and the automotive industry are leading technological innovations with ever-more-rapid acceleration. Ultracapacitors provide an energy storage technology complementary to electrochemical energy storage systems and understanding how to apply ultracapacitors into automotive solutions furthers the advancement of the industry's ability to develop innovative solutions for electrical drivetrains, according to Oliver Gross, chair of the Ultracapacitor Committee and an energy storage systems specialist.

The committee is focused on the performance, safety, and testing characteristics for ultracapacitors. Ultracapacitors have many similarities to batteries, including performance and life concerns, as well as abuse characterization. It will canvas both the energy storage and automotive industries for ideas and input on standards. According to Gross, the initial scope may need to be expanded into other technical areas as well. Ultracapacitors are quite new to the transportation area and the lack of agreement upon measurements and tests has complicated the ability to characterize these devices. One popular option has been to pair ultracapacitors with batteries and combine the best characteristics of both. Characterization tests have been proposed but not yet elevated to standards.

Gross expects ultracapacitors committee members to work closely with others addressing testing methods, labeling, abuse testing, packaging, and fuel gauging, among others. Conversely, the output of the committee could possibly suggest the modifications of standards from these other committees. The realistic goal is to create a combination of unique standards and guidelines and eventually the modification of existing documents.

In other developments, Dominico Gabrielli is leading the newly formed SAE International Battery Field Discharge and Disconnect Committee, which is in the process of staffing up and preparing some basic goals.

Several of the committees may be impacted by the discussion and topic forums from the April NAA/BB Batt Workshop held in Chicago, at which I was honored to serve as moderator of the panel entitled "Battery Experiences for Cell and System Level Solutions." Therefore, safety is currently an important topic and truly a regulatory concern. I have no doubt the information shared in the workshop will be an ongoing source of information for the committees and may well affect their directions.

Also, Rich Byczek has taken over as chair for the 30-member strong SAE International Battery Test Equipment Committee and has revisited the engines since taking the helm in early March. He has identified four main areas of focus: cycling (charge/discharge) performance equipment; vibration/mechanical durability; environmental simulation (temp/hum/alt); and safety factors (facility and equipment options). "Safety factors" is probably most important because it directly relates to the safety of workers performing testing. Cycling performance may develop some added complexity according to Byczek as the equipment manufacturers have a vested interest in having the standard match the equipment. While these are equipment capabilities, the reality is that we will come up with the best possible options. The next focus for the committee will be collecting best practices information, specifically from the past few years of Lithium-ion testing. This committee will no doubt need to work closely with the Battery Testing Committee to be sure that any parameters specified correlate to the latest testing methods. Byczek envisions two potential recommended practice documents: one on facility and equipment safety practices and a second on equipment performance parameters related to EV batteries.

Less than stellar EV auto sales due to the economic crisis have placed a new importance on EV truck and bus fleets, and thus added focus for the SAE International Truck and Bus Battery Committee, headed by Dan Youngs. Many on the committee feel that the industry has a chance at standardizing at the pack level for energy storage. The work of the committee now includes developing key proving quickly enough to support the interchangeability of any energy storage system (ESS) units for truck and bus applications. Through 2012, it will focus on producing a Technical Information Report outlining applicable standards and recommended practices that will guide the design of an ESS for EV or hybrid-EV trucks or buses. One of the first steps, according to Youngs, is to pick a set of standard voltage ranges and a communication protocol. Currently, it looks like buses will head toward 600v systems and trucks are using 300v systems. The committee will focus on voltage ranges and communication messages and expect in future years to tackle energy, power, and mechanical mounting, among others in 2012.

The financial crisis is having some additional fallout for the industry and, not all of it bad for batteries in the long term. What do I mean? I absolutely believe the consolidation of the large players is in full swing. I also believe this consolidation, which comes out of the market not growing as expected, is the natural evolution of a new market because let's face it, it's a difficult job making electric cars.

Finally, several committees have either recently completed balloting on documents or are in the process. The SAE International Labeling Committee recently passed ballot on J2938: Vehicle Battery Labeling Guidelines, which covers "labeling guidelines for any electrical storage device at all levels of sub-component, component, subsystem and system level architectures describing content, placement and durability requirements of labels." Bravo to Mark McGory, the primary author of this new standard! Now that it's tackled, the team will be re-directed toward another area of labeling.

The Starter Battery Committee is proving that there is always new work to be done, even for standards previously addressed. The group is tackling J1495: Test Procedures for Battery-Flame Retardant Venting Systems. This is an old document going through a five-year review. With a 29-member team, there may well be dissension now that it is out for balloting, but I am confident the importance of this document will inspire people to move through concerns and hammer out a final version very soon.

One "little" point about our eighteen committees and hundreds of volunteer members: the oil of this standards-generating-machine is a set of helpful tools provided by SAE International to guide the work of the committees. Of course, with so many chairs and members, everyone might have a very different view of how we go about the task of "standards making." However, as SAE knows a bit about standards, it is with its guidelines, request forms, reference tools, governing policies, balloting, and committee structure that we are able to streamline our work and deliver an outcome where all voices of the industry are heard. It sure beats reinventing the battery.

My many thanks to all of our dedicated committee volunteers. If interested in being involved the work of the SAE Battery Committees, please contact me at robertgalyen@magnae.com

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”

- SAE Standards activities were featured in a table-top exhibition at the 2012 IEEE International Electric Vehicle Conference, March 4-8 in Greenville, South Carolina. Keith Wilson, Technical Project Manager, SAE Global Ground Vehicle Standards, also presented an overview of SAE Ground Vehicle Standards activities related to EVs and PHEVs and participated in a panel discussion on EV standards.

- At the SAE BRASIL New Automotive Technology Symposium on March 26 in Sao Paulo, Brazil, SAE Technical Project Manager Keith Wilson presented a comprehensive overview of the latest SAE Ground Vehicle Standards and research efforts in the area of PHEV (Plug-in Hybrid Electric Vehicles) and BEV (Battery Electric Vehicles) including charging solutions, battery safety, interoperability and communication between EV and the electric grid.

- Gery Kissel, Chair of the SAE J1172 Conductive Charger Committee and Richard Scholer, Chair of the J2836, J2847 & J2931 Communications Committee provided presentations on SAE conductive charge connector standards to the Electric Power Research Institute (EPRI) Infrastructure Working Council Meeting, March 27, Atlanta, Georgia.

- Keith Wilson participated in a panel discussion at the National Alliance for Advanced Technology Batteries in Chicago, Illinois on April 2. Keith provided an overview of the SAE Cooperative research Project for Rechargeable Energy Storage Systems (RESS) Safety, and also provided an overview of standards development activities by SAE's battery committees. Monique Richard, Chair of the SAE Battery Testing Standards Committee and Robert Galyen, Chair of the SAE Battery Steering Systems Committee also participated on the panel.

- Robert Galyen, Chair of the SAE Battery Standards Steering Committee, provide an overview of standard development activities by each of the 16 SAE battery committees, and discussed the development of two new SAE battery standards committees at the Advanced Lithium Ion Battery International Symposium in Charlotte, North Carolina on April 18-20.

- Ground Vehicle Standards staff members attended the SAE 2012 World Congress on April 22-24 in Detroit, Michigan to meet with both industry and government executives to discuss Ground Vehicle Standards development activities in areas such as EV / PHEV’s, advanced safety, ITS, fuel cell vehicles and SAE Cooperative Research Projects. In addition, SAE Ground Vehicle Standards Committee meetings were held during the SAE 2012 World Congress event at both Cobo Hall and SAE Automotive Headquarters.

- Peter Byk, Ground Vehicle Standards staff member, spoke at the UL annual meeting in Chicago, Illinois on May 7, discussing SAE's activities in the green and connected technology areas.

- Michael Brown, SAE International Standards Specialist, acted in her official capacity of Secretariat and U.S. Administrator of TC22 SC13 – Road Ergonomics to and several working groups as part of the semi-annual ISO TC22 SC15 and working group meeting, May 7-11 in Berlin, Germany.

Look for SAE at these upcoming events:

- Mary Doyle. Ground Vehicle Standards staff member, will represent SAE Ground Vehicle Standards at the Ward’s Automotive Interiors Conference, May 17 in Dearborn, Michigan.

- Galen Ressler, Chair SAE Battery Safety Standards Committee, Robert Galyen, Chair SAE Battery Steering Committee, Jack Pokrzywa, SAE Ground Vehicle Standards Manager, and SAE Ground Vehicle Standards staff members Peter Byk and Keith Wilson will attend the DOT/NHTSA Battery Safety Symposium on May 18 in Washington D.C. Mr. Galyen will provide a presentation on SAE Hybrid/EV related standards activities.

- Nikki Ameredes, SAE International Standards Specialist, will be in Kyoto, Japan, May 28-June 1. She will be acting in her official capacity of Secretariat and U.S. Administrator to several working groups as part of the semi-annual ISO TC22 SC10 and SC12 working group meeting.

- Peter Byk will serve as panel moderator at the ITS Michigan Annual Meeting, on May 30 in Dearborn, Michigan.

V2V, V2I, connected vehicle technology developments covered at 2012 SAE World Congress

The latest developments in connected vehicle technology were spotlighted throughout the SAE 2012 World Congress. A number of speakers who are involved with efforts related to the U.S. Department of Transportation's Vehicle-to-Vehicle (V2V) and Vehicle-to-Infrastructure (V2I) Technology Test Bed discussed the test bed’s use in public and private sector testing and development activities.

The keynote speaker in the AVL Technology Leadership Center on April 26 was David Strickland, Administrator, National Highway Traffic Safety Administration (NHTSA), who discussed NHTSA's efforts related to active safety, connected vehicle technology, and V2V and V2I connectivity.

A "Chat with the Experts" session on the U.S. Department of Transportation (DOT) V2V and V2I Technology Test Bed, held on April 25, featured Walter Fehr, Program Manager, Systems Engineering, at the DOT's Research and Innovative Technology Administration, and Greg Krueger, Connected Vehicle Program Manager for SAC.

Experts from OEMs, suppliers, government and academia participated in the "Connected Vehicle Technology – Establishing a Market Base and Breaking Down the Barriers to Entry" panel discussion on April 25. The panel addressed connected vehicle technology developments and provided insight on how the industry can achieve a market niche for this technology. Participants addressed IVS, active safety, and infotainment technologies as they relate to V2V and V2I.

A panel discussion on “How the Connected Vehicle is Changing the Safety Paradigm” was held on April 26. The panel explored how to overcome the challenges created by the connected vehicle while implementing the potential safety benefits.

More information on the V2V and V2I Technology Test Bed can be found at http://www.okdocs.fhwa.dot.gov/factsheets/v2v\_v2i\_tsdbd\_factsheet.html

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.

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- 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
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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
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(Feb 2012 – May 1, 2012)

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.

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New SAE International committee chairs

- Luis Moreiras, Retired/Consultant, Parker Hannifin Corporation — Materials, Processes and Parts Council
- Phil Yaccarino, General Motors — Fuel Systems Standards, Motor Vehicle Council
- A sincere thank you goes to Outgoing Chair Pam Graham, Energy Automotive Systems LLC for her excellent support.
- Rob Mangan, Link Engineering Company — All-Wheel Drive Committee, Motor Vehicle Council
- A sincere thank you to Outgoing Chair Ben Malinke, Eaton Corporation for his excellent support.

Nominate a deserving individual for an SAE award

Arch T. Colwell Cooperative Engineering Medal
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. The medal was named in honor of Arch T. Colwell, its first recipient and 1941 SAE President. Dr. Colwell symbolized the dedication and devotion of SAE members who work to further the objectives of the SAE Technical Standards Program.

Henry Souther Standards Award
Deadline: August 31

This award acknowledges accomplishments in standards development in the disciplines of environment, safety, materials, testing and emissions. It honors Henry Souther, 1911 SAE President, known as the father of SAE standards. It is administered by the Environmental Award Committee under the auspices of the SAE Sustainable Development Program Committee. Submit nominations at www.sae.org/awards

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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/

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New, revised & stabilized SAE standards (Feb 2012 – May 1, 2012)

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<td>MOTOR VEHICLE COUNCIL</td>
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<td>Development of Design and Engineering Recommendations for In-Vehicle Alphanumeric Messages</td>
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<td>Safety and Human Factors Steering Committee</td>
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<td>Interior Climate Control Standards</td>
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<td>R-1234yf/HFO-1234yf Recovery/Recycling/Recharging Equipment for Flammable Refrigerants for Mobile Air Conditioning Systems</td>
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<td>Recovery Equipment for Contaminated Refrigerant From Mobile Automotive Air Conditioning Systems</td>
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<td>R-1234yf and Service Hose, Fittings and Couplers for Mobile Refrigerant Systems, Service Equipment</td>
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<td>J2099_201202</td>
<td>Standard for Purification of R-134a (HFC-134a) and R-1234yf (HFO-1234yf) for Use in Mobile Air Conditioning Systems</td>
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<td>Vehicle E/E System Diagnostic J1930DA_201203</td>
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    - Brake Lining Standards
    - Brake NVH Standards
    - Brake Display Standards
  - Highway Tire Forum Steering Cmte
    - Vehicle Dynamics Standards
    - Wheel Standards
    - Brake Fluid Standards
  - Automotive Brake & Steering Hose Standards
  - Automotive Brake Components Standards

- Vehicle Safety Systems Group
  - Crash Data Collection and Analysis SC
    - Roadway Environment Data Standards
    - Safety Features
  - Restraint Systems Standards SC
    - Child Restraints
    - Seat Belt Systems
    - Inflatable Restraints
  - Safety Components Advisory Grp
    - Human Biomechanics & Simulation SC
    - Dummy Testing & Equip
  - Driver Safety Advisory Group
    - Impact & Reliability Test Procedures
    - Safety Test Instrumentation Standards

- Service Development Steering Committee
  - Service
    - Tech Support
  - Towability
  - Graphics Based Service Info

- Automotive Quality & Process Improvement Committee
  - Jack Polkzywa – jackp@sae.org
  - Gary Polkiz – gary@sae.org
  - Kris Siddall – kssiddall@sae.org
  - Peter Ryk – peterryk@sae.org
  - Keith Wilson – kwilson@sae.org

- Electrical Systems Group
  - Vehicle E-E Systems Diagnostic
    - Electronic Design Automation Standards
  - Vehicle Architecture for Data Communications
  - Embedded Software Standards
  - Automotive Electronic Systems Reliability
    - Electromechanical Flat Panel Displays Standards
  - Electromagnetic Compatibility (EMC)
  - Electrical Distribution Systems SC
    - Connector Systems
    - Cable Standards
  - Harness Covering
  - Circuit Protection & Switch Devices
  - Functional Safety
  - Automotive OEM EMC
  - Power Data Records
  - Vehicle Electrical System Security

- Green Technology Groups
  - Green Technology Steering Committee
  - Green Bio-Materials Task Force
  - Green Terminology Task Force

- Work Track Safety Committee
  - Advanced & Hybrid Powertrain SC
  - Alternative Fuels
  - Hybrid Safety
  - Electric Hybrids
  - Body & Occupant Environment SC
    - Truck Crashworthiness
    - Washed/Wipers & Climate Control
  - Human Factors
  - Electrical/Electronic Steering Cmte
  - International Lighting Advisory Group
    - Lighting Materials Standards
    - Lighting Coordinating Advisory Group
  - Automotive Corrosion & Prevention
  - Metals Technical Executive Steering Cmte
  - Brake Linings Standards
  - Brake NVH Standards
  - Brake Display Standards

- Construction, Agricultural & Off-Road Machinery Council
  - Common Tools Technical SC
    - Hydraulics
    - Electrical Components
  - Human Factors Technical Adv. Grp
    - Machine Controls – Operator
    - Machine Design Standards
    - Operator Seating and Ride
    - Operator Accommodation
  - Machine Technical Steering Cmte
    - Loaders, Crawlers, Scrapers & Attachments
    - Sweeper, Cleaner & Machinery
    - Industrial Equipment
    - Forestry & Logging Equipment
    - Excavators
    - Roadbuilding Machinery
    - Tire & Rim

- Specialized Vehicle & Equipment Council
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  - Small Engine & Powered Equipment
  - Snowmobile
  - Motorcycle
  - Marine Technical Steering Cmte
    - Marine Engine Fuel Systems
    - Marine Electrical Systems
    - Marine Engine Systems
  - Trailers
    - Gooseneck & Fifth Wheel
  - Trailer Dynamics
  - Conventional Towing to 20,000 lbs
  - Tire Technology
  - Ship Systems Technical Steering Cmte
    - Ship Fluid Systems

- Contact Information:
  - SAE International (248) 273-2455
  - www.sae.org

- Standards Derivative Programs
  - Hose+Valves Compendium
  - J2734.1 Steering Wheel Standards

- Cooperative Research Projects
  - RISS Safety
  - High Strength Steels
  - TRB Irradiation
  - TRB/CASTOR
  - Emergency Vehicle Lighting
  - Vehicle Sound Level for Passengers
  - Plastic Components for use with H2