Amendment No. 1 to (12/2023)
to
AIS-171 Safety Requirements for Type Approval of Vehicles operated using Anhydrous Ethanol & Higher Ethanol Blended Motor Gasoline (EBMG) (for Blends above 20 %)

1.0 Clause 4.4.6

Substitute following text for existing text:

Fire Extinguishers for higher EBMG fueled vehicles: 3 Wheelers or Passenger car or Sports Utility Vehicle which run on higher EBMG (Containing Ethanol above 20%) and Buses running on ED-95 should be equipped with AR Foam based/ Dry chemical powder type fire-fighting canisters of Min. 1Kg. The canister should be placed in an appropriate place inside the vehicle which is accessible to all the occupants in case of emergency.

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THE AUTOMOTIVE RESEARCH ASSOCIATION OF INDIA

P. B. NO. 832, PUNE 411 004

ON BEHALF OF

AUTOMOTIVE INDUSTRY STANDARDS COMMITTEE

UNDER

CENTRAL MOTOR VEHICLES RULES - TECHNICAL STANDING COMMITTEE

SET-UP BY

MINISTRY OF ROAD TRANSPORT & HIGHWAYS

(DEPARTMENT OF ROAD TRANSPORT & HIGHWAYS)

GOVERNMENT OF INDIA

20th December 2023

AIS-171

AUTOMOTIVE INDUSTRY STANDARD

Safety Requirements for Type Approval of Vehicles operated using Anhydrous Ethanol & Higher Ethanol Blended Motor Gasoline (EBMG) (for Blends above 20 %)

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March 2021

INTRODUCTION

The Government of India felt the need for a permanent agency to expedite the publication of standards and development of test facilities in parallel when the work on the preparation of the standards is going on, as the development of improved safety critical parts can be undertaken only after the publication of the standard and commissioning of test facilities. To this end, the erstwhile Ministry of Surface Transport (MoST) has constituted a permanent Automotive Industry Standards Committee (AISC) vide order No. RT-11028/11/97-MVL dated September 15, 1997. The standards prepared by AISC will be approved by the permanent CMVR Technical Standing Committee (CTSC). After approval, the Automotive Research Association of India (ARAI), Pune, being the secretariat of the AIS Committee, will publish this standard.

Presently Government of India is emphasizing usage of bio-fuels in the automotive vehicles to reduce the impact on environment as well as reduce import bills of crude oil from which mineral fuels are produced. Ethanol is one of the bio-fuel which provideclean, reliable and sustainable energy supply for meeting the growing demand of transportation fuels in the country. In India, Ethanol is produced primarily from sugarcane. There are alternate sources identified and work in progress for producing Ethanol from bio-mass also. In order to accelerate the development and utilization of ethanol in automotive fuel in our country (especially as a blend with Gasoline), National Biofuels Policy was announced in 2018 by Ministry of Petroleum and Natural Gas (MoPNG). Accordingly, Blending of Ethanol in Gasoline fuel was increased. Presently Ethanol is blended with Gasoline fuel up to 10 %. MoPNG insists and planned to increasethe blending percentage to 20 %. Further, there is a plan to introduce E-85 and E-100 fuel in the regions of our country where there are surplus Ethanol is available.

An AISC panel has been constituted vide the directions RT-11036/ 111/2020-MVL dated 16th September 2020 received from Ministry of Road Transport to generate a standard which specifies safety requirements related to those vehicles which can use blended fuel having ethanol above 20%. This standard will recommend the code of practice forHigher Ethanol Blended Motor Gasoline fueled vehicles (20 % and above). The purpose of this standard is to enhance vehicle safety by specifying safety requirements for hazards such as fire, corrosion, exposure to fumes etc. The Composition of the Panel and Automotive Industry Standards Committee (AISC) responsible for preparation and approval of this standard are given in Annex I and II.

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Safety Requirements for Type Approval of Vehicles operated using Anhydrous Ethanol & Higher Ethanol Blended Motor Gasoline (EBMG) (for Blends above 20 %)

1.0	**SCOPE**
	This standard is applicable to vehicles of category L, M and N which will use gasoline fuel blended with Ethanol (EBMG) for blends above 20 % as admixture meeting the quality requirements specified by corresponding BIS standards. This standard is applicable for flex fuel vehicles and those which can run on neat Ethanol (with required co-solvents and additives). Further, it should be noted this standard is applicable only to vehicles manufactured by Original Equipment Manufacturer (OEM) which are compliant to the usage of Ethanol blended fuels and warranted to use such fuels. This standard is neither applicable to fuel cell vehicles nor retrofitted vehicles (vehicle components upgraded after sales and not by OEMs).
2.0	**REFERENCES**
2.1	**USDOE** Handbook for Handling Ethanol Gasoline Blends, DOE/GO-102016-4854dated Feb 2016
2.2	**IEA** - Advanced Motor Fuels- Report on Ethanol as a fuel for Road Transportation - May 2009
2.3	**Renewable Fuels Association (RFA) -** Industry Guidelines, Procedures and Specifications - E85 as an automotive fuel - March 2009
2.4	**NREL** - Vehicle Codes and Standards - Alternative Fuels, NREL/TP-560-47336 - February 2010
2.5	**ACS** - American Chemical Society **https://pubs.acs.org/doi/10.1021/acsomega.8b03686**
3.0	**DEFINITIONS**
3.1	**Ethanol:** Ethanol, also called ethyl alcohol is pure organic chemical made from molasses, grains or bio-mass is a colorless, volatile, flammable liquid with a strong characteristic odor.
3.2	**Anhydrous Ethanol:** Anhydrous ethanol is essentially ethyl alcohol, with minimum 99% purity and complying to the IS 15464 specification. Anhydrous Ethanol also refers to the Ethyl Alcohol which is denatured, meant for use in Automotive Gasoline blending or use directly as a fuel in suitable engines with appropriate additives and co-solvents.
3.3	**E-20:** E 20 is acronym of the fuel complying to IS 17021 specifications, blend made of 20 % Anhydrous Ethanol with 80 % Motor Gasoline which can be used in vehicles fittedwith spark ignited or direct injected gasoline engines which

	have compliance for using such fuel blends ~~using such fuel blends~~.
3.4	**E-85:** E85 is the acronym of the fuel complying to the IS 16634 specification, blend made of 70 to 85% Ethanol with Motor Gasoline. It is called as flex fuel also and to be used in vehicles fitted with spark ignited or direct injected gasoline engines which have compliance for using such fuel blends.
3.5	**ED-95**: It is a blend of 95 % ethanol with Additive as defined in CMVR 115 E to be used in vehicles fitted with compression ignition engines and is defined by Specification IS 16629: 2017.
3.6	**E-100:** E 100 is acronym of a fuel which primarily consists of Anhydrous Ethanol complying to IS 15464 specifications greater than 93% with other hydrocarbons as co-solvent. This fuel can be only used in vehicles which are manufactured with compliance tosuch a fuel. The specification of this fuel can be referred in BIS portal as soon as it is published.
3.7	**Denaturant:** Denaturant is a substance completely miscible in ethyl alcohol and of such a character that while its addition makes the material or any aqueous dilution of it unpleasant and unwholesome for potable purposes, its presence does not render anhydrous ethanol, either as such or blended with petrol or diesel, unsuitable for use in automobile engines.
4.0	**REQUIREMENTS**
4.1	**Anhydrous Ethanol Fuel Quality Requirements for Safety**
4.1.1	Ethanol as an admixture or directly to be used as fuel in automotive vehicles should comply to the technical requirements published by Bureau of Indian Standards (BIS). Gasoline blended with Ethanol and used as fuel in automotive vehicles is termedas EBMG fuel. Presently the BIS specifications viz., IS 15464 can be referred for quality requirement of Ethanol used for blending in Gasoline fuel respectively.
4.1.2	Ethanol during transportation for blending with Gasoline should be denatured by using denaturants as prescribed by IS 4117. Prohibited denaturants are mentioned in IS 15464. Fuel manufacturers must ensure any such components are not used.
4.1.3	Moisture content in Ethanol should be controlled as mentioned in the IS 15464 specification since its detrimental to the blended fuel stability as well as cause incompatibility with fuel system polymer or metal components corrosion.
4.1.4	Blended fuel should be fortified with necessary corrosion inhibitors and seal protection agents to avoid corrosion and ageing issues respectively.
4.1.5	Ethanol Quality is driven by both the national Fuel Standards and octane requirements. The important chemical properties of ethanol affecting safety are given below in Table 1.

	Table 1 Ethanol Properties affecting Vehicle Safety (Source: USDOE)	
	Property	Comment
	Vapor Density	Ethanol vapour, like gasoline vapour, is denser than air and tends to settle in low areas, Ethanol/ gasoline blends, including E85, should be treated like gasoline blends with respect to handling and safety.
	Solubility in water	Ethanol is extremely hydroscopic (i.e. attracts water), Water should be removed to the extent possible from fuel ethanol handling, storage, and distribution equipment. A small amount of water is soluble in E85, but at higher concentrations, the gasoline portion will separate from the ethanol/water mixture.
	Energy Content	For identical volumes, ethanol contains approximately 30% less energy than gasoline, depending on the gasoline formulation. As a result, vehicle fuel economy of E85 can be expected to be reduced by about 25%, depending on the gasoline formulation and the individual vehicle.
	Flame Visibility	A fuel ethanol flame is less bright than a gasoline flame, but is easily visible in daylight.
	Specific Gravity	Pure ethanol and ethanol/gasoline blends are slightly denser than gasoline.
	Conductivity	Ethanol and ethanol blends have increased electrical conductivity compared to gasoline. This can affect materials compatibility due to increased corrosion of certain metal junctions and exposed electrical connections.
	Air-Fuel Ratio.	Due to the oxygen content in ethanol, the ideal or "stoichiometric" air-fuel ratio for E85 is a lower value than it is for gasoline (i.e. fewer pounds of air per pound of fuel) FFVs are designed to detect ethanol and property adjust the air fuel ratio.
	Toxicity	Pure ethanol is small amounts is not toxic and is not considered carcinogenic due to the addition of hydrocarbons and gasoline.
	Flammability	Depending on the hydrocarbon blending component, the vapour concentration in the storage tank head space of many E85 blends can fall into the flammable range. This is a concern primarily at low ambient temperatures.
4.1.6	Ethanol and Gasoline have different explosion limits. For Gasoline stored in a closed container, a gas atmosphere at which an explosion may occur ranges typically from - 41 ℃ to - 10℃ and for E85 between - 33℃ and 11℃. Extra	

	precautionary measuresfor handling high ethanol blends may be necessary and can be referred to the PESO guidelines. Potential fire risk due to static electricity is possible during fuel filling. Hence, it is recommended to install suitable flame arrestor device or filling shut off valve in the retail outlets to avoid such incidences. E100 fuel should be blended with Gasoline or suitable hydrocarbon materials to make the flame easily visible.
4.1.7	Trace elements like sulfates and chlorides may be present in Ethanol as impurities. Excess of these may cause the formation of deposits on gasoline injection components. Hence, these contaminants should be limited as per the IS 15464 specification.
4.1.8	Galvanic Corrosion Inhibitors for ethanol-gasoline blends
	Ethanol has high polarity and moisture affinity, which considerably influence its aggressiveness to metallic, plastic and polymer materials. The corrosion aggressiveness of EBMG fuel can be minimized by suitable corrosion inhibitors. The inhibitors are recommended in IS specifications. Additionally, can be referred from the American Chemical Society (ACS) documents also. Few of them are listed below along with suggested dosage in the Table 2.
	Table 2
	Galvanic Corrosion Inhibitors for Ethanol (Source: ACS)

	Sr. No.	**Inhibitors type**	**Purity requirement**	**Recommended Dosage mg/L**
	1	Diethylene Triamine (DETA)	99 %	100
	2	Propargyl Alcohol + Dibenzyl Sulfoxide	99 %	100+65
	3	Propargyl Alcohol + Octadecyl Amine + Mercaptobenzothiazole	99 %	100+70+25

	Please note above recommendations given are generic in nature and as specified in the reference document(s). It is essential and responsibility of the manufacturers or blenders to ensure these ultimately do not harm fuel properties, its compatibility withvehicle components and hence no impact on the tail pipe emission of vehicles.
4.2	**Material Compatibility Requirements for E100 and higher EBMG fuel (above 20 % Ethanol) in Vehicles**

4.2.1	Similar to regular gasoline fuel, it is important to ensure proper fuel handling andhousekeeping practices to minimize contamination with higher EBMG fuels also. Few of the materials widely used in Gasoline vehicles may be incompatible with higher EBMG fuels. Some materials may degrade over time, potentially leading to break-down problems such as corrosion, swelling consequently leakage of fuel which is critical safety concern. These degradations and swelling may also contaminate the fuel, whichmay adversely affect vehicle fuel system operation or cause component malfunction, lead to degraded driveability, performance and emission non-compliance.
4.2.2	EBMG fuels impact metallic components in fueling systems. Blends above E20 cancause corrosion of some of the components. Zinc, brass, lead, and aluminum have shown sensitivity to degradation with higher EBMG fuels. To address these issues, manufacturers have to upgrade materials and develop engine, fuel and vehicle systemor components to be compatible with higher EBMG fuel as directed by GSR notifications.
4.2.3	Many elastomer materials (primarily used as hoses and seals) will show faster degradation in their properties when used with higher EBMG fuels. Nonmetallic materials that degrade when in contact with fuel ethanol include natural rubber, polyurethane, cork gasket material, leather, polyvinyl chloride, nylon 6/6, methyl- methacrylate plastics, and certain thermoplastic and thermoset polymers. Some of thenon-metallic materials successfully used for higher EBMG fuels include thermoset- reinforced fiberglass, and thermoplastics.
4.2.4	Higher EBMG fuel may cause sludge in vehicle fuel tanks and found in-compatibleif commonly used Terne-plated steel (lead-tin alloy coating) and lead-based solder areused. Un plated steel with suitable coatings, stainless steel, black iron, and bronze haveshown acceptable resistance to higher EBMG fuel.
4.2.5	Electrical wiring and connectors for submersed components, such as the fuel-levelsensor and fuel pump require modification for higher EBMG fuel.
4.2.6	Increased evaporative emissions carbon canister capacity, modified fuel tank vapor pressure sensor, engine valve and valve seat materials may also be required for higher EBMG fuel.
4.2.7	The list of fuel-system components to be modified for higher EBMG fuel includehoses, fuel pump, fuel pressure regulator diaphragms and fuel injector O-rings. Thesewill support to avoid leakage and permeation of fuel vapor.
4.3	**Health Safety Considerations for Use of E100 / Higher Ethanol Blended Gasoline fuel in Vehicles**
4.3.1	Ethanol or higher EBMG fuel should be handled in the same manner as gasoline. Personal exposure should be minimized.
4.3.2	Like gasoline, EBMG fuel is highly flammable and may contain additives that canbe harmful even with casual body contact.
4.3.3	EBMG fuel is toxic and carcinogenic and should not be ingested. In case of

	accidental ingestion medical personnel must be contacted immediately.	
4.3.4	Exposure to EBMG fuel can occur by inhalation (breathing in its vapors), absorption (contact with the skin or the eyes), or ingestion (swallowing). The various symptoms of exposure to fuel ethanol are shown in Table 3.	
4.3.5	The fuel station operators filling the EBMG fuel or service mechanics in vehicle service centers or vehicle operators must use PPE equipment such as gloves, safety glasses and safety shoes when coming in contact with the EBMG fuel system.	
4.3.6	The remedial measures when exposed to EBMG fuel and ethanol are listed in Table 3	
	Table 3 **Safety precautions for Ethanol Exposure (Source: USDOE)**	
	Symptoms of Exposure	
	• Dullness of memory and concentration	
	• Impaired motor coordination	
	• Drowsiness, stupor and coma.	
	Inhalation	Move away from the vapours to fresh air, and contact medical personal immediately
	Skin Absorption	Immediately wash skin with soap, and flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and contact medical personal
	Eye Absorption	Immediately flush eye with plenty of water for at least 15 minutes and contact medical personal
	Ingestion	Lie down, keep warm, do not induce vomiting, and contact medical personal immediately.
4.4	**Fire Safety Considerations for Use of E100 or higher EBMG fuel in Vehicles**	
4.4.1	E100 and higher EBMG fuel are highly flammable liquids. These are classified and designated as Class A fuel as per PESO and class 3 fuel as per US Department of Transportation.	
4.4.2	Fighting E100 and higher EBMG fires require specific equipment, materials, and training. Conventional gasoline fire-fighting methods and chemicals are insufficient forfighting fires in vehicle fueled by ethanol blends higher than E20.	
4.4.3	EBMG fuel containing greater than 20% Ethanol require the use of a Polar Solventor Alcohol Resistant (AR) type of Foam commonly known as an AR-AFFF. AR foams haveshown superior performance across the entire range of	

	EBMG fuel firefighting and would be the optimal for the fire response equipment. Vehicles using higher EBMG fuel shouldbe equipped with AR Foam based firefighting canisters.
4.4.4	At low ambient temperature, vapor concentration of higher EBMG and E 100 fueltank vehicles will be high which can cause flammability. Hence, proper venting provisions should be made in the vehicles for vapor disbursement
4.4.5	Certified flame arrestors in the vehicle fuel system can be provided as an additional safety wherever required and considering service operations which potentially can produce spark
4.4.6	Fire Extinguishers for higher EBMG fueled vehicles: 3 Wheelers or Passenger car or Sports Utility Vehicle which run on higher EBMG (Containing Ethanol above 20%) and Buses running on ED-95 should be equipped with AR Foam based fire-fighting canisters of Min. 1Kg. The canister should be placed in an appropriate place inside the vehicle which is accessible to all the occupants in case of emergency.
4.4.7	Ventilation for E100 or higher EBMG Vehicles: Vehicles other than two wheelers which use Ethanol or higher EBMG as fuel shall be provided with the blowers or other suitable devices to ensure proper ventilation.
4.5	**Electrical Conductivity Considerations for Use of E100 / higher EBMG fuel in Vehicles**
4.5.1	E100 and higher EBMG fuel has increased electrical conductivity compared to gasoline. This can lead to increased galvanic corrosion of certain metal junctions and exposed electrical connections.
4.5.2	The addition of corrosion inhibitors in the fuel are required to reduce the electrical conductivity and hence the galvanic corrosion tendency of EBMG fuel or E100.
4.5.3	Provision for grounding of static charge buildup in the vehicle may be consideredas applicable.
4.5.4	Necessary procedural guidance can be issued to avoid any spark producing operations / tools which may cause fire hazard.
4.6	**Labeling of Vehicles compliant with higher EBMG blend (Ethanol above 20%)**
4.6.1	Higher EBMG or E 100 fuel must have the labels as shown below. It should have yellow background with Green letters.
4.6.2	The 4W vehicles label diameter should be 50 mm, with outer thickness of 4 mm, font size of 22 to be visible and pasted on the Fuel Lid flap of the vehicle.
4.6.2.1	The label shall be in position at all times, shall be in good condition, and the shape, colouring and lettering shall be easily identifiable.
4.6.3	Refer Table 4 for the dimension of the Fuel Labels and Figure 1 for the

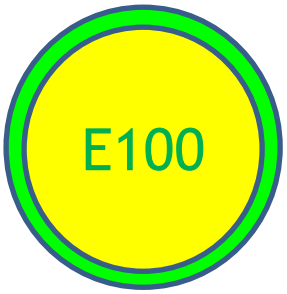
	graphical representation of lable	
	Table 4 **Dimensions of the labels**	
	Colours:	
	Background: Yellow	Background: Yellow
	Letters: Green	Letters: Green
	Dimensions:	
	Font Size: 22 mm	Font Size: 22 mm
	Character thickness: 4 mm	Character thickness: 4 mm
	Sticker Diameter: 50 mm	Sticker Diameter: 50 mm
		
		
	Figure 1 : Labeling for M & N Category Ethanol Vehicles	
4.6.4	Two Wheelers using higher EBMG or E 100 fuel must have the labels as shown below. It should have blue background with white letters (in accordance with Clause 7.3 of ISO 3864-1:2002). The 2W label diameter should be minimum 13 mm and font size of minimum 14 points (scalable to the size of the shape based on blending ratio) to be visible and pasted near/on the fuel lid of the vehicle or where rider can see easily.	
	Representative labels for higher EBMG compliant 2W vehicles are shown below. (Blue colour should be in accordance with Clause 11 of ISO3864-1:2002)	

	
	Figure 2 : Labeling for L Category Ethanol Vehicles
4.6.5	It should be noted and instructed to customers through Owner's manual or appropriate medium; Fill the higher EBMG fuel from the retail outlets which display exactly similar sign boards.
4.6.6	Appropriate labelling of dispensing pumps and guns confirming to international standard to be also considered by oil companies marketing or retail division. Type of fuel filled should be clearly visible to both the retail outlet person and the consumer which will avoid any wrong fuel being filled. Filling of wrong grade of EBMG fuel or other than the one recommended for their vehicle may cause performance deterioration and emission non-compliance

ANNEX I
(See Introduction)
COMPOSITION OF AISC PANEL ON
Safety Requirements for Type Approval of Vehicles operated using Anhydrous Ethanol & Higher Ethanol Blended Motor Gasoline (EBMG) (for Blends above 20 %)*

Chairperson	**Organization**
Dr. S. S. Thipse	ARAI
Members	**Representing**
Mr. Sandeep Rairikar	ARAI
Mr. M. A. Bawase	ARAI
Mr. K. P. Kavathekar	ARAI
Mr. Ajay Dekate	ARAI
Mr. Kamalesh Patil	ARAI
Ms. Vijayanta Ahuja	ICAT
Mr. Vikas Sadan	ICAT
Mr. V. Kagdiyal	IOCL
Mr. P. Sakthivel	IOCL
Mr. Uday Harite	ACMA
Mr. P. S. Gowrishankar	SIAM (Tata Motors Ltd.)
Mr. Shailendra Dewangan	SIAM (Tata Motors Ltd.)
Mr. Uday Salunkhe	SIAM (Tata Motors Ltd)
Mr. Sethuramalingam Tyagrajan	SIAM (Tata Motors Ltd)
Mr. Harjeet Singh	SIAM (Hero Motocorp)
Mr. Feroz Khan	SIAM (Hero Motocorp)
Mr. Anoop Bhat	SIAM (Maruti Suzuki India Ltd.)
Mr. Gururaj Ravi	SIAM (Maruti Suzuki India Ltd.)
Mr. Nishant Sarna	SIAM (Maruti Suzuki India Ltd.)
Mr. Kumar Ajay	SIAM (Maruti Suzuki India Ltd.)
Mr. Ramprabhu	SIAM (Mahindra & Mahindra)
Mr. Sudhir Sathe	SIAM (Mahindra & Mahindra)
Mr. Nitin Mahajan	SIAM (Mahindra & Mahindra)
Mr. Devinder Tangri	SIAM (Mahindra & Mahindra)
Mr. Faustino	SIAM (Ashok Leyland)
Mr. Ved Prakash Gautam	SIAM (Ashok Leyland)

Mr. Krishnamoorthi Gnanasekaran	SIAM (Renault Nissan India)
Mr. Raj Ajay Kumar	SIAM (Renault Nissan India)
Mr. S. Muthukumar	SIAM (Renault Nissan India)
Mr. Shekar MB	SIAM (Toyota Kirloskar Motors)
Mr. Subhash Mahajan	SIAM (TVSM)
Mr. Makrand Bramhe	SIAM (Volkswagen)
Mr. Venu Suresh	SIAM (Yamaha)
Mr. Pankaj Kumar Karn	SIAM (Ford India)
Mr. Chaitanya Joshi	Praj Industries
Mr. S. Koulgi	Swagelok
Mr. Devashish Gupta	Advantek
Mr. Fredrick A	Bosch
Mr. Kulkani Shailesh	Eco Fuel System
Mr. Vivek Murali	Valeo
Mr. Noel Peters	Denso
Ms. Yuko Kobayashi	Denso
Mr. Anant Wanpal	Shigan

* At the time of approval of this Automotive Industry Standard (AIS)

ANNEX II
(See Introduction)
COMMITTEE COMPOSITION *
Automotive Industry Standards Committee

Chairperson	
Dr. Reji Mathai	Director The Automotive Research Association of India, Pune
Members	**Representing**
Representative from	Ministry of Road Transport and Highways (Dept. of Road Transport and Highways), New Delhi
Representative from	Ministry of Heavy Industries and Public Enterprises (Department of Heavy Industry), New Delhi
Mr. S. M. Ahuja	Office of the Development Commissioner, MSME, Ministry of Micro, Small and Medium Enterprises, New Delhi
Mr. Shrikant R. Marathe	Former Chairman, AISC
Mr. R.R. Singh	Bureau of Indian Standards, New Delhi
Director	Central Institute of Road Transport, Pune
Director	Global Automotive Research Centre, Chennai
Director	International Centre for Automotive Technology, Manesar
Director	Indian Institute of Petroleum, Dehra Dun
Director	Vehicles Research and Development Establishment, Ahmednagar
Director	Indian Rubber Manufacturers Research Association
Representatives from	Society of Indian Automobile Manufacturers
Mr. R. P. Vasudevan	Tractor Manufacturers Association, New Delhi
Mr. Uday Harite	Automotive Components Manufacturers Association of India, New Delhi
Mr. K. V. Krishnamurthy	Indian Construction Equipment Manufactures' Association (ICEMA), New Delhi
Member Secretary	
Mr. Vikram Tandon	The Automotive Research Association of India, Pune

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