BUREAU OF INDIAN STANDARDS

AGENDA

Name of the Committee	No. of Meeting	Date and Time	Day	Venue
Automotive Vehicles Running on Non-conventional Energy Sources Sectional Committee, TED 26	Twenty-Seventh (27th)	31st May 2024 from 10:30 AM onwards	Friday	Webex

CHAIRPERSON: Dr S.S. Thipse **MEMBER SECRETARY:** Shri Gaurav Jayaswal
HEAD (TED): Shri Deepak Aggarwal

ITEM 0 WELCOME ADDRESS

0.1 Welcome remarks by the Head (TED)

0.2 Opening Remarks by the Chairperson

ITEM 1 CONFIRMATION OF THE MINUTES OF LAST MEETING

1.1 The Minutes of the 26th Meeting of Automotive Vehicles Running on Non-conventional Energy Sources Sectional Committee, TED 26 held in online mode through Webex Video Conferencing Platform, on 26/09/2023 were circulated through BIS Portal.

1.2 No comments with regards to decision of committee have been received. The Committee may kindly confirm the Minutes.

ITEM 2 SCOPE AND COMPOSITION OF THE SECTIONAL COMMITTEE

2.1 Existing Scope of Sectional Committee TED 26 as approved by TEDC in its 30th Meeting dt. 18/03/2024 is as follows:

a) *Scope : "Standardization of Fuel System Components for Automotive Vehicles using New and Renewable Energy Sources such as Compressed Natural Gas (CNG), Liquified Natural Gas (LNG), Liquefied Petroleum Gas (LPG), Bio-CNG (CBG), Bio-diesel/diesel blends, alcohol (Ethanol/Methanol)-petrol blends, Hydrogen, Hydrogen/Methane Blends, Fuel Cells, DME, DME-LPG Blends, Ammonia along with other synthetic fuels and their installation requirements."*

b) *Liaison : "Liaison with Co-ordination of work with ISO/TC 22/SC 41 (Voter), ISO TC 197 (Voter), ISO/TC 22/SC 37 (Ballot Monitor)"*

The Committee may please note.

2.2 The present composition of this Sectional Committee, TED 26 is given in **Annex- 1.** The list shows the attendance of the members in the last three consecutive meetings and also their status as Consumer, Industry, Testing Laboratory, etc. The Committee may deliberate and decide on further continuation / deletion of representation of these organizations.

2.3 Following organizations failed to attend consecutive previous two (2) meetings:

Sl. No.	NAME OF THE ORGANIZATION
1.	Bosch Limited, Bengaluru
2.	Central Institute of Road Transport, Pune
3.	Central Pollution Control Board
4.	Delhi Transport Corporation
5.	GAIL (India) Limited, New Delhi
6.	Ministry of New and Renewable Energy, New Delhi
7.	Petronet LNG Ltd. New Delhi
8.	Prodair Air Products India Private Ltd., Pune
9.	TVS Motor Company Ltd, Hosur
10.	Volkswagen India Pvt. Ltd.

The committee may discuss the course of action to retain/remove the membership of aforementioned organizations in line with Circular PNC09/18/2023-PNC-BIS dated 05/09/2023.

2.4 Following New Co-option requests have been received for membership of SC TED 26 :

Sl. No.	Name of Organisation	Name of Representative	CV/Resume/ Nomination Proforma	Remarks
1.	Chakr Innovation Private Limited, Gurugram	Smt. Chhavi Agarwal	**Annex- 2**	-
2.	The Energy and Resources Institute (TERI)	Dr Piyali Das, Dr Sanjukta Subudhi	**Annex- 3**	-

3.	M/s Apurwa Green Tech	Smt. Apurwa Shinde	-	The co-option request was discussed in the last meeting and as per Item 2.5.3 of the minutes of last (26^{th}) meeting, It was agreed by the committee to put their request on Hold and invite them in the next meeting to know how they can contribute to SC TED 26.

The committee may deliberate and decide.

2.5 Panels Working Under SC TED 26

2.5.1 *The committee in its previous (26^{th}) meeting, reconstituted the panels working under its purview. The details of the same is given below:*

Panel	Composition	Assignment	Status
TED 26/P-1 : Panel for Bio-CNG/CNG/LPG	**Panel Convener:** Shri Ajay D Dekate, ARAI **Members:** 1. Advantek Fuel Systems Pvt. Ltd. 2. Ashok Leyland 3. Automotive Component Manufacturers Association of India (ACMA) 4. Bajaj Auto Limited 5. Indian Auto LPG Coalition 6. International Centre for Automotive Technology (ICAT) 7. Mahindra and Mahindra Limited 8. Maruti Suzuki India Limited(MSIL) 9. Society of Indian Automobile	• Finalization of the composition of Panel (*Contact details of panel members need to be communicated to BIS Secretariat for registration on the BIS Portal.)* • Review of following LPG Standards : 1. **IS 15956 : 2012** - Road vehicles - Liquefied petroleum gas (LPG) specific equipment - Definitions, classification and general requirements 2. **IS 15957 : 2012** - Road vehicles - Liquefied petroleum gas	Panel details have been updated on BIS Portal. Panel Meeting yet to be conducted by the panel convener.

	Manufacturers (SIAM) 10. Swagelok – Bombay Fluid System components Pvt. Ltd. 11. Tata Motors Limited 12. Vanaz Engineers Limited 13. Indian Oil 14. SHIGAN (Quantum Technologies) 15. Minda Westport 16. AB Process	(LPG) specific equipment - general design requirements, performance and test methods 3. **IS 16009 : 2013** - Road vehicles - Liquefied petroleum gas (LPG) specific equipment - Shut off valve 4. **IS 16053 : 2013** - Road vehicles - Liquefied petroleum gas (LPG) specific equipment - Pressure regulator and vapourizer 5. **IS 16062 : 2013** - Road vehicles - Liquefied petroleum gas (LPG) specific equipment - Pressure and/or temperature sensor 6. **IS 16063 : 2013** - Road vehicles - Liquefied petroleum gas (LPG) specific equipment - LPG filter unit 7. **IS 16064 : 2013** - Road vehicles - Liquefied petroleum gas (LPG) specific equipment - Gas mixing piece 8. **IS 16065 : 2013** - Road vehicles - Liquefied	

		petroleum gas (LPG) specific equipment - Fuel rail 9. **IS 16367 : 2017** - Road vehicles - Liquefied petroleum gas (LPG) specific equipment - Gas injector 10. **IS 16057: 2013** – LPG operated internal combustion engines - Safety and performance requirements - Specification • Examination of ISO Ballots related to Bio-CNG/CNG/LPG • Identification of New Subject for formulation of Indian Standards in the domain of Bio-CNG/CNG/LPG	
TED 26/P-2 : Panel for Hydrogen/Natural gas blends (HCNG) fuel system components	**Panel Convener:** Shri S J Vispute, Vanaz Engineers Limited **Members:** 1. Ashok Leyland 2. Automotive Component Manufacturers Association of India (ACMA) 3. Bajaj Auto Limited	• Finalization of the composition of Panel (*Contact details of panel members need to be communicated to BIS Secretariat for registration on the BIS Portal.)*	Panel details have been updated on BIS Portal. Panel Meeting yet to be conducted by the panel convener.

	4. CLH Gaseous fuel Applications (P) Ltd 5. Indian Auto LPG Coalition 6. International Centre for Automotive Technology (ICAT) 7. Indraprastha Gas Limited (IGL) 8. Indian Oil Corporation 9. KPIT Technologies Ltd. 10. Mahindra and Mahindra Limited 11. Maruti Suzuki India Limited(MSIL) 12. Society of Indian Automobile Manufacturers (SIAM) 13. Swagelok – Bombay Fluid System components Pvt. Ltd. 14. The Automotive Research Association of India(ARAI) 15. Tata Motors Limited 16. Minda Westport	• Review of standards formulated by ISO TC 22/SC 41, ISO TC 197, and other global standards bodies concerning HCNG Components to assess their viability for adoption as National Standards. • Examining the safe blending percentage of hydrogen in natural gas and updating this value across pertinent standards such as IS/ISO 12619 and similar standards for blending of hydrogen. • Review of ISO Ballots concerning HCNG fuel system components, particularly documents from ISO/TC 22/SC 41/JWG 5 { *Joint ISO/TC 22/SC 41 - ISO/TC 197 WG: Fuel system components and refuelling*	

		connector for vehicles propelled by blends of natural gas and hydrogen} • Identification of New Subject for formulation of Indian Standards in the domain of HCNG Fuel system components	
TED 26/P-3 : Panel for Refilling connectors	**Panel Convener:** Dr. Sithananthan , Indian Oil Corporation Limited **Members:** 1. Central Institute of Road Transport 2. International Centre for Automotive Technology (ICAT) 3. Indraprastha Gas Limited (IGL) 4. KPIT Technologies Ltd. 5. Mahindra and Mahindra Limited 6. Minda Westport Technologies Limited 7. Maruti Suzuki India Limited(MSIL) 8. Petroleum and Explosive Safety Organization 9. Swagelok – Bombay Fluid System components Pvt. Ltd.	• Finalization of the composition of Panel (*Contact details of panel members need to be communicated to BIS Secretariat for registration on the BIS Portal.)* • Review of existing Indian standards for Refilling connectors and .receptacles • Examination of ISO Ballots related to Refilling connectors • Identification of New Subject for formulation of Indian Standards in the domain of / DME / Hydrogen	Panel details have been updated on BIS Portal. Panel Meeting yet to be conducted by the panel convener.

	10. The Automotive Research Association of India(ARAI) 11. Vanaz Engineers Limited 12. Volkswagen India Pvt. Ltd. 13. Shigan 14. TML	LNG Refilling Connectors	
TED 26/P-4 : Panel for LNG	**Panel Convener:** Shri P S Gowrishankar, Tata Motors Limited **Members:** 1. Ashok Leyland 2. Bajaj Auto Limited 3. Central Institute of Road Transport 4. CLH Gaseous fuel Applications (P) Ltd 5. GAIL 6. INOX 7. Indian Oil Corporation 8. International Centre for Automotive Technology (ICAT) 9. Mahindra and Mahindra Limited 10. Minda Westport Technologies Limited 11. Petronet LNG Limited 12. The Automotive Research Association of India (ARAI) 13. Vanaz Engineers Limited 14. SIAM 15. ACMA	• Finalization of the composition of Panel (*Contact details of panel members need to be communicated to BIS Secretariat for registration on the BIS Portal.)* • Review of existing Indian standards related to LNG Fuel System Components • Examination of ISO Ballots related to LNG Fuel System Components • Identification of New Subject for formulation of Indian Standards in the domain of LNG Fuel System Components	Panel details have been updated on BIS Portal. Panel Meeting yet to be conducted by the panel convener.

TED 26/P-5 : Panel for Ethanol / Methanol / Bio-Diesel / Flex-Fuels	**Panel Convener:** Shri Gururaj Ravi, MSIL **Members:** 1. Ashok Leyland 2. Automotive Component Manufacturers Association of India (ACMA) 3. Bosch 4. Hero MotoCorp 5. IISc Bangalore 6. Indian Oil Corporation 7. Mahindra and Mahindra Limited 8. Praj 9. Society of Indian Automobile Manufacturers (SIAM) 10. The Automotive Research Association of India(ARAI) 11. Tata Motors Limited 12. Vanaz Engineers Limited 13. Continental/Vitesco	• Finalization of the composition of Panel (*Contact details of panel members need to be communicated to BIS Secretariat for registration on the BIS Portal.)* • Examination of international standards for Fuel Injectors and Hoses and determining their viability for adoption as Indian standards • Examination of ISO Ballots related to Ethanol / Methanol / Bio-Diesel / Flex-Fuel system components	Panel details have been updated on BIS Portal. Panel Meeting yet to be conducted by the panel convener.
TED 26/P-6 : Panel for Hydrogen Fuel Cell	**Panel Convener:** Shri P S Gowrishankar, Tata Motors Limited **Members:** 1. Ashok Leyland 2. Automotive Component Manufacturers Association of India (ACMA)	• Finalization of the composition of Panel (*Contact details of panel members need to be communicated to BIS Secretariat for registration on the BIS Portal.*	The Panel Convener prepared the Working Draft based on AIS 157 and submitted to BIS for internal circulation within the committee.

	3. Bajaj Auto Limited ~~4.~~ Shigan 5. International Centre for Automotive Technology (ICAT) 6. Indian Oil Corporation 7. KPIT Technologies Ltd. 8. Mahindra and Mahindra Limited 9. Maruti Suzuki India Limited(MSIL) 10. Society of Indian Automobile Manufacturers (SIAM) 11. Swagelok – Bombay Fluid System components Pvt. Ltd. 12. The Automotive Research Association of India(ARAI) 13. Vanaz Engineers Limited 14. PESO 15. Reliance 16. AB Process 17. NTPC 18. IIT Ropar	• Conversion of AIS 157 to Indian Standard • Assessment of global standards concerning vehicles powered by hydrogen fuel cells to determine their suitability for adoption as Indian standards. • Examination of ISO Ballots related to H_2 Fuel Cell vehicles • Identification of other New Subjects for formulation of Indian Standards in the domain Hydrogen Fuel cell vehicles	The Working Draft was circulated among the committee members dt. 25/04/2024 for comments after approval from chairperson, TED 26. Subsequently, A Panel Meeting was organized by the Panel Convener dt. 17/05/2024 to discuss and resolve the comments received. The minutes of the meeting were circulated through BIS Portal dt. 20/05/2024 and also attached at **Annex- 4** for reference.
TED 26/P-7 : Panel for Hydrogen IC Engine	**Panel Convener:** Shri Muthu Kumar, Ashok Leyland (AL) **Members:** 1. Automotive Component Manufacturers Association of India (ACMA)	• Finalization of the composition of Panel (*Contact details of panel members need to be communicated to BIS Secretariat for registration on the BIS Portal.*	The Panel Convener prepared two Working Drafts based on AIS 195 for M&N Category vehicles and for CEVs and submitted the same to BIS

	2. Bajaj Auto Limited 3. International Centre for Automotive Technology (ICAT) 4. Indian Oil Corporation 5. KPIT Technologies Ltd. 6. Mahindra and Mahindra Limited 7. Maruti Suzuki India Limited(MSIL) 8. Society of Indian Automobile Manufacturers (SIAM) 9. Swagelok – Bombay Fluid System components Pvt. Ltd. 10. The Automotive Research Association of India(ARAI) 11. Tata Motors Limited 12. Vanaz Engineers Limited 13. PESO 14. Reliance 15. AB Process 16. NTPC 17. IISc Bangalore 18. Volvo Eicher 19. Minda Westport 20. IIT Ropar	• Conversion of AIS 195 and AIS 195 a to Indian Standard • Development of standards for hydrogen injection systems encompassing both port fuel injection (PFI) and direct injection (DI), as well as materials and safety devices compatible with hydrogen • Assessment of global standards concerning vehicles powered by hydrogen IC Engines to determine their suitability for adoption as Indian standards. • Review of ISO Ballots related to H_2 IC Engine vehicles • Identification of other New Subjects for formulation of Indian Standards in the domain Hydrogen ICEs.	for internal circulation within the committee. The Working Drafts were circulated among the committee members dt. 15/05/2024 for comments after approval from chairperson, TED 26. Subsequently, A Panel Meeting was organized by the Panel Convener dt. 28/05/2024 to discuss and resolve the comments received. The minutes of the meeting were circulated through BIS Portal dt. 29/05/2024 and also attached at **Annex- 5** for reference.

TED 26/P-8 : Panel for Synthetic Fuels	**Panel Convener:** Dr. Sithananthan, Indian Oil Corporation Limited **Members:** 1. NCL 2. THERMAX 3. AL 4. MSIL 5. IISc 6. IIT Delhi 7. IAC 8. Vanaz 9. TML 10. Shigan Quantam 11. SIAM 12. ACMA 13. ECMA 14. AMOL Carbons 15. HPCL 16. ARAI	• Finalization of the composition of Panel (*Contact details of panel members need to be communicated to BIS Secretariat for registration on the BIS Portal.* • Development of standards for DME fuel system components including DME-LPG Blends • Review of international standards related to E-Fuels and Ammonia to explore their potential adoption or modification as national standards. • Review of ISO Ballots related to Synthatic Fuels • Identification of other New Subjects for formulation of Indian Standards in the domain of synthetic fuels	Panel details have been updated on BIS Portal. Panel Meeting yet to be conducted by the panel convener.

TED 26/P-9 : Panel for Training, competence and conformity assessment	**Panel Convener:** Dr. R. V. Ravi Krishna, IISc Bangalore **Members:** 1. IIT Indore 2. IIT Ropar 3. ARAI 4. Other members as recommended by Convener and approved by SC TED 26	• Finalization of the composition of Panel (*Contact details of panel members need to be communicated to BIS Secretariat for registration on the BIS Portal.* • Development of Industrial Training standards related to alternate fuels in line with developments at ISO/TC 22/SC 41/WG 9 : *Training, competence and conformity assessment* • Review of ISO Ballots related to Industrial Training Standards	Panel details have been updated on BIS Portal. Panel Meeting yet to be conducted by the panel convener.

The committee may review the composition assignment and current progress of the panels.

ITEM 3 ACTIONS ARISING OUT OF THE MINUTES OF THE LAST MEETING

The summary of actions taken on the minutes of previous meeting is given below:

Sl. No.	Subject	Background	Status and Decision in the previous Committee Meeting	Current Status
1.	**Standards on LNG fuel system components**	The Committee agreed to allow TML to continue with the convenorship of the LNG panel. Other members of the **LNG Panel** being following along-with GAIL, Petronet, ICAT and INOX: • ARAI • Vanaz • Mahindra • Ashok Leyland • Minda Emer • IOC The Committee requested Shri Gowrishankar of TML to expedite conducting the panel meeting and formulate draft documents on LNG. BIS was requested to circulate the documents received from this panel as preliminary draft to all the members for one month. The LNG panel meeting was held at TML on 19.02.2018 under the convenorship of Shri Gowrishankar. The members discussed and deliberated on following agenda points during the meeting: • Current regulatory framework available in India for type approval certification of LNG vehicles. • Schematic, functional layout and advantages of LNG fuelled vehicles • Review of global standards available for LNG fuel system components. • Comparison of ISO and ECE standards for each LNG fuel system components. • Adoption of best practices from ISO and ECE for drafting BIS standards. In the last meeting, TML gave presentation on the draft document and emphasized that LNG is the future fuel for logistics transportation. The supply framework is being developed on highways.	**Status in 26th Meeting:** All the 18 documents have been sent to publication department for printing **Decision in the 26th Meeting:** The committee noted	All 18 standards on LNG Fuel System Components have been published as **IS 19038 (Part 1-19) :2023.** The Committee may please note.

Sl. No.	Subject	Background	Status and Decision in the previous Committee Meeting	Current Status
		The Chairman requested members to submit comments on p-draft and requested Member Secretary to compile all the comments and forward them to TML for incorporation. The LNG Panel will discuss the p-draft with comments in its next Meeting and will finalize the document and will forward the same to BIS for wide circulation. Draft documents received from the LNG panel & have been sent for circulation as given below: <u>Under P-draft:</u> (1) TED26(15806)P; (2) TED26(15807)P; (3) TED26(15808)P; and (4) TED26(15937)P <u>Under Wide Circulation (WC):</u> (1) TED26(15676)W; (2) TED26(15678)W; (3) TED26(15681)W; and (4) TED26(15682)W No comments have been received on the above documents. The Member Secretary stated that all the draft documents give reference of other draft documents for which IS number can be only b allotted after finalization. Hence, it is difficult to finalize the WC documents for printing. The Committee examined the issue & ask the Member Secretary to finalize two documents initially & write reference documents as ‘únder development’. The		

Sl. No.	Subject	Background	Status and Decision in the previous Committee Meeting	Current Status
		committee also requested Shri Gowrishankar to look into the matter and finalize two documents at the earliest for printing. **Status in 23rd Meeting:** A Mail has been sent to Mr. PS Gowrishankar dt. 19 March 2021 to suggest the priority for the documents. Following response has been received : "The formulation of Bureau of Indian Standards for LNG fuel system components are in progress under convenorship of undersigned. As of now, we have already drafted 8 BIS standards (out of 19 intended) and the same are wide circulated to TED-26 members for review and comments. These draft standards are prepared based on best practices of International Standards ISO 12614 and ECE R110. Over the period ISO has already adopted best practices of ECE and now ISO 12614 standards are mostly aligned with ECE R110. In view of this, we propose adoption of LNG standards ISO 12614 (Part 1-19) as BIS standard with single numbering as appropriate." Meanwhile the Member Secretary has also followed up with publication department and the suitable IS Numbers have been sought from publication wing to finalize the documents in process. The IS Number corresponding to the document number is attached as Annexure – 3 of the agenda of 23rd Meeting.		

Sl. No.	Subject	Background	Status and Decision in the previous Committee Meeting	Current Status
		The committee may deliberate and decide. **Decision in 23rd Meeting :** The committee discussed the proposal of TML to adopt the latest ISO standards in place of old draft standards as most of the ISO documents have been revised in recent times. It was decided to drop the eight old draft standards i.e. Under P-draft: (1) TED26(15806)P; (2) TED26(15807)P; (3) TED26(15808)P; and (4) TED26(15937)P Under Wide Circulation (WC): (1) TED26(15676)W; (2) TED26(15678)W; (3) TED26(15681)W; and (4) TED26(15682)W . The committee decided that in place of these draft standards, the latest ISO 12614 series would be adopted. The committee authorized member secretary start process of identical adoption of ISO 12614 series under dual numbering system. **Status in 24th Meeting:** With approval of the chairman TED 26 via email dt. 15/06/2022, National Forewords of all 18 Parts of ISO 12614 Series have been Uploaded on BIS Portal for Wide Circulation for 60 Days. Document Number of these documents are as follows :		

Sl. No.	Subject	Background	Status and Decision in the previous Committee Meeting	Current Status
		1. *TED/26/19851 (Identical To: ISO 12614-1:2021)* **2.** *TED/26/19853 (Identical To: ISO 12614-2:2021)* **3.** *TED/26/19854 (Identical To: ISO 12614-3:2021)* **4.** *TED/26/19855 (Identical To: ISO 12614-4:2021)* **5.** *TED/26/19856 (Identical To: ISO 12614-5:2021)* **6.** *TED/26/19857 (Identical To: ISO 12614-7:2021)* **7.** *TED/26/19858 (Identical To: ISO 12614-8:2021)* **8.** *TED/26/19859 (Identical To: ISO 12614-9:2021)* **9.** *TED/26/19860 (Identical To: ISO 12614-10:2021)* **10.** *TED/26/19861 (Identical To: ISO 12614-11:2021)* **11.** *TED/26/19862 (Identical To: ISO 12614-12:2021)* **12.** *TED/26/19863 (Identical To: ISO 12614-13:2021)* **13.** *TED/26/19864 (Identical To: ISO 12614-14:2021)* **14.** *TED/26/19865 (Identical To: ISO 12614-15:2021)* **15.** *TED/26/19866 (Identical To: ISO 12614-16:2021)*		

Sl. No.	Subject	Background	Status and Decision in the previous Committee Meeting	Current Status
		16. *TED/26/19867 (Identical To: ISO 12614-17:2021)* **17.** *TED/26/19868 (Identical To: ISO 12614-18:2021)* **18.** *TED/26/19869 (Identical To: ISO 12614-19:2021)* The Documents will be circulated and available for comments after HoD's Approval. **Decision in the 24th Meeting:** The committee Noted. **Status in 25th Meeting:** All the 18 documents have completed their WC Period. No comments have been received on .them Hence the committee may decide to send .these documents for printing **Decision in the 25th Meeting:** The committee decided to send all the 18 documents for printing.		
2.	Adoption of ISO Standards as recommended by MNRE	Ministry of New and Renewable Energy (MNRE), Government of India launched the 'National Green Hydrogen Mission' and under this mission, MNRE had constituted a working group (WG) consisting of representatives from relevant Ministries, Government agencies, Standardization and Certification bodies, and Industry to establish the Green Hydrogen ecosystem. Accordingly, the WG has recommended the adoption of various international standards	**Status in 26th Meeting** The Chairperson accorded his approval for wide circulation of National Foreword corresponding to ISO 16964 and ISO 23273	The Standards have been published as **IS 19035** and **IS 19036**. The Committee may please note.

Sl. No.	Subject	Background	Status and Decision in the previous Committee Meeting	Current Status
		related to equipment and processes to be deployed across the hydrogen value chain. MNRE has requested the Bureau of Indian Standards for immediate (Highest Priority) adoption of International Codes and Standards as recommended by the WG. Out of these, the following standard pertain to Automotive Vehicles Running on Non-conventional Energy Sources Sectional Committee, TED 26 : 1. ISO 16964: 2019 - Gas Cylinders Flexible Hoses Assemblies Specification And Testing {TED/26/22603} 2. ISO 23273: 2013 - Fuel Cell Road Vehicles Safety Specifications Protection Against Hydrogen Hazards For Vehicles Fuelled With Compressed Hydrogen {TED/26/22604} In view of the above, Chairperson, TED 26 was requested to accord his approval for sending the National Foreword Corresponding to this document for Wide Circulation of 30 days.	for 30 days through email. Accordingly National Forewords were prepared and sent for wide circulation to all the committee members through BIS Portal as TED 33 (22603)W and TED 33 (22604)W. The draft completed its wide circulation period and No Comments have been received. The committee may discuss and decide. **Decision in 26th Meeting:** The committee approved the documents TED 26 (22603)W {*Adoption of ISO 16964: 2019* } and TED 26 (22604)W {*Adoption of ISO 23273: 2013* } for printing.	

Sl. No.	Subject	Background	Status and Decision in the previous Committee Meeting	Current Status
3.	**Review of CNG Series of Standards**	A Series of 14 standards on CNG Sub systems have been taken up for review by Sectional Committee TED 26. These 14 standards are given below: Review for revision of IS 15710:2006 **Doc: TED 26(14995)** Review for revision of IS 15711:2006 **Doc: TED 26(15007)** Review for revision of IS 15712:2006 **Doc: TED 26 (15008)** Review for revision of IS 15713:2006 **Doc : TED 26 (18368)** Review for revision of IS 15714:2006 **Doc : TED 26 (18373)** Review for revision of IS 15715:2008 **Doc: TED26 (15013)** Review for revision of IS 15716:2006 **Doc: TED26 (15014)** Review for revision of IS 15717:2006 **Doc : TED 26 (18374)** Review for revision of IS 15718:2006 **Doc : TED 26 (18375)** Review for revision of IS 15719:2006 **Doc : TED 26 (18377)** Review for revision of IS 15720:2008 **Doc : TED 26 (18378)** Review for revision of IS 15721:2006 **Doc : TED 26 (18379)** Review for revision of IS 15722:2006 **Doc : TED 26 (18380)** **Status in 23rd Meeting:** The Draft documents TED 26 (14995), TED 26 (15014) have been sent for Wide Circulation. Document TED 26 (15007), TED 26 (15008), TED 26 (15013) & TED 26 (15015) have been sent for HoD approval for Wide circulation.	**Status in 26th Meeting:** Following documents are under wide circulation : **1.** *TED 26 (15007)* **2.** *TED 26 (15008)* **3.** *TED 26 (18368)* **4.** *TED 26 (18373)* **5.** *TED 26 (18374)* **6.** *TED 26 (18375)* **7.** *TED 26 (18377)* **8.** *TED 26 (18378)* **9.** *TED 26 (18379)* **10.** *TED 26 (18380)* **Decision in the 26th Meeting:** The committee noted	Following documents have completed their wide circulation period: **1.** *TED 26 (15007)* **2.** *TED 26 (15008)* **3.** *TED 26 (18368)* **4.** *TED 26 (18373)* **5.** *TED 26 (18374)* **6.** *TED 26 (18375)* **7.** *TED 26 (18377)* **8.** *TED 26 (18378)* **9.** *TED 26 (18379)* **10.** *TED 26 (18380)* No Comments have been received. The committee may deliberate and decide. In addition, The

Sl. No.	Subject	Background	Status and Decision in the previous Committee Meeting	Current Status
		Apart from the aforesaid six documents, Remaining 8 documents have also been received from Panel Convener and the same are attached as Annexure-4 of Agenda of 23rd Meeting. The Committee may deliberate and decide. **Decision in 23rd Meeting:** The committee noted the status of documents TED 26 (14995), TED 26 (15014), TED 26 (15007), TED 26 (15008), TED 26 (15013) & TED 26 (15015). The committee also decided to send remaining eight documents of this series as attached with agenda for wide circulation. **Status in 24th Meeting:** Following Documents Have completed their Wide Circulation Period : **1.** *TED 26 (14995)* **2.** *TED 26 (15013)* **3.** *TED 26 (15014)* **4.** *TED 26 (15015)* Comments have been received on the document TED 26 (14995)W and the same have been attached as Annexure 2 of the Agenda. No Comments have been received on other three documents i.e. TED 26 (15013)W TED 26 (15014)W TED 26 (15015) W. The Committee may discuss the comments and finalize the documents for printing.		committee finalized following four documents for printing in its 24th meeting (*However kept the documents on hold in 25th meeting till the time all documents get finalized to address the cross referencing problem*) **1.** *TED 26 (14995) {After Incorporating accepted comments }* **2.** *TED 26 (15013)* **3.** *TED 26 (15014)* **4.** *TED 26 (15015)* The committee may deliberate

Sl. No.	Subject	Background	Status and Decision in the previous Committee Meeting	Current Status
		Apart from that following Documents have been sent as P Drafts and have completed their circulation period : **1.** *TED 26 (15007)* **2.** *TED 26 (15008)* **3.** *TED 26 (18368)* **4.** *TED 26 (18373)* **5.** *TED 26 (18374)* **6.** *TED 26 (18375)* **7.** *TED 26 (18377)* **8.** *TED 26 (18378)* **9.** *TED 26 (18379)* **10.** *TED 26 (18380)* No Comments have been received on these documents. The committee may send these drafts for Wide Circulation. **Decision in 24th Meeting:** The comments received on the document TED 26 (14995) was discussed in the meeting and the committee decided to accept all the comments owing to their editorial Nature. The committee decided to following four documents for printing: **5.** *TED 26 (14995) {After Incorporating accepted comments}* **6.** *TED 26 (15013)* **7.** *TED 26 (15014)* **8.** *TED 26 (15015)* The committee also decided to send following ten Documents for Wide Circulation for a period of 60 days: **11.** *TED 26 (15007)* **12.** *TED 26 (15008)*		and decide.

Sl. No.	Subject	Background	Status and Decision in the previous Committee Meeting	Current Status
		13. *TED 26 (18368)* **14.** *TED 26 (18373)* **15.** *TED 26 (18374)* **16.** *TED 26 (18375)* **17.** *TED 26 (18377)* **18.** *TED 26 (18378)* **19.** *TED 26 (18379)* **20.** *TED 26 (18380)* **Status in 25th Meeting:** Following Documents have been uploaded on BIS Portal for Wide Circulation and are due for HoD's Approval for the circulation: **1.** *TED 26 (15007)* **2.** *TED 26 (15008)* **3.** *TED 26 (18368)* **4.** *TED 26 (18373)* **5.** *TED 26 (18374)* **6.** *TED 26 (18375)* **7.** *TED 26 (18377)* *Following documents will be sent for WC Shortly:* *1. TED 26 (18378)* *2. TED 26 (18379)* *3. TED 26 (18380)* Other four documents which the committee finalized in the last meeting, give cross references to other standards of this (CNG) series which are under the process of revision. Hence difficulty is being faced to prepare the final draft of these standards as year of publication and title of other standards will be different after the revision. The committee may deliberate the issue. **Decision in the 25th Meeting:**		

Sl. No.	Subject	Background	Status and Decision in the previous Committee Meeting	Current Status
		The committee deliberated the issue and decided that all the documents will be finalized only after all the documents complete their Wide circulation period so that cross referencing problem can be addressed.		
4.	**Adoption of AIS 157** (SAFETY AND PROCEDURAL REQUIREMENTS FOR TYPE APPROVAL OF COMPRESSED GASEOUS HYDROGEN FUEL CELL VEHICLES) **as Indian Standard**	In the last (24th) meeting of SC TED 26, The committee noted that SC TED 27 (Electric and Hybrid Vehicles Sectional Committee), is in the process of adopting AIS 157 as Indian Standard. The committee also noted that 'Fuel Cell' falls under the Scope of SC TED 26 and not under the scope of SC TED 27. {*Scope of SC TED 26: Standardization of Fuel System Components for Automotive Vehicles using New and Renewable Energy Sources such as Compressed Natural Gas (CNG), Liquefied Petroleum Gas (LPG), Bio-Gas, Hydrogen/Methane Blends, Bio-diesel/diesel blends, alcohol (Ethanol/Methanol)-petrol blends Hydrogen, <u>Fuel Cell and their installation requirements.</u>* *Scope of SC TED 27: Standardization of Electric and Hybrid vehicles and their components}* Hence the committee recommended the Adoption work of AIS 157 to be shifted from SC TED 27 to SC TED 26. The committee also requested member secretary to raise this issue in the next meeting of SC TED 27 and also to seek suitable directions from TEDC.	**Status in 26th Meeting:** The draft will be sent for wide circulation once the thoroughly deliberated draft is received from Fuel Cell Panel (Convenor : Tata Motors) **Decision in the 26th Meeting:** The committee discussed the matter and requested Shri P S Gowrishankar, Convener of Panel 6, to promptly organize the next Panel 6 meeting and submit the discussed draft, inclusive of all amendments, for the adoption of AIS 157 as Indian	The Panel 6 Convener, Shri P S Gowrishankar, prepared the Working Draft based on AIS 157 and submitted to BIS for internal circulation within the committee. The Working Draft was circulated among the committee members dt. 25/04/2024 for comments after approval from chairperson, TED 26. Subsequently, A Panel Meeting was organized by

Sl. No.	Subject	Background	Status and Decision in the previous Committee Meeting	Current Status
		Status in 25th Meeting: The matter was discussed in the last (29th) meeting of Transport Engineering Division Council (TEDC) held on 22/12/2022, and it was decided to transfer the conversion work of AIS 157 from SC TED 27 to SC TED 26, along with Fuel Cell Panel (Panel 8 of SC TED 27). The committee may deliberate and decide the further course of action for the panel along with the document. **Decision in the 25th Meeting:** The committee noted the decision of TEDC. It was decided to keep Tata Motors as the convener of the Fuel cell panel as they were the convener when the panel was working under the guidance of SC TED 27. Mr. Shailendra Kumar from Tata Motors informed the committee that AISC panel is discussing a draft amendment to AIS 157. The committee hence asked Tata Motors to provide the final draft to BIS Within one month time. The committee also asked member secretary to send the draft for a wide circulation of 60 days, once the draft is received from Tata Motors. The comments received on the draft can then be discussed in next SC TED 26 Meeting.	Standards to BIS Secretariat. Member secretary was requested to send the draft submitted by Panel 6 for wide circulation of 60 days	the Panel Convener dt. 17/05/2024 to discuss and resolve the comments received. The minutes of the meeting were circulated through BIS Portal dt. 20/05/2024 and also attached at **Annex- 4** for reference. The Committee may deliberate and decide.

Sl. No.	Subject	Background	Status and Decision in the previous Committee Meeting	Current Status
5.	**Adoption of AIS 195** (SAFETY AND PROCEDURAL REQUIREMENTS FOR TYPE APPROVAL OF COMPRESSED GASEOUS HYDROGEN IC ENGINE POWERED VEHICLES) **as Indian Standard**	In previous meeting, The committee constituted Panel 7 to formulate standards related to Hydrogen IC Engine Powered Vehicles.		The Panel Convener, Shri Muthu Kumar, prepared two Working Drafts based on AIS 195 for M&N Category vehicles and for CEVs and submitted the same to BIS for internal circulation within the committee. The Working Drafts were circulated among the committee members dt. 15/05/2024 for comments after approval from chairperson, TED 26. Subsequently, A Panel Meeting was organized by the Panel Convener dt.

Sl. No.	Subject	Background	Status and Decision in the previous Committee Meeting	Current Status
				28/05/2024 to discuss and resolve the comments received. The minutes of the meeting were circulated through BIS Portal dt. 29/05/2024 and also attached at **Annex- 5** for reference. The Committee may deliberate and decide.

ITEM 4 REVIEW OF INDIAN STANDARDS

4.1 As per the statutory requirement of the Bureau, every standard should be reviewed by the Sectional Committee responsible not more than five years after publication, reaffirmation or revision to establish whether it is still current. Circumstances may lead to any earlier review, too.

When reviewing a standard, a committee has five options available:

a) Reaffirmation indicating continuing current of the standard without change;
b) Amendment and reaffirmation indicating the continuing currently of standard after necessary changes to bring it up to date;
c) Revision involving the routine procedure for new project and reaffirm for time being;
d) declaration of obsolescence indicating by amendment that the standard is not recommended for use in new equipment but needs to be retained to provide for the servicing of existing equipment that is expected to have a long working life;
e) Withdrawal indicating that the standard is no longer needed.

4.2 As on-going activity, as indicated at 4.1 above, Sectional Committee reviews the Indian Standards formulated by it at an interval of five years from the date of publication/last review. Following standard are falling due for review this year, i.e. 2024-25:

S. No.	IS Number	IS Title
1.	IS 15715 : 2008	Road vehicles - Compressed natural gas (CNG) fuel system components - Conduit (Ventilation Hose)
2.	IS 15720 : 2008	Road vehicles - Compressed natural gas (CNG) fuel system components - Compartments/sub - Compartments
3.	IS 15870 : 2009	Road vehicles - Use of compressed natural gas (CNG) fuel system in internal combustion engine vehicles - Code of practice
4.	IS/ISO 17268 : 2020	Gaseous Hydrogen Land Vehicle Refuelling Connection Devices

The committee may deliberate and decide.

ITEM 5 PROGRAM OF WORK

5.1 Detailed Program of Work of SC TED 26 has been given at **Annex- 6.** The committee may please note.

ITEM 6 INTERNATIONAL ACTIVITIES

6.1 India holds '**P**' membership for ISO/TC 22/SC 41 Specific aspects for gaseous fuels and SC TED 26 has the voting rights for ISO/TC 22/SC 41.

6.2 India holds '**P**' membership for ISO/TC 197 Hydrogen technologies and SC TED 26 has the voting rights for ISO/TC 197.

6.3 India holds '**P**' membership for ISO TC 22 SC 37 Electrically propelled vehicles and SC TED 26 has the Ballot Monitor rights for ISO TC 22 SC 37.

6.4 The Program of Work of aforementioned ISO Technical committees may be accessed through following links:

a) PoW of ISO/TC 22/SC 41

b) PoW of ISO/TC 197

c) PoW of ISO/TC 22/SC 37

ITEM 7 DATE AND PLACE FOR THE NEXT MEETING

ITEM 8 ANY OTHER BUSINESS

ANNEX- 1

(*Item 2.2*)

AUTOMOTIVE VEHICLES RUNNING ON NON-CONVENTIONAL ENERGY SOURCES SECTIONAL COMMITTEE, TED 26

24th Meeting	27th June 2022	Webex
25th Meeting	29th December 2022	Webex
26th Meeting	26th September 2023	Webex

Sl. No.	**NAME OF THE ORGANIZATION**	**REPRESENTED BY** Principal member (*Alternate member*) (*Young Professional*)	**Attendance of the last three meetings**			
			24th	**25th**	**26th**	**Total**
1.	Automotive Research Association of India (ARAI)	Dr S S Thipse (Chairperson) Shri A D Dekate (P)	Y	Y	Y	3/3
2.	Ashok Leyland Ltd.	Ms. Suchismita C. (P) Shri Muthukumar N (A)	N	N	Y	1/3
3.	Automotive Component Manufactures Associationof India (ACMA)	Shri Sanjay Tank (P) Ms. Seema Babal (A)	Y	Y	N	2/3
4.	A B Process Technologies	Shri Kunal Chopde	-	-	Y	1/3
5.	Bajaj Auto Ltd., Pune	Shri Milind J. Pagare (P) Shri Arvind V. Kumbhar (A) Shri Abhay Kumar(YP)	Y	Y	Y	3/3
6.	Bosch Limited, Bengaluru	Shri Bharadwaj M. Krishnamurthy (P) Shri Vikram K (A)	Y	N	N	1/3
7.	Central Institute of RoadTransport, Pune	Shri Samir Sattigeri (P) Shri V. V. Joshi (A)	N	N	N	0/3
8.	Central Pollution ControlBoard	Shri A Sudhakar (P) Shri Suneel Dave (A) Shri Kedarnath Dash (A)	N	N	N	0/3
9.	CLH Gaseous Fuel Applications (P) Ltd, Gurgaon	Shri Shishir Agrawal (P) Shri Gagan Agrawal (A)	N	N	Y	1/3
10.	Delhi Transport Corporation	Shri Vikas Batra (P)	Y	N	N	1/3
11.	GAIL (India) Limited, New Delhi	Shri Ashish Kumar Mittal (P) Shri Lokesh Mehta (A)	N	N	N	0/3
12.	Indian Auto LPG Coalition, Faridabad	Shri Shishir Agrawal (P) Shri Suyash Gupta (A)	N	N	Y	1/3

Sl. No.	NAME OF THE ORGANIZATION	REPRESENTED BY Principal member (*Alternate member*) (*Young Professional*)	Attendance of the last three meetings			
			24th	25th	26th	Total
13.	Indian Institute of Petroleum, Dehradun	Shri Wittison Kamei (P) Shri Robindro Lairenlakpam (A)	Y	Y	Y	3/3
14.	Indian Institute of Science, Bengaluru	Prof. R.V. Ravikrishna (P)	Y	N	Y	2/3
15.	Indian Institute of Technology Ropar, Punjab	Shri Dhiraj Kumar Mahajan (P) Dr. Debaprasad Mandal (A)	-	Y	Y	2/3
16.	Indian Oil Corporation Ltd., (R & D Centre), Faridabad	Dr. M Sithananthan (A)	N	Y	Y	2/3
17.	Indian Rubber Mfrs. Research Association, Thane, Mumbai	Dr. K Raj Kumar (P) Dr. Bharat Kapgate (A)	N	Y	N	1/3
18.	International Centre for Automotive Technology (ICAT)	Shri Vaibhav Prashant Yadav (P) Shri Vijayanta Ahuja (A)	Y	N	Y	2/3
19.	Mahindra & Mahindra Ltd., Mumbai	Shri Rajamani Parthiban (P) Shri Shailesh Kulkarni (A)	N	N	Y	1/3
20.	Mahindra & Mahindra Ltd. (Truck and Bus Division)	Shri V G Kulkarni (A)	N	Y	N	1/3
21.	Maruti Suzuki IndiaLimited, Gurgaon	Shri Gururaj Ravi Shri Arun Kumar (A) Shri Rajesh Kumar (YP)	Y	N	Y	2/3
22.	Minda Emer TechnologiesLimited, Gurgaon	Shri Vivek Jain (P) Shri Bibhuti Kumar (A)	N	N	Y	1/3
23.	Ministry of New and Renewable Energy, NewDelhi	Shri Dipesh Pherwani (P)	N	N	N	0/3
24.	Petroleum and Explosive Safety Organization, Nagpur	Shri D K Gupta (P) Shri Vivek Kumar (A)	N	N	Y	1/3
25.	Petronet LNG Ltd. New Delhi	Shri Pankaj Wadhwa (A)	N	N	N	0/3
26.	Prodair Air Products IndiaPrivate Ltd., Pune	Shri Ravi Subramanian (P) Shri Arun Kuruvangattil (A)	N	N	N	0/3
27.	Renault India Private Limited,Mumbai	Shri Rajendra Khile (P) Shri Vijay Dinakaran (A) Shri Jebin Jowhar (YP)	-	-	Y	1/1
28.	Rohan BRC Gas Equipment Pvt. Ltd, Ahmedabad	Shri Stefano De Carolis (P) Shri Parthiv Shukla (A)	N	Y	N	1/3

Sl. No.	NAME OF THE ORGANIZATION	REPRESENTED BY Principal member (*Alternate member*) (*Young Professional*)	Attendance of the last three meetings			
			24th	25th	26th	Total
29.	Society of Indian Automobile Manufacturers, New Delhi	Shri P K Banerjee (P) Dr. Sandeep Garg (A)	N	N	Y	1/3
30.	Swagelok – Bombay FluidSystem components Pvt. Ltd.	Shri Sachin Koulgi (P) Shri Harish Takke (A)	Y	Y	Y	3/3
31.	Tata Motors Ltd.	Shri P. S. Gowrishankar (P) Shri Shailendra Dewangan (A)	Y	Y	Y	3/3
32.	TVS Motor Company Ltd, Hosur	Shri V Pattabiraman (P) Shri K M Srikanth (A)	N	N	N	0/3
33.	Vanaz Engineers Ltd. Pune	Shri S J Vispute (P) Shri J S Dhumal (A)	Y	Y	Y	3/3
34.	Volkswagen India Pvt. Ltd.	Shri Joreg Bouzek (P) Shri Pankaj Gupta (A)	N	N	N	0/3

ANNEX- 2
(*Item 2.4*)

CV Uploaded by representative of Chakr Innovation Private Limited, Gurugram

Abhijit A. Datta

Delhi-NCR, India 122017
abhijitdatta32@gmail.com • http://linkedin.com/in/abhijit-a-datta-31a12240

A motivated and proactive team player with a dynamic personality, my mission is to advance a sustainable energy future. With an industrious will to solve problems, coupled with an appetite to learn quickly and contribute to building new sustainable technology, I believe I can help provide solutions, products and services that have real impact on human lives and societies.

With over 8 years of experience in corporate research, product design and development for the Energy Storage Systems (ESS) and Electric Vehicle (EV) market in a multicultural and multinational environment, and over 2 years of experience in academic research in Power Electronics, I believe I can work with and lead cross-functional teams in completing time bound deliverables and projects.

Top Skills:

- Project Planning and Management, Team building and Resource Management.
- Cost and Use case Analysis, ROI
- Lead the Design and Development of metal-air and Li-ion Battery Module (Pack) and BMS Hardware, Design of Control Algorithms, Design of Functionally Safe BMS, Design of EV power train components including power converters.
- Design of Analog, Digital, LV, HV and Power Circuits, Microcontroller peripherals, Sensor circuits.
- DRBFM, FMEA, FTA, MTBF, CFT teamwork, VA/VE, VA/CD.
- Product Prototyping, Testing, Evaluation, Technical Documentation.
- Aras PLM, MATLAB, LTspice, PSCAD, PSIM, Zuken, C, MS Office, Windows, Linux
- English (Native level), Hindi (Native level), Japanese (Business level, JLPT N2 Score:110/180)

Work Experience:

- **Chakr Innovation Pvt. Ltd., Gurgaon, India** — ***1 Yr. 1 mon.***
  - ◆ ***Assistant General Manager, New Product Development*** — *Apr' 2023- Present*
    - ➢ **Built, led, and currently managing a vertical** of more than **40 engineers and 15 technicians** for the **development of alternate metal-air battery systems** for next generation **energy solutions** to target the domestic Indian and global **EV** and **ESS** market, while conducting a thorough **literature survey** and **policy compliance.**
    - ➢ Defined the product and design specifications after conducting thorough **use case analyses.**
    - ➢ Spearheading and directing the **recyclability** and **circular economy and infrastructure development** for metal-air batteries.
    - ➢ Leading the **Commercialization, Cost Analysis, Return of Investment (ROI)** and **manufacturing facility establishment** for metal-air batteries.
  - ◆ ***Senior Manager, New Product Development*** — *Nov' 2022- Mar'2023*
    - ➢ Led and managed a cross-functional Product development team of more than **10 engineers and 5 technicians** from **end-to-end system conceptualization** to prototyping and testing of **metal-air powered 2-Wheeler EV**
    - ➢ **Planned and managed projects** for the development of **EV power train** components like battery system (metal-air), Battery Management systems (**BMS**) and **power converters.**
    - ➢ **Lead interviewer** in the Chakr Innovation Interview Panel for EV Powertrain in **campus recruitment** 2022 at **IIT Bombay and IIT Delhi.**

ANNEX- 3
(*Item 2.4*)

Nomination Proforma received from Dr Piyali Das and Dr Sanjukta Subudhi, TERI

NOMINATION PROFORMA

TRANSPORT ENGINEERING DEPARTMENT

Committee Name: Automotive Vehicles Running on Non-conventional Energy Sources

Committee Number: TED 26

Principal Member

General Interest: **Alternate Fuel/ Sustainable Biofuel, Synthetic Fuel production from renewable and waste sources, Technology Assessment, Fuel standardization, Storage and Bunkering, Fuel Properties, Characterization, Alternate fuel and blend fuel Standard development, Alternate fuel related Emission, Regulatory, Certification**
(Bio- diesel/diesel blends, alcohol (Ethanol/Methanol)-petrol blends, Hydrogen, Hydrogen/Methane Blends, Fuel Cells, DME, DME-LPG Blends, Ammonia along with other synthetic fuels and their installation requirements)

Shri/Smt/Dr./Prof. : Dr Piyali Das

Designation : Senior Fellow and Area Convenor (Advanced Biofuels Division)

Name of Organization : The Energy and Resources Institute (TERI)

Address in full for Correspondence (with PINCODE) : Core 6C, Darbari Seth Block, India Habitat Centre, Lodhi Road, New Delhi-110003

City : New Delhi

Mobile Phone No. +919899094840 Fax :

E-mail : piyalid@teri.res.in

Alternate Member

General Interest : Bio Hydrogen, Ethanol

Shri/Smt/Dr./Prof. : Dr Sanjukta Subudhi
Designation : Senior Fellow and Area Convenor

Name of Organization : The Energy and Resources Institute (TERI)

Address in full for Correspondence (with PINCODE) : Core 6C, Darbari Seth Block, India Habitat Centre, Lodhi Road, New Delhi-110003

City : New Delhi
Mobile Phone No. : 9818845129 Fax :
E-mail : ssubudhi@teri.res.in

ANNEX- 4

Minutes of 1st TED26/P6 (Hydrogen Fuel Cell) Panel Meeting dt. 17/05/2024

The meeting of BIS TED26 P6 (HFC) sub-panel was held virtually on 17th May'2024 (Friday) from 10:30-11:45 hrs under convenorship of Mr. P S Gowrishankar (GM & Head-Regulations, Engineering Quality, ERC, TATA Motors Ltd., Pune). The list of participants is provided in Annexure-A.

1. Member Secretary Mr. Gaurav Jayaswal welcomed all the participants and set the context for the sub-panel meeting.

2. The convenor also welcomed the participants and provided updates from inception regarding the activities further to initiation in the year 2018. He explained the glide path on how the final notification was issued by MoRTH on mandating AIS-157 standard for CMVR type approval purposes. This was culmination of the collective efforts for enabling of the new and emerging technologies in the Indian context.

3. He further informed that based on inputs received from OEMs/Component & system suppliers/Certification agencies, Amendment-1 to AIS-157 was published in July'2023 with specific inclusion of EC 79/2009 and other running & editorial changes. This enabled and fostered realisation/introduction of H2 fuel cell technology in India.

4. He further mentioned that during last BIS TED-26 committee meeting held on 26th Sep'2023, P6 Sub-Panel (Hydrogen Fuel Cell) was constituted under his convenorship to convert AIS-157 into Indian Standard. As per BIS guideline, members from various fields including certification agencies, authorities, vehicle manufacturers, system suppliers, technology partners, OMC, PSU, academia and Industry Associations have been co-opted to ensure wide range participation, receipt of holistic views and their review for consideration.

5. It was informed that BIS working draft prepared by M/s TATA Motors Limited was circulated to all panel members on 25th April'2024 for comments latest by 5th May'2024. The comments have been received from M/s MSIL, M/s ALL and M/s TML.

6. Comments received from the members were discussed in detail and decision of the panel are recorded in attached presentation (Annexure-B). Panel requested ALL to provide global references and pictorial representation of hydrogen cylinder arrangements to understand new proposed clause 4.3.8 requirement in more detail and decide way forward based on small group meeting. MSIL was also requested to share additional comment through BIS secretariat.

7. Convenor mentioned that based on discussions and deliberations in panel meeting today and further to receipt of ALL/MSIL inputs/comments latest by 23rd

May'2024, the working draft would be updated with the agreed changes and would be circulated to members as p-draft for further study, views and comments in line with BIS stipulations.

8. Meeting ended with vote of thanks to the chair.

Annexure-A
Meeting Attendance

SN	Name	Organization
1	Mr. P S Gowrishankar (Panel Convenor)	TATA Motors Limited
2	Mr. Gaurav Jayaswal (BIS Member Secretary)	Bureau of Indian Standard
3	Mr. S D Rairikar	Automotive Research Association of India
4	Mr. Ajay Dekate	Automotive Research Association of India
5	Mr. Amol kumar	International Centre for Automotive Technology
6	Mr. Pritam Singh	International Centre for Automotive Technology
7	Mr. Muthukumar N	Ashok Leyland Limited
8	Mr. Mayank Sharma	Maruti Suzuki India Limited
9	Mr. Rajesh Kumar	Maruti Suzuki India Limited
10	Dr. Abhijeet Chougule	TATA Motors Limited
11	Mr. Shailendra Dewangan	TATA Motors Limited
12	Mr. Amit Patil	Mahindra Truck & Bus Division
13	Ms. Pushpanjali	Mahindra & Mahindra
14	Mr. Parmeshwar Mane	Bajaj Auto Limited
15	Mr. Jebin Jowhar	Renault Nissan
16	Dr. M Sithananthan	Indian Oil Corporation Limited
17	Mr. Debaprasad Mandal	IIT, Ropar
18	Mr. Sachin Koulgi	Swagelok

Annexure-B

M/s MSIL Comments

M/s MSIL comments on working draft

Existing Clause	Proposed Clause	Justification
Clause 4.3.4. In the case where hydrogen storage system is not subjected to frontal impact test, the container shall be mounted in a position which is rearward of a vertical plane perpendicular to centre line of the vehicle and located 420mm rearward from the front edge of the vehicle.	**Clause 4.3.4.** In the case where hydrogen storage system is not subjected to frontal impact test, the container shall be mounted in a position which is rearward of a vertical plane perpendicular to centre line of the vehicle and located at least 420mm rearward from the front edge of the vehicle.	Position of hydrogen storage system has been fixed at "420mm rearward from the front edge of the vehicle", which may not be feasible in many cases depending upon the length and design of vehicles.

Convenor / Panel Decision:

Comment is accepted. This provides better clarity.

M/s MSIL comments on working draft

Existing Clause	Proposed Clause	Justification
Clause 4.12(b) And not exceed 8 percent at any time when tested according to Annexure 5, Paragraph 4 of UN ECE R134.	**Clause 4.12(b)** And not exceed 8 by volume percent at any time when tested according to Annexure 5, Paragraph 4 of UN ECE R134.	▪ For better clarity. ▪ Or else 8% of what? Shall be specified.

Convenor / Panel Decision:

Comment is accepted. This provides total clarity.

M/s MSIL comments on working draft

Existing Clause	Proposed Clause	Justification
Clause 4.13.2 Any single failure downstream of the main hydrogen shut-off valve shall not result in accumulations in the levels of hydrogen concentration in the passenger compartment according to following test procedure defined in Annexure 5, paragraph 3.2 of UN ECE R134.	**Clause 4.13.2** Any single failure downstream of the main hydrogen shut-off valve shall not result in accumulations in the levels of hydrogen concentration in the passenger compartment according to following test procedure defined in ~~Annexure 5, paragraph 3.2 of UN ECE R134.~~	Reference to clauses of UNR 134 can be avoided. Instead, those clauses/Annexure of UNR 134 can be included in this document itself. Comment is applicable to all those clauses where UNR 134 has been referred.

Convenor / Panel Decision:

Convenor mentioned that UNECE regulations are subjected to frequent changes and amendments. In case provision of UNECE regulations are directly copied in AIS/BIS standard, it would call for frequent amendment/revision in AIS/BIS standards whenever there is amendment in UNECE regulations. Panel decided to continue with existing text and separately refer this subject in BIS committee / council meeting for directional guidelines.

M/s MSIL comments on working draft

Existing Clause	Proposed Clause	Justification
Clause 4.16.3 **Concentration limit in enclosed spaces** Hydrogen gas leakage shall not result in a hydrogen concentration in the air greater than **4.0** percent by volume in the passenger and luggage compartments (Annexure 5, paragraph 2 of UNR 134). The requirement is satisfied if it is confirmed that the shut-off valve of the storage system has closed within 5 seconds of the crash and no leakage from the storage system.	**Clause 4.16.3** **Concentration limit in enclosed spaces** Hydrogen gas leakage shall not result in a hydrogen concentration in the air greater than **3.0** percent by volume in the passenger and luggage compartments (Annexure 5, paragraph 2 of UNR 134). The requirement is satisfied if it is confirmed that the shut-off valve of the storage system has closed within 5 seconds of the crash and no leakage from the storage system.	Clause 4.13 states **Protection against flammable conditions:** If the hydrogen concentration exceeds 3.0 percent by volume in the air in the enclosed or semi-enclosed spaces of the vehicle, the main shut-off valve shall be closed to isolate the storage system (Annexure 5, paragraph 3 of UN R134). Clause 4.13 restricts the hydrogen concentration exceeds 3.0 percent by volume whereas clause 4.16.3 hydrogen concentration due to leakage to 4% by volume in the enclosed or semi-enclosed spaces/ passenger and luggage compartments. Mismatch in the limit to be addressed.

Convenor / Panel Decision:

Comment is accepted. This brings clarity and alignment across the relevant clauses..

M/s ALL Comments

M/s ALL comments on working draft

Existing Clause	Proposed Clause	Justification
Clause 4.3.1 The compressed gaseous hydrogen cylinder (container) shall comply with Gas Cylinder Rule, 2016 as amended from time to time. PESO may evaluate hydrogen cylinders based on BIS standard 16735:2018) or international standards such as ISO 19881:2019, UN R 134, GTR 13, EC 79/2009 (EU 406/2010), EU 2021/535 etc.	**Clause 4.3.1** The compressed gaseous hydrogen cylinder (container) shall comply with Gas Cylinder Rule, 2016 as amended from time to time. PESO may evaluate hydrogen cylinders based on BIS standard 16735:2018) or international standards such as ISO 19881:2019, UN R 134, GTR 13, EC 79/2009 (EU 406/2010), EU 2021/535 etc.	")" after 16735: 2018 can be removed, not relevant.

Convenor / Panel Decision:

Comment is accepted.

M/s ALL comments on working draft

Existing Clause	Proposed Clause	Justification
Clause 4.3.3 In case one or both of the vehicle crash tests specified above are not applicable for vehicle category, the container or container assembly including safety devices shall be mounted and fixed so that the following accelerations can be absorbed without breaking of the fixation or loosening of the container(s) (demonstrated by testing or calculation). The mass used shall be representative for a fully equipped and filled container or container assembly.	**Clause 4.3.3** In case that one or both of the vehicle crash tests specified above are not applicable to the vehicle, the compressed hydrogen storage system shall, instead, be subject to the relevant alternative accelerations specified below and the compressed hydrogen storage system shall comply with the relevant requirements in Paragraphs 4.3.3. and 4.3.4. The accelerations shall be measured at the location where the compressed hydrogen storage system is installed. The compressed hydrogen storage system shall be mounted and fixed on the representative part of the vehicle. The mass used shall be representative for a fully equipped and filled container or container assembly.	In case vehicle crash tests are not applicable to heavy vehicles, then acceleration requirement shall be checked for compliance. Modification suggested for better clarity & aligned with AIS 195 requirements

Convenor / Panel Decision:

Convenor mentioned that the vehicle fuel system (hydrogen cylinder) integrity requirements for vehicles which are not subjected to frontal & lateral impact are well defined in clause 4.3.3, 4.3.4 & 4.3.5. Hence, panel unanimously decided to retain these clauses as it is without any modification based on the nuances mentioned.

M/s ALL comments on working draft

Existing Clause	Proposed Clause	Justification
Clause 4.3.3 Vehicles of categories M1 and N1: a) +/- 20 g in the direction of travel. b) +/- 8 g horizontally perpendicular to the direction of travel. Vehicles of categories M2 and N2: a) +/- 10 g in the direction of travel. b) +/- 5 g horizontally perpendicular to the direction of travel. Vehicles of categories M3 and N3: a) +/- 6.6 g in the direction of travel. b) +/- 5 g horizontally perpendicular to the direction of travel.	**Clause 4.3.3** **Vehicles of categories M1 and N1:** a) **+/-** 20 g in the direction of travel **(forward and rearward direction)** b) **+/-** 8 g horizontally perpendicular to the direction of travel **(to left and right)** **Vehicles of categories M2 and N2:** a) **+/-** 10 g in the direction of travel **(forward and rearward direction)** b) **+/-** 5 g horizontally perpendicular to the direction of travel **(to left and right)** **Vehicles of categories M3 and N3:** a) **+/-** 6.6 g in the direction of travel **(forward and rearward direction)** b) **+/-** 5 g horizontally perpendicular	

Convenor / Panel Decision:

Comment is accepted. Panel agreed to indicate acceleration direction in both symbolic and word format.

M/s ALL comments on working draft

Existing Clause	Proposed Clause	Justification
Clause 4.3.5 In the case where hydrogen storage system is not subjected to lateral impact test, the container shall be mounted in a position which is between the two vertical planes parallel to the centre line of vehicle located 200mm inside from the outermost edge of the vehicle in the proximity of the container.	**Clause 4.3.5** In the case where hydrogen storage system is not subjected to lateral impact test, the container shall be mounted in a position which is between the two vertical planes parallel to the centre line of vehicle located 200mm inside from the both outermost edge of the vehicle in the proximity of the container. **Alternatively, this requirement is deemed to be met in case vehicle is equipped with lateral under run protection device approved as per IS 14682: 2004 amended from time to time.**	Modification suggested in line with Cl. No. 7.10.5.2 of AIS 195 standard. LUPD compliance added as an alternative to 200 mm dimension.

Convenor / Panel Decision:

Comment is accepted. This brings alignment with AIS-195 standard.

M/s ALL comments on working draft

Existing Clause	Proposed Clause	Justification
----------	**Requirements for Hydrogen cylinder/container** **Cl. No. 4.3.8** **However, when H2 cylinders are mounted behind cab or in chassis rear overhang area or on roof of the vehicle, adequate guards shall be provided for Cylinder valves. This guard shall be considered suitable if it is capable of withstanding a horizontal static force of 1kN applied perpendicularly to any part of its external surface by the centre of the ram the face of which is circular and flat, with suitable diameter and if the deflection of the guard under load is not more than 30mm. If the vehicle is so designed and / or equipped that by their shape and characteristics, the component parts together meet the above strength requirements, they may be regarded as replacing the side guards.**	Existing lateral impact test applies for cases where H2 cylinders are mounted on chassis frame in wheelbase area and H2 cylinders positioned below floor line of loading platform. In such cases, vehicle lateral protection will serve as guard for cylinders and valves. Recently, there are many positions and orientation of H2 cylinders being pursued by industry like positioning behind cab or on roof or in chassis rear overhang area, hence modification suggested in order to suit multiple orientation of H2 cylinders.

Convenor / Panel Decision:

Panel requested ALL to provide global references and pictorial representation of hydrogen cylinder arrangements to understand proposed requirement in more detail and decide way forward based on small group meeting.

M/s ALL comments on working draft

Existing Clause	Proposed Clause	Justification
Clause 4.14 The hydrogen fueling line (e.g. piping, joint, etc.) downstream of the main shut-off valve(s) to the fuel cell system shall not leak. Compliance shall be verified at NWP (Annexure 5, paragraph 5 of UN ECE R 134). In In accordance with vehicle architecture, hydrogen leakage would be tested in critical location(s) based on mutual agreement between OEMs & Certification agency.	**Clause 4.14** The hydrogen fueling line (e.g. piping, joint, etc.) downstream of the main shut-off valve(s) to the fuel cell system shall not leak. Compliance shall be verified at NWP (Annexure 5, paragraph 5 of UN ECE R 134). ~~In~~ In accordance with vehicle architecture, hydrogen leakage would be tested in critical location(s) based on mutual agreement between OEMs & Certification agency.	"In" repeated twice, hence deleted. Editorial correction

Convenor / Panel Decision:

Comment is accepted.

M/s ALL comments on working draft

Existing Clause	Proposed Clause	Justification
Clause 4.16.1 The vehicle fuel system shall comply with crash safety test requirements as specified in clause 4.3.2, 4.3.3, 4.3.4 and 4.3.5 of this standard.	**Clause 4.16.1** The vehicle fuel system shall comply with crash safety test requirements as specified in clause 4.3.2, ~~**4.3.3, 4.3.4 and 4.3.5**~~ of this standard. **Convenor Proposal** As applicable to vehicle categories, the vehicle fuel system shall comply with ~~crash safety~~ test requirements as specified in clause 4.3.2, 4.3.3, 4.3.4 and 4.3.5 of this standard.	Crash specific requirements are covered in Cl. No. 4.3.2, hence modified for better clarity. Also aligned with AIS 195 standard.

Convenor / Panel Decision:

Panel agreed to convenor suggestion with inclusion of ALL remarks mentioned in green text.

Running Changes proposed by TML

M/s TML comments on working draft

Existing Clause	Proposed Clause	Justification
Clause 4.15.1 (b) Yellow in colour if the detection system malfunctions (e.g. circuit disconnection, shot-circuit, sensor fault). It shall be red in compliance with section 4.13.3.	**Clause 4.15.1 (b)** Yellow or **Amber** in colour if the detection system malfunctions (e.g. circuit disconnection, shot-circuit, sensor fault). It shall be red in compliance with section 4.13.3	Alignment with AIS-071

Convenor / Panel Decision:

Comment is accepted. This brings alignment with AIS-071.

M/s TML comments on working draft

Annexure-II			
Safety checklist and type approval requirements for hydrogen fuel cell vehicles			
SN	**System / Components**	**Test Details & Certifying Authority**	**Reference Standard**
4	Thermally activated pressure relief device (TPRD)	Testing of the component by authorized test / certifying agency (PESO to certify / endorse in case component is fitted directly on cylinder)	IS/ISO 12619-10 or ISO 19882 UN R134 or GTR13 or EC 79/2009 (EU 406/2010) or EU 2021/535 **Justification** (alternate compliance standard)

Convenor / Panel Decision:

Panel decided to adopt ISO 19882 standard further to its ongoing revision at ISO.

M/s TML comments on working draft

Existing Clause	Proposed Clause	Justification
Clause 4.1.1 The hydrogen fuelling receptacle shall comply with test requirements laid down in IS/ISO 17268 standard. The typical profile of H35 hydrogen receptacle is illustrated in Annexure-I (Example only).	**Clause 4.1.1** The profile of hydrogen fuelling receptacle shall comply with IS/ISO 17268 standard. The typical profile of H35 hydrogen receptacle is illustrated in Annexure-I (for example only). Based on mutual agreement between Certification Agencies and OEMs/Suppliers, the fuelling receptacle shall comply with test requirements laid down in IS/ISO 17268 or EC 79/2009 or SAE J2600 / SAE J2799 standards.	This proposal while mandating the profile of hydrogen fueling receptacle common across auto industry, provides flexibility and operational headroom to certification agencies / OEMs / Suppliers to validate the fueling receptacle as per available and recognized alternate international standards.

Convenor / Panel Decision:

Comment is accepted with inclusion of green text.

ANNEX- 5

Minutes of 1st Meeting of TED 26/P7 (Hydrogen IC Engine) Panel dt. 28/05/2024

1. The 1st TED 26 Panel 7 meeting to initiate the panel discussions and activities for formulation of BIS standard for Type Approval of Hydrogen Powered Vehicles (Liquid / Compressed Gaseous Hydrogen was held on 28th May, 2024 virtually under the Convenorship of Shri. N Muthukumar, Deputy General Manager – Product Development.
2. Shri. N. Muthukumar welcomed all the panel members from Industry, test agencies & academia and presented details on the following points (Refer '**Annexure'** for details):
    a. Background of Panel formulation
    b. ISO/TC 197 Hydrogen technology standards – Overview
    c. Global standards for H2 IC Engine vehicles
    d. AIS 195 H2 ICE – Brief summary
    e. Members comments on H2 ICE working draft
3. Shri N. Muthukumar explained the proposed structure of H2 ICE Working draft and presented the details covered in the working draft (Refer **'Annexure**') to the Panel.
4. BIS secretariat was asked to share list of ISO standards (adopted / WIP) on H2 technologies under ISO/TC 197 & other ISO committees
5. BIS secretariat stated that existing standard IS 16735: 2018 on "Cylinders for on-Board Storage of Compressed Gaseous Hydrogen and Hydrogen Blends as a Fuel for Automotive Vehicles-Specification" is being revised in line with adopted ISO 19881 standard. Also he asked members to share their views on reviewing IS 16713 standard on H2 apparatus for stationary application to include requirements related to H2 leakage sensor compliance
6. Prof. Ravi Krishna, IISc opined that flammability starts from H2 concentration level of 4% ~ 75%, hence safety tolerance of 3% may be allowed for H2 limit in enclosed / semi-enclosed places
7. H2 Being future emerging technology, Prof. Ravi Krishna, IISc, stated that flexibility may be provided for component manufacturers to all downstream components to bring alternative / India specific solutions. Hence it was decided to retain existing H2 component level requirements in line with ECE R 134 & AIS 195
8. Mr. Ajay Dekate ARAI, expressed his views on test facility readiness for testing H2 components. Test facility for components > 50 bar pressure will be made ready this year end except for receptacle. No test facility development for receptacle planned as of now.
9. Comments received from RTBCI, TML, MSL & AL on working draft and the same were presented by respective members in detail. Refer '**Annexure**' for acceptance status of members comments.
10. It has been decided to circulate the working draft as "WC" to all relevant stakeholders for their review and for deliberation in the next panel meeting.
11. It has been suggested to have next panel meeting in physical mode, probably in Pune to visit H2 component test facilities at ARAI & exact date would be finalized appropriately and will be communicated.

12. Meeting ended with the vote of thanks to the Panel convener and all the members.

Annexure

Members comments

RNTBCI comments

Sl. No.	Clause/ Sub-clause/ para/ table/ fig. No. commented	Type of Comments (General/ Editorial/ Technical)	Proposed change	Justification
1	7.1.3 & 7.1.6	Technical	Out of following two requirements, we propose to keep only one option and delete the other 1. Label requirements (7.1.3) 2. Compliance Plate requirements (7.1.6)	Both requirements (7.1.3, 7.1.6) serve similar purpose. Some common details are required in both label and compliance plate (Fuel Type, NWP, Date of removal from service of containers). We suggest retaining only one option. 1. Compliance plate, or 2. Labelling (with additional details, if required)

Inference: Cl. No. 7.1.3 (label provision) shall be kept as "Reserved", inline with AIS 157 Amend 1

Panel decision: Cl. No. 7.1.3 shall be deleted & other Cl. Nos. shall be renumbered appropriately

RNTBCI comments

Sl. No.	Clause/ Sub-clause/ para/ table/ fig. No. commented	Type of Comments (General/ Editorial/ Technical)	Proposed change	Justification
2	Annex II 4.3 (a)	Technical	The exhaust of the shutoff valve (and other internal connections to hydrogen systems) shall be capped for this test (as the test is focused at external leakage). **At the discretion of the tester, the test article may be immersed in the leak-test fluid or leak-test fluid applied to the test article when resting in open air. Bubbles can vary greatly in size, depending on conditions. The tester estimates the gas leakage based on the size and rate of bubble formation.**	In line with AIS 195 and UN-R134.

Inference: Gas leak test (bubble test) procedure is part of AIS 195 & R 134 regulations but missed out in working draft

Panel decision: Agreed

RNTBCI comments

Sl. No.	Clause/ Sub-clause/ para/ table/ fig. No. commented	Type of Comments (General/ Editorial/ Technical)	Proposed change	Justification
3	3.25	Editorial	"IP code" means a coding system to indicate the degrees of protection provided by an enclosure against access to hazardous parts, ingress of solid foreign objects, ~~ingress of~~ ingress of water to give additional information in connection with such protection	Editorial correction. Repetition of words

Inference: Editorial correction

Panel decision: Agreed

TML comments

Existing Clause	Proposed Clause	Justification
Clause 7.1.3 ~~A label shall be affixed close to the fueling receptacle, for instance inside a refilling hatch, showing the following information: Fuel type (e.g. "CHG" for gaseous hydrogen/H2 gas, Maximum fueling pressure (MFP), Nominal working pressure (NWP), date of removal from service of containers e.g.~~ ~~'H2 gas~~ ~~'XX' MPa~~ ~~Where 'XX' = nominal working pressure of the container.~~	**Clause 7.1.3** **Reserved**	The deletion of H2 Identification label near receptacle / refuelling device was agreed during last ASIC CNG/LPG panel meeting as compliance plate is already provided near receptacle.

Inference: Cl. No. 7.1.3 (label provision) shall be kept as "Reserved", inline with AIS 157 Amend 1

Panel decision: Cl. No. 7.1.3 shall be deleted & other Cl. Nos. shall be renumbered appropriately

TML comments

Existing Clause	Proposed Clause	Justification
Clause 7.6.3 If during operation, a single failure results in a hydrogen concentration exceeding ~~3.0~~ percent by volume in air in the enclosed or semi-enclosed spaces of the vehicle, then a warning shall be provided in accordance with 7.8. If the hydrogen concentration exceeds ~~4.0~~ percent by volume in the air in the enclosed or semi-enclosed spaces of the vehicle, the main shut-off valve shall be closed to isolate the storage system (Annexure IV, paragraph 3).	**Clause 7.6.3** If during operation, a single failure results in a hydrogen concentration exceeding **2.0** percent by volume in air in the enclosed or semi-enclosed spaces of the vehicle, then a warning shall be provided in accordance with 7.8. If the hydrogen concentration exceeds **3.0** percent by volume in the air in the enclosed or semi-enclosed spaces of the vehicle, the main shut-off valve shall be closed to isolate the storage system (Annexure IV, paragraph 3).	Alignment with Amendment-1 to AIS-157 standard

Inference: Proposal suggested in line with Amend 1 to AIS 157

Panel decision: Agreed

TML comments

Existing Clause	Proposed Clause	Justification
Clause 7.8.1 (b) Yellow in colour if the detection system malfunctions (e.g. circuit disconnection, shot-circuit, sensor fault). It shall be red in compliance with section 7.6.3.	**Clause 7.8.1 (b)** Yellow or Amber in colour if the detection system malfunctions (e.g. circuit disconnection, shot-circuit, sensor fault). It shall be red in compliance with section 7.6.3.	Alignment with AIS-157 standard (BIS Conversion)

Inference: Proposal suggested in line with decision taken in TED 26 P6 meeting held on 17th May

Panel decision: Agreed

TML comments

Existing Clause	Proposed Clause	Justification
Clause 7.8.1(d) Remains illuminated when 3.0 percent concentration or detection system malfunction exists and the ignition locking system is in the "On" ("Run") position or the propulsion system is activated.	**Clause 7.8.1(d)** Remains illuminated when 2.0 percent concentration or detection system malfunction exists and the ignition locking system is in the "On" ("Run") position or the propulsion system is activated.	Alignment with Amendment-1 to AIS-157 standard

Inference: Proposal suggested in line with Amend 1 to AIS 157

Panel decision: Agreed

TML comments

Existing Clause	Proposed Clause	Justification
Clause 7.10.3 Concentration limit in enclosed spaces Hydrogen gas leakage shall not result in a hydrogen concentration in the air greater than**4.0** percent by volume in the passenger and luggage compartments (Annexure IV, paragraph 2). The requirement is satisfied if it is confirmed that the shut-off valve of the storage system has closed within 5 seconds of the crash and no leakage from the storage system.	**Clause 7.10.3 Concentration limit in enclosed spaces** Hydrogen gas leakage shall not result in a hydrogen concentration in the air greater than**3.0** percent by volume in the passenger and luggage compartments (Annexure IV, paragraph 2). The requirement is satisfied if it is confirmed that the shut-off valve of the storage system has closed within 5 seconds of the crash and no leakage from the storage system.	Alignment with Amendment-1 to AIS-157 standard (BIS Conversion)

Inference: Proposal suggested in line with decision taken in TED 26 P6 meeting held on 17th May

Panel decision: Agreed

MSIL comments

Sl. No.	Clause	Type of Comments (General/ Editorial/ Technical)	Proposed change	Justification
1.	7.1.3	General	Existing clause: ~~A label shall be affixed close to the fueling receptacle, for instance inside a refilling hatch, showing the following information: Fuel type (e.g. "CHG" for gaseous hydrogen/H2 gas, Maximum fueling pressure (MFP), Nominal working pressure (NWP), date of removal from service of containers e.g.~~ ~~H2 gas~~ ~~'XX' MPa~~ ~~Where 'XX'= nominal working pressure of the container.~~ Proposed: **Clause 7.1.3 to be deleted**	1.Clause deleted in AIS 157 Amd 1. 2. Cl. 7.1.3 & Cl. 7.1.6 asking for labelling requirement near filling connection, however it creates confusion of duplicity. 3. Cl. 7.1.6 has better description. Hence, it is proposed to keep this clause only and delete Cl 7.1.3 accordingly

Inference: Cl. No. 7.1.3 (label provision) shall be kept as "Reserved", inline with AIS 157 Amend 1

Panel decision: Cl. No. 7.1.3 shall be deleted & other Cl. Nos. shall be renumbered appropriately

MSIL comments

Sl. No.	Clause	Type of Comments (General/ Editorial/ Technical)	Proposed change	Justification
2.	7.2.4	Technical	Existing Clause: In the case where hydrogen storage system is not subjected to frontal impact test, the container shall be mounted in a position which is rearward of a vertical plane perpendicular to centre line of the vehicle and located 420mm rearward from the front edge of the vehicle Proposal: In the case where hydrogen storage system is not subjected to frontal impact test, the container shall be mounted in a position which is rearward of a vertical plane perpendicular to centre line of the vehicle and located atleast 420mm rearward from the front edge of the vehicle	1.This comment is already accepted in **Panel 6 (Hydrogen Fuel Cell)**, 2.Position of hydrogen storage system has been fixed at "420mm rearward from the front edge of the vehicle", which may not be feasible in many cases depending upon the length and design of vehicles

Inference: Proposal suggested in line with decision taken in TED 26 P6 meeting held on 17th May

Panel decision: Agreed

MSIL comments

Sl. No.	Clause	Type of Comments (General/ Editorial/ Technical)	Proposed change	Justification
3.	7.8.1(b)	General	Existing  Proposal:  Note: Above figure is for illustration purposes only	1.UNR 134,GTR 13 and AIS 157 does not provide any pictorial illustration of tell-tale to be used 2.Note to be added for clarity

Inference: Tell tale symbol is AIS 195 unique & not part of EU & AIS 157 standards. Proposal to be deliberated.

Panel decision: Agreed

MSIL comments

Sl. No.	Clause	Type of Comments (General/ Editorial/ Technical)	Proposed change	Justification
4	7.8.1(d)	Editorial	Existing: (d) Remains illuminated when 3.0 percent concentration or detection system malfunction exists and the ignition locking system is in the "On" ("Run") position or the propulsion system is activated. Proposal: (d) Remains illuminated when 2 ± 1.0 per cent concentration or detection malfunction) exists and the ignition locking system is in the "On" ("Run") position or the propulsion system is activated.	1. Tell-tale signal warning illumination limit in GTR 13 and AIS 157 is 2 percent.

Inference: 2% H2 concentration suggested in line with AIS 157 Amend 1.
Proposal to be deliberated.

Panel decision: Agreed for 2% H2 concentration in line with AIS 157 Amend 1. ± 1.0% was not agreed. System provided by manufacturer may trigger warning at lower H2 concentration percentage

MSIL comments

Sl. No.	Clause	Type of Comments (General/ Editorial/ Technical)	Proposed change	Justification
5.	7.5 (b)	General	(b) And not exceed 8 percent at any time when tested according to Annexure IV, Paragraph 4. (b) And not exceed 8 percent by volume at any time when tested according to Annexure IV, Paragraph 4.	Comment: 1.For better clarity. 2.Or else 8% of what? Shall be specified 3.This comment is already accepted in Panel 6 (Hydrogen Fuel Cell)

Inference: Modification suggested in line with Cl. No. 7.5(a) on H2 concentration level in exhaust system. Also in line with decision taken in TED 26 P6 meeting held on 17th May

Panel decision: Agreed

MSIL comments

Sl. No.	Clause	Type of Comments (General/ Editorial/ Technical)	Proposed change	Justification
6.	7.6.3	Editorial	If during operation, a single failure results in a hydrogen concentration exceeding 3.0 percent by volume in air in the enclosed or semi-enclosed spaces of the vehicle, then a warning shall be provided in accordance with 7.8. If the hydrogen concentration exceeds 4.0 percent by volume in the air in the enclosed or semi-enclosed spaces of the vehicle, the main shut-off valve shall be closed to isolate the storage system (Annexure IV, paragraph 3). **Proposed:** If during operation, a single failure results in a hydrogen concentration exceeding 2.0percent by volume in air in the enclosed or semi-enclosed spaces of the vehicle, then a warning shall be provided in accordance with 7.8. If the hydrogen concentration exceeds 3.0 percent by volume in the air in the enclosed or semi-enclosed spaces of the vehicle, the main shut-off valve shall be closed to isolate the storage system (Annexure IV, paragraph 3). Considering the overall safety hazards, the system provided by the manufacturers may trigger warning signal & shut-off valve closure at lesser hydrogen concentration percentage.	1.Correction in hydrogen concentration limits inline with AIS 157 2.This comment is already accepted in Panel 6 (Hydrogen Fuel Cell) 3. Same Changes to be in clauses ANNEXURE IV ,3.1.1.2

Inference: Proposal suggested in line with Amend 1 to AIS 157. Warning may be provided for lesser H2 concentration percentage.
Similar changes to be carried out in Cl. No. 3.1.1.2 of ANNEXURE IV on "Detailed test procedure for vehicle fuel system"
Proposal to be deliberated.

Panel decision: Agreed

MSIL comments

Sl. No.	Clause	Type of Comments (General/ Editorial/ Technical)	Proposed change	Justification
7.	7.10.3	Editorial	Existing: Hydrogen gas leakage shall not result in a hydrogen concentration in the air greater than ~~4.0~~ percent by volume in the passenger and luggage compartments (Annexure IV, paragraph 2). The requirement is satisfied if it is confirmed that the shut-off valve of the storage system has closed within 5 seconds of the crash and no leakage from the storage system. Proposed: Hydrogen gas leakage shall not result in a hydrogen concentration in the air greater than 3.0 percent by volume in the passenger and luggage compartments (Annexure IV, paragraph 2). The requirement is satisfied if it is confirmed that the shut-off valve of the storage system has closed within 5 seconds of the crash and no leakage from the storage system.	1.Correction in hydrogen concentration limits inline with AIS 157 2.Max proposed limit for hydrogen concentration is 3.0 percent

Inference: Proposal suggested in line with decision taken in TED 26 P6 meeting held on 17th May

Panel decision: Agreed

MSIL comments

Sl. No.	Clause	Type of Comments (General/ Editorial/ Technical)	Proposed change	Justification
8.	ANNEXURE IA	General	Existing: **Typical representation of compressed gaseous hydrogen vehicle (For Illustration Purpose only)** 1. Tank~~s~~ 2. PRD vent~~s~~ 3. Cylinder valve~~s~~ 4. Shut off valve~~s~~ 5. Pressure transducer 6. Pressure gauge 7. Receptacle 8. Filter 9. Solenoid valve 10. HP regulator 11. PRV vent 12. LP regulator 13. Injector rail assembly ~~s-Mandatory~~	1. Many of the items like receptable, regulator etc. that are currently not marked as mandatory fitment shall be mandated as these are necessary fitment for compressed gaseous hydrogen vehicle 2.Hence it is proposed to not to classify the components items as mandatory/Non mandatory. For better clarity

			Proposed: 1. Tank	
			2. PRD vent 3. Cylinder valve 4. Shut off valve 5. Pressure transducer 6. Pressure gauge 7. Receptacle 8. Filter 9. Solenoid valve 10. HP regulator 11. PRV vent 12. LP regulator 13. Injector rail assembly	

Inference: AIS 195 standard drafted in line with ECE R 134 req.; R 134 mandates only upstream components. To be deliberated

Panel decision: Existing clause shall be retained

MSIL comments

Sl. No.	Clause	Type of Comments (General/ Editorial/ Technical)	Proposed change	Justification
9.	3.2.1.4. F	Editorial	Existing: For the purpose of the test, a hydrogen concentration detector is installed where hydrogen gas may accumulate most in the passenger compartment (e.g. near the headliner) when testing for compliance with Paragraph ~~7.1.4.2.~~ of this Standard and hydrogen concentration detector are installed in enclosed or semi enclosed volumes on the vehicle where hydrogen can accumulate from the simulated hydrogen releases when testing for compliance with Paragraph ~~7.1.4.3.~~ of this Standard (see Annex IV, Paragraph 3.2.1.3.). Proposed: For the purpose of the test, a hydrogen concentration detector is installed where hydrogen gas may accumulate most in the passenger compartment (e.g. near the headliner) when testing for compliance with Paragraph 7.6.2 of this Standard and hydrogen concentration detector are installed in enclosed or semi enclosed volumes on the vehicle where hydrogen can accumulate from the simulated hydrogen releases when testing for compliance with Paragraph 7.6.3. of this Standard (see Annex IV, Paragraph 3.2.1.3.).	1.Cl. 7.6.2 & 7.6.3 deals with H2 concentration & warning requirement in AIS 195. 2.Cl. 7.1.4.2 & 7.1.4.3 is not described in AIS 195. This clause reference might have copied from ECE-134, hence editorial correction required 3. wherever **cross referencing** of Cl. 7.1.4.2 & 7.1.4.3 have been done, it need to substituted with Cl. 7.6.2 & 7.6.3 respectively. 4.Same Changes to be in clauses **3.2.2.4, 3.2.2.5**

Inference: Cl. No. reference correction.
Cl. 7.1.4.2 & 7.1.4.3 shall be read as "Cl. 7.6.2 & 7.6.3" in all relevant clauses wherever specified

Panel decision: Agreed

Positioning of H2 cylinders in vehicles – AL proposal to amend AIS 157 & AIS 195 standard requirements

Background

- AIS 157 standard on Hydrogen fuel cell vehicle already notified in CMVR & in force since September 2020; AIS 195 H2 ICE from October 2023
- AIS 157 & AIS 195 standards covers requirements for Hydrogen cylinders positioned below chassis frame; Does not specify requirements if cylinders located behind the Cab or roof or ROH area
- Globally, Protective guard in form of extended cab at rear is provided in most of the Trucks. No protective guard in case Cylinders are positioned well within Cab width (may be within 200 mm from vehicle extremity)
- Being evolving technology, we suggest to include specific requirements in AIS 157 & AIS 195 standards related to cylinders positioning behind Cab or roof or ROH area

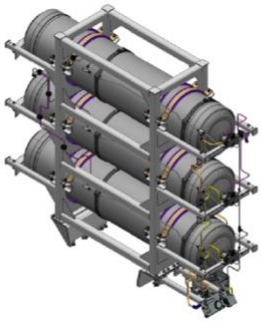
Global scenarios

Globally, Protective guard in form of extended cab at rear is provided in most of the Trucks

In case, Cylinders are positioned well within Cab width, protective guard is not provided

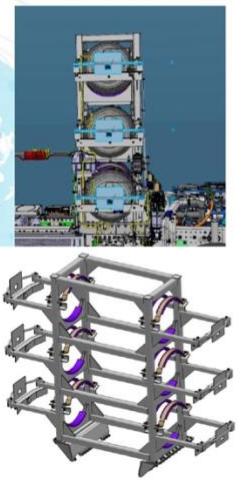
Strength requirement for protective guard is not defined in global standards

Illustration



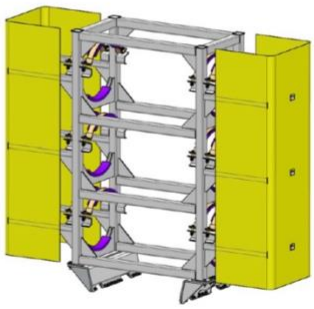
Illustration

Option 1



- Cylinders are positioned in case (metallic structure) placed behind Cab with protective guard for each valves.
- This may be an alternative method protecting cylinder valves from impact, to global practice of provision of guard in form of extended Cab at rear.
- This guard (rigid plate) shall be provided on both sides of cylinder in form of full cover or against cylinder valve as shown in this Illustration.
- Guard shall withstand 1 kN load complying to lateral protection requirement as per IS 14682
- This concept of protective guard may be deployed for other cylinder positions like roof, rear overhang area etc.,
- Strength requirement for protective guard is not part of any international standards

Option 2



AL proposal / Justifications

New clause to be included –

Cl. No. 4.3.8

However, when H2 cylinders are mounted behind cab or in chassis rear overhang area or on roof of the vehicle, adequate guards shall be provided for Cylinder valves. This guard shall be considered suitable if it is capable of withstanding a horizontal static force of 1kN applied perpendicularly to any part of its external surface by the centre of the ram the face of which is circular and flat, with suitable diameter and if the deflection of the guard under load is not more than 30mm. If the vehicle is so designed and / or equipped that by their shape and characteristics, the component parts together meet the above strength requirements, they may be regarded as replacing the side guards.

Justifications:

Existing lateral impact test applies for cases where H2 cylinders are mounted on chassis frame in wheelbase area and H2 cylinders positioned below floor line of loading platform. In such cases, vehicle lateral protection will serve as guard for cylinders and valves. Recently, there are many positions and orientation of H2 cylinders being pursued by industry like positioning behind cab or on roof or in chassis rear overhang area, hence modification suggested in order to suit multiple orientation of H2 cylinders.

Panel decision: Agreed

ANNEX- 6

(*Item 5.1*)

Detailed Program of Work (PoW) of SC TED 26

Sl. No.	IS No.	TITLE	Reaffirm M-Y	No. of Amds	Eqv.
1	IS/ISO 12619-1 : 2014 ISO 12619-1 : 2014 ISO 12619-1 : 2014	Road Vehicles Compressed Gaseous Hydrogen CGH2 And Hydrogen Natural Gas Blend Fuel System Components Part 1: General Requirements And Definitions		-	Identical under dual numbering
2	IS/ISO/IEC 12619-2 : 2014 ISO 12619-2 : 2014 ISO 12619-2 : 2014	ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGEN NATURAL GAS BLEND FUEL SYSTEM COMPONENTS PART 2: PERFORMANCE AND GENERAL TEST METHODS		-	Identical under dual numbering
3	IS/ISO 12619-3 : 2014 ISO 12619-3: 2014 ISO 12619-3: 2014	ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGEN NATURAL GAS BLEND FUEL SYSTEM COMPONENTS PRESSURE REGULATOR		-	Identical under dual numbering
4	IS/ISO 12619-4 : 2016 ISO 12619-4: 2016 ISO 12619-4: 2016	ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGEN NATURAL GAS BLENDS FUEL SYSTEM COMPONENTS CHECK VALVE		-	Identical under dual numbering
5	IS/ISO 12619-5 : 2016 ISO 12619-5: 2016 ISO 12619-5: 2016	ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGEN NATURAL GAS BLENDS FUEL SYSTEM COMPONENTS PART 5: MANUAL CYLINDER VALVE		-	Identical under dual numbering
6	IS/ISO 12619-6 : 2017 ISO 12619-6: 2017 ISO 12619-6: 2017	ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGENNATURAL GAS BLEND FUEL SYSTEM COMPONENTS AUTOMATIC VALVE		-	Identical under dual numbering
7	IS/ISO 12619-7 : 2017 ISO 12619-7: 2017 ISO 12619-7: 2017	ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGENNATURAL GAS BLENDS FUEL SYSTEM COMPONENTS GAS INJECTOR		-	Identical under dual numbering
8	IS/ISO 12619-8 : 2017 ISO 12619-8: 2017 ISO 12619-8: 2017	ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGENNATURAL GAS BLENDS FUEL SYSTEM		-	Identical under dual numbering

		COMPONENTS PRESSURE INDICATOR			
	IS/ISO 12619-9 : 2017 Adoption of ISO 1261	ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGENNATURAL GAS BLENDS FUEL SYSTEM			
9	Adoption of ISO 1261	COMPONENTS PRESSURE RELIEF VALVE PRV	-		Identical under dual numbering
	IS/ISO 12619-10 : 2017 ISO 12619-10: 2017	ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGEN NATURAL GAS BLENDS FUEL SYSTEM			
10	ISO 12619-10: 2017	COMPONENTS PRESSURE RELIEF DEVICE PRD	-		Identical under dual numbering
	IS/ISO 12619-11 : 2017 ISO 12619-11 : 2017	ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGEN NATURAL GAS BLENDS FUEL SYSTEM			
11	ISO 12619-11 : 2017	COMPONENTS EXCESS FLOW VALVE	-		Identical under dual numbering
	IS/ISO 12619-12 : 2017 ISO 12619-12 : 2017	ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGEN NATURAL GAS BLENDS FUEL SYSTEM			
12	ISO 12619-12 : 2017	COMPONENTS GAS-TIGHT HOUSING AND VENTILATION HOSES	-		Identical under dual numbering
	IS/ISO 12619-13 : 2017 ISO 12619-13 : 2017	ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGEN NATURAL GAS BLENDS FUEL SYSTEM			
13	ISO 12619-13 : 2017	COMPONENTS RIGID FUEL LINE IN STAINLESS STEEL	-		Identical under dual numbering
	IS/ISO 12619-14 : 2017 ISO 12619-14: 2017	ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGEN NATURAL GAS BLENDS FUEL SYSTEM			
14	ISO 12619-14: 2017	COMPONENTS FLEXIBLE FUEL LINE	-		Identical under dual numbering
	IS/ISO 12619-15 : 2017 ISO 12619-15: 2017	ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGENNATURAL GAS BLENDS FUEL SYSTEM			
15	ISO 12619-15: 2017	COMPONENTS FILTER	-		Identical under dual numbering
	IS/ISO 12619-16 : 2017 ISO 12619-1 : 2014	Road Vehicles Compressed Gaseous Hydrogen CGH2 And Hydrogen Natural Gas Blend Fuel System Components Part 1:			
16	ISO 12619-1 : 2014	General Requirements And Definitions	-		Identical under dual numbering
	IS 15710 : 2006 ISO 15500-1	Road vehicles - Compressed natural gas (CNG) fuel system			
17	Reviewed In : 2021 ISO 15500-1: 2000	components - General requirements and definitions	September, 2021	1	Modified/Technically Equivalent
18	IS 15711 : 2006			1	

	ISO 15500-2 Reviewed In : 2021 ISO 15500-2: 2001 IS 15712 : 2006	Road vehicles - Compressed natural gas (CNG) fuel system components - Performance and general test methods	September, 2021		Modified/Technically Equivalent
19	ISO 15500-6 Reviewed In : 2021 ISO 15500-6: 2001 IS 15713 : 2006	Road vehicles - Compressed natural gas (CNG) fuel system components - Automatic valve (Solenoid Valve)	September, 2021	1	Modified/Technically Equivalent
20	ISO 15500-9 Reviewed In : 2021 ISO 15500-9: 2001 IS 15714 : 2006	Road vehicles - Compressed natural gas (CNG) fuel system components - Pressure regulator	September, 2021	1	Modified/Technically Equivalent
21	ISO 15500-11 Reviewed In : 2021 ISO 15500-11: 2001 IS 15715 : 2008	Road vehicles - Compressed natural gas (CNG) fuel system components - Gas/air mixer	September, 2021	1	Modified/Technically Equivalent
22	Reviewed In : 2019 IS 15716 : 2006	Road vehicles - Compressed natural gas (CNG) fuel system components - Conduit (Ventilation Hose)	December, 2019	1	Indigenous
23	Reviewed In : 2021 IS 15717 : 2006	Road vehicles - Compressed natural gas (CNG) fuel system components - Cng high pressure fuel line (Rigid) with end connections [having pressure exceeding 2.15 mpa (21.5 Bar)]	September, 2021	2	Indigenous
24	Reviewed In : 2021 IS 15718 : 2006	Road vehicles - Compressed natural gas (CNG) fuel system components - Petrol valve (Automatic/manual)	September, 2021	2	Indigenous
25	Reviewed In : 2021 IS 15719 : 2006	Road vehicles - Compressed natural gas (CNG) fuel system components - Cng high pressure fuel line (Flexible Hose) with end connections [having service pressure exceeding 2.15 mpa (21.5 Bar)]	September, 2021	-	Indigenous
26	Reviewed In : 2021 IS 15720 : 2008	Road vehicles - Compressed natural gas (CNG) fuel system components - Electrical wiring kit	September, 2021	1	Indigenous
27	Reviewed In : 2019 IS 15721 : 2006	Road vehicles - Compressed natural gas (CNG) fuel system components - Compartments/sub - Compartments	December, 2019	1	Indigenous
28	Reviewed In : 2021 IS 15722 : 2006	Road vehicles - Compressed natijral gas (CNG) - Fire retardant material for seat,upholstery,roof and side lining	September, 2021	1	Indigenous
29	Reviewed In : 2021	Road vehicles - Compressed natural gas (CNG) fuel system components - Cng low - Pressure flexible fuel line with end connections [cng fuel line having	September, 2021	1	Indigenous

		pressure not exceeding 2.15 mpa (21.5 Bar)]			
30	IS 15723 : 2006 Reviewed In : 2021	Road vehicles - Compressed natural gas (CNG)Fuel system components - Current limiting devices	September, 2021	1	Indigenous
31	IS 15870 : 2009 Reviewed In : 2019	Road vehicles - Use of compressed natural gas (CNG) fuel system in internal combustion engine vehicles - Code of practice	December, 2019	-	Indigenous
32	IS 15956 : 2012 Reviewed In : 2017	Road vehicles - Liquefied petroleum gas (LPG) specific equipments - Definitions, classification and general requirements	September, 2017	-	Indigenous
33	IS 15957 : 2012 Reviewed In : 2017	Road vehicles - Liquefied petroleum gas (LPG) specific equipment - general design requirements, performance and test methods	September, 2017	-	Indigenous
34	IS 16009 : 2013 Reviewed In : 2018	Road vehicles - Liquefied petroleum gas (LPG) specific equipment - Shut off valve	August, 2018	-	Indigenous
35	IS 16053 : 2013 Reviewed In : 2018	Road vehicles - Liquefied petroleum gas (LPG) specific equipment - Pressure regulator and vapourizer	August, 2018	-	Indigenous
36	IS 16062 : 2013 Reviewed In : 2018	Road vehicles - Liquefied petroleum gas (LPG) specific equipment - Pressure and/or temperature sensor	August, 2018	-	Indigenous
37	IS 16063 : 2013 Reviewed In : 2018	Road vehicles - Liquefied petroleum gas (LPG) specific equipment - Lpg filter unit	August, 2018	-	Indigenous
38	IS 16064 : 2013 Reviewed In : 2018	Road vehicles - Liquefied petroleum gas (LPG) specific equipment - Gas mixing piece	August, 2018	-	Indigenous
39	IS 16065 : 2013 Reviewed In : 2018	Road vehicles - Liquefied petroleum gas (LPG) specific equipment - Fuel rail	August, 2018	-	Indigenous
40	IS 16367 : 2017	Road vehicles - Liquefied petroleum gas (LPG) specific equipment - Gas injector		-	Indigenous
41	IS/ISO 17268 : 2020 ISO 17268 : 2020 ISO 17268 : 2020	Gaseous Hydrogen Land Vehicle Refuelling Connection Devices		-	Identical under single numbering
42	IS 19026 (Part 1) : 2023 ISO 12614-1:2021 ISO 12614-1:2021	ROAD VEHICLES ï¿½ LIQUEFIED NATURAL GAS (LNG) FUEL SYSTEM COMPONENTS - PART 1 : GENERAL REQUIREMENTS AND DEFINITIONS		-	Identical under dual numbering

43	IS 19026 (Part 2) : 2023 ISO 12614-2:2021 ISO 12614-2:2021	ROAD VEHICLES ï¿½ LIQUEFIED NATURAL GAS (LNG) FUEL SYSTEM COMPONENTS ï¿½ PART 2: PERFORMANCE AND GENERAL TEST METHODS	-	Identical under dual numbering
44	IS 19026 (Part 3) : 2023 ISO 12614-3:2021 ISO 12614-3:2021	ROAD VEHICLES ï¿½ LIQUEFIED NATURAL GAS (LNG) FUEL SYSTEM COMPONENTS ï¿½ PART 3: CHECK VALVE	-	Identical under dual numbering
45	IS 19026 (Part 4) : 2023 ISO 12614-4:2021 ISO 12614-4:2021	ROAD VEHICLES ï¿½LIQUEFIED NATURAL GAS (LNG) FUEL SYSTEM COMPONENTS ï¿½PART 4: MANUAL VALVE	-	Identical under dual numbering
46	IS 19026 (Part 5) : 2023 ISO 12614-5:2021 ISO 12614-5:2021	ROAD VEHICLES ï¿½ LIQUEFIED NATURAL GAS (LNG) FUEL SYSTEM COMPONENTS ï¿½ PART 5: TANK PRESSURE GAUGE	-	Identical under dual numbering
47	IS 19026 (Part 7) : 2023 ISO 12614-7:2021 ISO 12614-7:2021	ROAD VEHICLES ï¿½ LIQUEFIED NATURAL GAS (LNG) FUEL SYSTEM COMPONENTS ï¿½ PART 7 : PRESSURE RELIEF VALVE (PRV)	-	Identical under dual numbering
48	IS 19026 (Part 8) : 2023 ISO 12614-8:2021 ISO 12614-8:2021	ROAD VEHICLES ï¿½ LIQUEFIED NATURAL GAS (LNG) FUEL SYSTEM COMPONENTS ï¿½ PART 8: EXCESS FLOW VALVE	-	Identical under dual numbering
49	IS 19026 (Part 9) : 2023 ISO 12614-9:2021 ISO 12614-9:2021	ROAD VEHICLES ï¿½ LIQUEFIED NATURAL GAS (LNG) FUEL SYSTEM COMPONENTS ï¿½ PART 9 GAS-TIGHT HOUSING AND VENTILATION HOSE	-	Identical under dual numbering
50	IS 19026 (Part 10) : 2023 ISO 12614-10:2021 ISO 12614-10:2021	ROAD VEHICLES ï¿½ LIQUEFIED NATURAL GAS (LNG) FUEL SYSTEM COMPONENTS ï¿½PART 10: RIGID FUEL LINE IN STAINLESS STEEL	-	Identical under dual numbering
51	IS 19026 (Part 11) : 2023 ISO 12614-11:2021 ISO 12614-11:2021	ROAD VEHICLES ï¿½ LIQUEFIED NATURAL GAS (LNG) FUEL SYSTEM COMPONENTS ï¿½ PART 11 : FITTINGS	-	Identical under dual numbering
52	IS 19026 (Part 12) : 2023 ISO 12614-12:2021 ISO 12614-12:2021	ROAD VEHICLES ï¿½ LIQUEFIED NATURAL GAS (LNG) FUEL SYSTEM COMPONENTS ï¿½ PART 12: RIGID FUEL LINE IN COPPER AND ITS ALLOYS	-	Identical under dual numbering
53	IS 19026 (Part 13) : 2023 ISO 12614-13:2021	ROAD VEHICLES ï¿½ LIQUEFIED NATURAL GAS (LNG) FUEL SYSTEM COMPONENTS ï¿½PART	-	Identical under dual numbering

	ISO 12614-13:2021	13: TANK PRESSURE CONTROL REGULATOR		
54	IS 19026 (Part 14) : 2023 ISO 12614-14:2021 ISO 12614-14:2021	ROAD VEHICLES ï¿½ LIQUEFIED NATURAL GAS (LNG) FUEL SYSTEM COMPONENTS ï¿½ PART 14: DIFFERENTIAL PRESSURE FUEL CONTENT GAUGE	-	Identical under dual numbering
55	IS 19026 (Part 15) : 2023 ISO 12614-15:2021 ISO 12614-15:2021	ROAD VEHICLES ï¿½ LIQUEFIED NATURAL GAS (LNG) FUEL SYSTEM COMPONENTS ï¿½PART 15: CAPACITANCE FUEL CONTENT GAUGE	-	Identical under dual numbering
56	IS 19026 (Part 16) : 2023 ISO 12614-16:2021 ISO 12614-16:2021	ROAD VEHICLES ï¿½ LIQUEFIED NATURAL GAS (LNG) FUEL SYSTEM COMPONENTS ï¿½ PART 16: HEAT EXCHANGER-VAPORIZER	-	Identical under dual numbering
57	IS 19026 (Part 17) : 2023 ISO 12614-17:2021 ISO 12614-17:2021	ROAD VEHICLES ï¿½ LIQUEFIED NATURAL GAS (LNG) FUEL SYSTEM COMPONENTS ï¿½ PART 17: NATURAL GAS DETECTOR	-	Identical under dual numbering
58	IS 19026 (Part 18) : 2023 ISO 12614-18:2021 ISO 12614-18:2021	ROAD VEHICLES ï¿½ LIQUEFIED NATURAL GAS (LNG) FUEL SYSTEM COMPONENTS ï¿½ PART 18: GAS TEMPERATURE SENSOR	-	Identical under dual numbering
59	IS 19026 (Part 19) : 2023 ISO 12614-19:2021 ISO 12614-19:2021	ROAD VEHICLES ï¿½ LIQUEFIED NATURAL GAS (LNG) FUEL SYSTEM COMPONENTS ï¿½ PART 19: AUTOMATIC VALVE	-	Identical under dual numbering
60	IS 19032 : 2023	ROAD VEHICLES-LIQUEFIED PETROLEUM GAS LPG SPECIFIC EQUIPMENT-LPG FLEXIBLE HOSE	-	Indigenous
61	IS 19035 : 2023 ISO 16964: 2019 ISO 16964: 2019	GAS CYLINDERS FLEXIBLE HOSES ASSEMBLIES SPECIFICATION AND TESTING	-	Identical under dual numbering
62	IS 19036 : 2023 ISO 23273: 2013 ISO 23273: 2013	Fuel cell road vehicles Safety specifications Protection against hydrogen hazards for vehicles fuelled with compressed hydrogen	-	Identical under dual numbering
63	IS/ISO 23828 : 2013 ISO 23828 : 2013 ISO 23828 : 2013	FUEL CELL ROAD VEHICLES - ENERGY CONSUMPTION MEASUREMENT - VEHICLES FUELLED WITH COMPRESSED HYDROGEN	-	Identical under dual numbering

Standards Under Develpoment

Projects Approved

Sl. No.	Doc No	TITLE

No Records Found

Preliminary Draft Standards

Sl. No.	Doc No	TITLE

No Records Found

Drafts Standards in WC Stage

Sl. No.	Doc No	TITLE

No Records Found

Draft Standards Completed WC Stage

Sl. No.	Doc No	TITLE
1	TED 26 (14995)	Road vehicles - Compressed natural gas CNG fuel systems components - General requirements and definitions
2	TED 26 (15007) (15500-2)	ROAD VEHICLES COMPRESSED NATURAL GAS CNG BIO - COMPRESSED NATURAL GAS BIO - CNG FUEL SYSTEM COMPONENTS PERFORMANCE AND GENERAL TEST METHODS First Revision
3	TED 26 (15008) (15500-6)	ROAD VEHICLES COMPRESSED NATURAL GAS CNG BIO- COMPRESSED NATURAL GAS BIO- CNG FUEL SYSTEM COMPONENTS AUTOMATIC VALVE SOLENOID VALVE First Revision
4	TED 26 (15013)	Road vehicles - Compressed natural gas CNG fuel system components - Conduit Ventilation Hose
5	TED 26 (15014)	Road vehicles - Compressed natural gas CNG fuel system components - Cng high pressure fuel line Rigid with end connections having pressure exceeding 215 mpa 215 Bar

6	TED 26 (15015)	Road vehicles - Compressed natural gas CNGFuel system components - Current limiting devices
7	TED 26 (15681)	ROAD VEHICLES - LIQUEFIED NATURAL GAS LNG FUEL SYSTEM COMPONENTS - PERFORMANCE AND GENERAL TEST METHODS
8	TED 26 (18368)	ROAD VEHICLES COMPRESSED NATURAL GAS CNG BIO-COMPRESSED NATURAL GAS BIO- CNG FUEL SYSTEM COMPONENTS PRESSURE REGULATOR First Revision
9	TED 26 (18373)	ROAD VEHICLES COMPRESSED NATURAL GAS CNG BIO - COMPRESSED NATURAL GAS BIO- CNG FUEL SYSTEM COMPONENTS GAS AIR MIXER First Revision
10	TED 26 (18374)	ROAD VEHICLES COMPRESSED NATURAL GAS CNG BIO-COMPRESSED NATURAL GAS BIO- CNG LIQUEFIED PETROLEUM GAS LPG FUEL SYSTEM COMPONENTS PETROL VALVE AUTOMATIC MANUAL First Revision
11	TED 26 (18375)	ROAD VEHICLES COMPRESSED NATURAL GAS CNG BIO-COMPRESSED NATURAL GAS BIO- CNG FUEL SYSTEM COMPONENTS HIGH PRESSURE FUEL LINE FLEXIBLE HOSE WITH END CONNECTIONS HAVING SERVICE PRESSURE EXCEEDING 2 15MPa 21 5 BAR First Revision
12	TED 26 (18377)	ROAD VEHICLES COMPRESSED NATURAL GAS CNG BIO-COMPRESSED NATURAL GAS BIO- CNG LIQUEFIED PETROLEUM GAS LPG FUEL SYSTEM COMPONENTS ELECTRICAL WIRING KIT First Revision
13	TED 26 (18378)	ROAD VEHICLES COMPRESSED NATURAL GAS CNG BIO-COMPRESSED NATURAL GAS BIO- CNG LIQUEFIED PETROLEUM GAS LPG FUEL SYSTEM COMPONENTS CNG BIO- CNG LPG COMPARTMENT SUB- COMPARTMENT First Revision

14	TED 26 (18379)	ROAD VEHICLES COMPRESSED NATURAL GAS CNG BIO-COMPRESSED NATURAL GAS BIO- CNG LIQUEFIED PETROLEUM GAS LPG FUEL SYSTEM COMPONENTS FIRE RETARDANT MATERIAL FOR SEAT UPHOLSTERY ROOF AND SIDE LINING First Revision
15	TED 26 (18380)	ROAD VEHICLES COMPRESSED NATURAL GAS CNG BIO-COMPRESSED NATURAL GAS BIO - CNG FUEL SYSTEM COMPONENTS FLEXIBLE FUEL LINE WITH END CONNECTIONS CNG FUEL LINE HAVING PRESSURE NOT EXCEEDING 2 15MPa 21 5 BAR First Revision

Finalized Draft Indian Standard

Sl. No.	Doc No	TITLE

No Records Found

Finalized Draft Indian Standards under Print

Sl. No.	Doc No	TITLE

No Records Found

Total Published Standards:43

Total Standards Under development : 15

Aspect Wise Report

Product:	50
Code of Practices :	1
Methods of Test :	5
Terminology :	3
Dimensions :	1
System Standard :	0
Safety Standard :	2
Others :	1
Service Specification :	0
Process Specification :	0

Unclassified : 0

Total :63

Annexure-I :List of Indian Standards Withdrawn/Superseded

Sl. No.	IS No. & Year	TITLE
	No Records Found	

Annexure-II :List of Indian Product Standards

Sl. No.	IS No. & Year	TITLE
1	IS/ISO 12619-3 : 2014 ISO 12619-3: 2014 ISO 18134-2 : 2017 IS/ISO 12619-4 : 2016 ISO 12619-4: 2016	ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGEN NATURAL GAS BLEND FUEL SYSTEM COMPONENTS PRESSURE REGULATOR ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGEN NATURAL GAS BLENDS FUEL SYSTEM
2	ISO 18134-3 : 2015 IS/ISO 12619-5 : 2016 ISO 12619-5: 2016	COMPONENTS CHECK VALVE ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGEN NATURAL GAS BLENDS FUEL SYSTEM
3	ISO 18846 : 2016 IS/ISO 12619-6 : 2017 ISO 12619-6: 2017	COMPONENTS PART 5 MANUAL CYLINDER VALVE ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGENNATURAL GAS BLEND FUEL SYSTEM
4	ISO 21470 : 2020 IS/ISO 12619-7 : 2017 ISO 12619-7: 2017	COMPONENTS AUTOMATIC VALVE ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGENNATURAL GAS BLENDS FUEL SYSTEM
5	16075-2 : 2015 IS/ISO 12619-8 : 2017 ISO 12619-8: 2017	COMPONENTS GAS INJECTOR ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGENNATURAL GAS BLENDS FUEL SYSTEM
6	ISO 23443 : 2020	COMPONENTS PRESSURE INDICATOR

	IS/ISO 12619-9 : 2017 Adoption of ISO 1261	ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGENNATURAL GAS BLENDS FUEL SYSTEM COMPONENTS PRESSURE
7	16075-3 : 2015	RELIEF VALVE PRV
	IS/ISO 12619-10 : 2017 ISO 12619-10: 2017	ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGEN NATURAL GAS BLENDS FUEL SYSTEM COMPONENTS PRESSURE
8	ISO 15653:2018	RELIEF DEVICE PRD
	IS/ISO 12619-11 : 2017 ISO 12619-11 : 2017	ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGEN NATURAL GAS BLENDS FUEL SYSTEM COMPONENTS EXCESS FLOW
9	ISO 20158:2018	VALVE
	IS/ISO 12619-12 : 2017 ISO 12619-12 : 2017	ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGEN NATURAL GAS BLENDS FUEL SYSTEM COMPONENTS GAS-TIGHT HOUSING AND VENTILATION
10	ISO 20754:2018	HOSES
	IS/ISO 12619-13 : 2017 ISO 12619-13 : 2017	ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGEN NATURAL GAS BLENDS FUEL SYSTEM COMPONENTS RIGID FUEL LINE
11	ISO 20932-1:2018	IN STAINLESS STEEL
	IS/ISO 12619-14 : 2017 ISO 12619-14: 2017	ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGEN NATURAL GAS BLENDS FUEL SYSTEM COMPONENTS FLEXIBLE FUEL
12	ISO/IEC 29192-7:2019	LINE
	IS/ISO 12619-15 : 2017 ISO 12619-15: 2017	ROAD VEHICLES COMPRESSED GASEOUS HYDROGEN CGH2 AND HYDROGENNATURAL GAS BLENDS FUEL SYSTEM
13	56002	COMPONENTS FILTER
	IS 15712 : 2006 ISO 15500-6 Reviewed In : 2021	Road vehicles - Compressed natural gas CNG fuel system components - Automatic valve
14	ISO 15500-6: 2001	Solenoid Valve
	IS 15713 : 2006 ISO 15500-9 Reviewed In : 2021	Road vehicles - Compressed natural gas CNG fuel system
15	ISO 15500-9: 2001	components - Pressure regulator
	IS 15714 : 2006 ISO 15500-11 Reviewed In : 2021 ISO 15500-11:	Road vehicles - Compressed natural gas CNG fuel system
16	2001	components - Gas air mixer

		IS 15715 : 2008	Road vehicles - Compressed natural gas CNG fuel system components - Conduit
17	Reviewed In : 2019		Ventilation Hose
		IS 15716 : 2006	Road vehicles - Compressed natural gas CNG fuel system components - Cng high pressure fuel line Rigid with end connections having pressure
18	Reviewed In : 2021		exceeding 2 15 mpa 21 5 Bar
		IS 15717 : 2006	Road vehicles - Compressed natural gas CNG fuel system components - Petrol valve
19	Reviewed In : 2021		Automatic manual
		IS 15718 : 2006	Road vehicles - Compressed natural gas CNG fuel system components - Cng high pressure fuel line Flexible Hose with end connections having service pressure exceeding 2 15 mpa 21
20	Reviewed In : 2021		5 Bar
		IS 15719 : 2006	Road vehicles - Compressed natural gas CNG fuel system
21	Reviewed In : 2021		components - Electrical wiring kit
		IS 15720 : 2008	Road vehicles - Compressed natural gas CNG fuel system components - Compartments
22	Reviewed In : 2019		sub - Compartments
		IS 15721 : 2006	Road vehicles - Compressed natijral gas CNG - Fire retardant material for seat upholstery roof
23	Reviewed In : 2021		and side lining
		IS 15722 : 2006	Road vehicles - Compressed natural gas CNG fuel system components - Cng low - Pressure flexible fuel line with end connections cng fuel line having pressure not exceeding 2 15 mpa
24	Reviewed In : 2021		21 5 Bar
		IS 15723 : 2006	Road vehicles - Compressed natural gas CNG Fuel system components - Current limiting
25	Reviewed In : 2021		devices
		IS 16009 : 2013	Road vehicles - Liquefied petroleum gas LPG specific
26	Reviewed In : 2018		equipment - Shut off valve
		IS 16053 : 2013	Road vehicles - Liquefied petroleum gas LPG specific equipment - Pressure regulator
27	Reviewed In : 2018		and vapourizer
		IS 16062 : 2013	Road vehicles - Liquefied petroleum gas LPG specific equipment - Pressure and or
28	Reviewed In : 2018		temperature sensor
29	IS 16063 : 2013		

	Reviewed In : 2018	Road vehicles - Liquefied petroleum gas LPG specific equipment - Lpg filter unit
	IS 16064 : 2013	Road vehicles - Liquefied petroleum gas LPG specific
30	Reviewed In : 2018	equipment - Gas mixing piece
	IS 16065 : 2013	Road vehicles - Liquefied petroleum gas LPG specific
31	Reviewed In : 2018	equipment - Fuel rail
32	IS 16367 : 2017	Road vehicles - Liquefied petroleum gas LPG specific equipment - Gas injector
	IS 19026 (Part 3) : 2023	ROAD VEHICLES LIQUEFIED NATURAL GAS LNG FUEL SYSTEM COMPONENTS PART 3 CHECK
33	ISO 12614-3:2021	VALVE
	IS 19026 (Part 4) : 2023	ROAD VEHICLES LIQUEFIED NATURAL GAS LNG FUEL SYSTEM COMPONENTS PART 4 MANUAL
34	ISO 12614-4:2021	VALVE
	IS 19026 (Part 5) : 2023	ROAD VEHICLES LIQUEFIED NATURAL GAS LNG FUEL SYSTEM COMPONENTS PART 5 TANK
35	ISO 12614-5:2021	PRESSURE GAUGE
	IS 19026 (Part 7) : 2023	ROAD VEHICLES LIQUEFIED NATURAL GAS LNG FUEL SYSTEM COMPONENTS PART 7
36	ISO 12614-7:2021	PRESSURE RELIEF VALVE PRV
	IS 19026 (Part 8) : 2023	ROAD VEHICLES LIQUEFIED NATURAL GAS LNG FUEL SYSTEM COMPONENTS PART 8 EXCESS
37	ISO 12614-8:2021	FLOW VALVE
	IS 19026 (Part 9) : 2023	ROAD VEHICLES LIQUEFIED NATURAL GAS LNG FUEL SYSTEM COMPONENTS PART 9 GAS-TIGHT HOUSING AND
38	ISO 12614-9:2021	VENTILATION HOSE
	IS 19026 (Part 10) : 2023	ROAD VEHICLES LIQUEFIED NATURAL GAS LNG FUEL SYSTEM
39	ISO 12614-10:2021	COMPONENTS PART 10 RIGID FUEL LINE IN STAINLESS STEEL
	IS 19026 (Part 11) : 2023	ROAD VEHICLES LIQUEFIED NATURAL GAS LNG FUEL SYSTEM
40	ISO 12614-11:2021	COMPONENTS PART 11 FITTINGS
	IS 19026 (Part 12) : 2023	ROAD VEHICLES LIQUEFIED NATURAL GAS LNG FUEL SYSTEM COMPONENTS PART 12 RIGID
41	ISO 12614-12:2021	FUEL LINE IN COPPER AND ITS ALLOYS
	IS 19026 (Part 13) : 2023	ROAD VEHICLES LIQUEFIED NATURAL GAS LNG FUEL SYSTEM COMPONENTS PART 13 TANK
42	ISO 12614-13:2021	PRESSURE CONTROL REGULATOR

	IS 19026 (Part 14) : 2023	ROAD VEHICLES LIQUEFIED NATURAL GAS LNG FUEL SYSTEM COMPONENTS PART 14
43	ISO 12614-14:2021	DIFFERENTIAL PRESSURE FUEL CONTENT GAUGE
	IS 19026 (Part 15) : 2023	ROAD VEHICLES LIQUEFIED NATURAL GAS LNG FUEL SYSTEM COMPONENTS PART 15
44	ISO 12614-15:2021	CAPACITANCE FUEL CONTENT GAUGE
	IS 19026 (Part 16) : 2023	ROAD VEHICLES LIQUEFIED NATURAL GAS LNG FUEL SYSTEM
45	ISO 12614-16:2021	COMPONENTS PART 16 HEAT EXCHANGER-VAPORIZER
	IS 19026 (Part 17) : 2023	ROAD VEHICLES LIQUEFIED NATURAL GAS LNG FUEL SYSTEM
46	ISO 12614-17:2021	COMPONENTS PART 17 NATURAL GAS DETECTOR
	IS 19026 (Part 18) : 2023	ROAD VEHICLES LIQUEFIED NATURAL GAS LNG FUEL SYSTEM
47	ISO 12614-18:2021	COMPONENTS PART 18 GAS TEMPERATURE SENSOR
	IS 19026 (Part 19) : 2023	ROAD VEHICLES LIQUEFIED NATURAL GAS LNG FUEL SYSTEM
48	ISO 12614-19:2021	COMPONENTS PART 19 AUTOMATIC VALVE
	IS 19035 : 2023	GAS CYLINDERS FLEXIBLE HOSES ASSEMBLIES
49	ISO 16964: 2019	SPECIFICATION AND TESTING
	IS 19036 : 2023	Fuel cell road vehicles Safety specifications Protection against hydrogen hazards for vehicles fuelled with compressed
50	ISO 23273: 2013	hydrogen