

**SUBJECT: DRAFT RULE NO. 2-VEHICLES WITH REGRAD TO  
THEIR ROADWORTHINESS**

**Ref. Document No. : TRANS/WP.29/2003/16.**

**INDIA'S COMMENTS:**

India is one of the largest operators of diesel vehicles converted to CNG/LPG fuel mode. Based on field experience and knowledge gathered during implementation over last five years, exhaustive documents for verification of such CNG/LPG vehicle have been formulated. Enclosed is the document used for road-worthiness of such Vehicles. This document contain certain terms those are used in Indian context. For clarity list of Acronyms is attached as an Annexure 1.

The document contains five Annexure

Annexure 1- List of Acronyms for the Documents on inspection of CNG and LPG Vehicles

Annexure 2 – Periodical Inspection of Check of CNG Buses with regard to their roadworthiness

Annexure 3- Periodical Inspection of Check of CNG Vehicles (Other than CNG Buses) with regard to their roadworthiness

Annexure 4 - Periodical Inspection of Check of LPG Buses with regard to their roadworthiness

Annexure 5- Periodical Inspection of Check of LPG Vehicles (Other than LPG Buses) with regard to their roadworthiness

## **ANNEXURE I**

### List of Acronyms for the Documents on inspection of CNG and LPG Vehicles

AFL	Auto Fill Limiter
AIS	Automotive Industry Standards (These are Indian standards describe the requirements for safety related components and systems for vehicles in India)
ALT	Auto LPG Tank
CC	Cubic Centimeter
CMVR	Central Motor Vehicle Rules (These Rules formed by the Ministry of Road Transport and Highways provide the legal guidelines for the Type Approval, Conformity of Production and operation of vehicles in India)
CNG	Compressed natural Gas
DOE	Department of Energy (It is an agency involved in the certification of cylinders and valves required for the CNG and LPG vehicles)
FMVSS	Federal Motor Vehicle Safety Standards
IS	Indian Standards
LPG	Liquefied Petroleum Gas
mm	Milli Meter
OE	Original Equipment
OEM	Original Equipment Manufacturer
PVC	Poly Vinyl Chloride
RCTC	Registration Cum Tax Certificate (It is a legal document which a motorist must have in order to operate his vehicle in India. It shows the status of registration and payment of Road taxes)
RTO	Road Transport Authority (Road Transport Authority is primarily responsible for enforcement of rules related to Motor Vehicles on the road at the state level)
AIS 028	Code of Practice of use For CNG fuels in Internal combustion Engined Vehicles

## ANNEXURE II

### CHECKLIST FOR THIRD PARTY CHECKING / INSPECTION OF BUILT UP CNG BUSES (NEW AND CONVERTED/RETROFITTED IN-USE) BEFORE REGISTRATION

This checklist is for third party inspection of fully built CNG buses before registration by RTOs. Reference to relevant clauses of Safety Code of Practice, e.g. AIS 028, and guidelines issued by Central Government from time to time should be made wherever appropriate.

<b>A. Details of CNG Bus</b>	
1. (a) Name and address of chassis manufacturer <u>(applicable for new &amp; converted/retrofitted in-use)</u>  <u>(b) Name and address of retrofitter (applicable for converted/retrofitted in-use)</u>  <u>(c) Name and address of engine manufacturer (applicable for converted/retrofitted in-use)</u>	
2. Name of type approval agency	
3. Details of type approval certificate	
4. Name and address of bus body builder	
5. Name and address of approved inspecting agency at R.T.O.	
6. Chassis and engine No.	
7. Year of manufacture	
<b>B. Detail of CNG System</b>	
1. Checking of Cylinders as per DOE/ vehicle testing agency approvals	
<ul style="list-style-type: none"> <li>• <i>Validity of DOE Certificate</i></li> </ul>	
<ul style="list-style-type: none"> <li>• <i>Safety checks</i></li> </ul> <p><u>a.</u> Check for corrosion on any CNG components / mountings of gas circuit</p> <p><u>b.</u> <u>Check whether</u> cylinder is securely mounted within the vehicle and check tightness of nuts and bolts</p> <p><u>c.</u> <u>Check whether</u> minimum 5 mm clearance is kept between cylinders and vehicle body structure</p> <p><u>d.</u> Distance between cylinder valve and bus body extremities shall not be less 200 mm <u>unless valves are protected (as per the details provided by the kit/vehicle manufacturer/kit supplier and duly vetted and approved by test agencies) to minimize the</u></p>	

<p><u>possibility of damage due to collision, overturning/ other accident.</u></p> <p><u>e. Check for non-moisture retaining hard rubber/equivalent material padding/lining (as approved by test agency) provided for inner side of the cylinder mounting band(s).(e.g. silicon coated or silicon rubber)</u></p> <p><i>Notes:</i></p> <ul style="list-style-type: none"> <li><i><u>In case of doubt, Inspecting Agencies will request the OE vehicle manufacturer/retrofitter to supply the sample of material for padding rubber which has been type approved by the testing agencies.</u></i></li> <li><i><u>Rubber packing if found damaged during inspection it should be replaced by the new material having revised specification</u></i></li> </ul>	
<p>2. Cylinder Valves</p>	
<p><u>a. Check specific type &amp; model approved by Vehicle testing agency for the vehicle under inspection.</u></p>	
<p><u>b. Check for operation</u></p>	
<p><u>c. Check for Shield / protection</u></p>	
<p><u>d. Check for physical damage to valves</u></p>	
<p><u>e. Check for burst disc with fusible plug as approved by DoE</u></p>	
<p><u>f. Leak test using non corrosive foaming agent(e.g. snoop of M/s Swagelok, collin etc) or Methane leak detector</u></p>	
<p>3. Refilling Valve</p>	
<ul style="list-style-type: none"> <li>Safety checks -</li> <li><u>a. Check for dust cap / plug</u></li> <li><u>b. Check that engine should not start when dust cap / plug is removed or open</u> <ul style="list-style-type: none"> <li><u>Check for proper make &amp; type of interlocking switch as approved by testing agencies.</u></li> </ul> </li> <li><u>c. Check leakage for non-return valve using non corrosive foaming agent(i.e. snoop of M/s Swagelok,collin etc) or Methane leak detector</u></li> </ul>	
<p>4. Fuel Line</p>	
<ul style="list-style-type: none"> <li>Safety checks</li> <li><u>a. Check for corrosion, <u>damage</u> on CNG fuel line</u> <u>(In case of PVC sleeved fuel line, corrosion shall be inspected at the ends, wherever it is exposed. Also inspect for any damage to the sleeving. Sleeve</u></li> </ul>	

<p><u>should be firmly gripped to the CNG fuel line)</u></p> <p><b>b.</b> <u>Check whether</u> fuel line is securely mounted</p> <p><b>c.</b> Check for deformation of U and Pigtail bends provided in high pressure piping for flexibility as per approved layout</p> <p><b>d.</b> Distance between fuel line and exhaust <u>pipe / shield</u> shall not be less than 75 mm <u>and the fuel line should also be properly clamped and routed so as not to touch the engine block</u></p> <p><b>e.</b> <u>Check whether effective protection is provided, as per approved layout, to prevent the possibility of damage due to loose objects from road.</u></p> <p><b>f.</b> <u>Check the distance between any two clips which shall not be more than 600mm</u></p> <p><b>g.</b> Leak test using non-corrosive foaming agent<i>(i.e. snoop of M/s Swagelok,collin etc.)</i> or methane leak detector</p>	
<p>5. Shut Off Valve (Solenoid Valve(s)) wherever separately provided</p>	
<p style="text-align: center;">• Safety checks</p> <p><b>a.</b> <u>Verify the following as per type approval specification</u></p> <ul style="list-style-type: none"> <li>➤ <u>Make</u></li> <li>➤ <u>Type (if applicable)</u></li> <li>➤ <u>Identification No.</u></li> </ul> <p><b>b.</b> <u>Check whether</u> shut off valve is securely mounted</p> <p><b>c.</b> Check operation for “Close &amp; Open” as required</p> <p><b>d.</b> Leak test using non-corrosive foaming agent<i>(i.e. snoop of M/s Swagelok,collin etc.)</i> or methane leak detector</p>	
<p>6. Regulator</p>	
<p style="text-align: center;">• Safety checks</p> <p><b>a.</b> <u>Verify the following as per type approval specification</u></p> <ul style="list-style-type: none"> <li>➤ <u>Make</u></li> <li>➤ <u>Type (if applicable)</u></li> <li>➤ <u>Identification No.</u></li> </ul> <p><b>b.</b> <u>Check whether</u> regulator is securely mounted</p> <p><b>c.</b> Leak test using non-corrosive foaming agent<i>(i.e. snoop of M/s Swagelok,collin etc.)</i> or methane leak detector</p>	
<p>7. Gas-Air Mixer</p>	
<p style="text-align: center;">• Safety checks</p> <p><b>a.</b> <u>Verify the following as per type approval specification</u></p> <ul style="list-style-type: none"> <li>➤ <u>Make</u></li> <li>➤ <u>Type (if applicable)</u></li> </ul>	

<p>➤ <u>Identification No.</u></p> <p><b>b.</b> <u>Check whether</u> gas-air mixer is securely mounted</p> <p><b>c.</b> Leak test using non-corrosive foaming agent<i>(i.e. snoop of M/s Swagelok, collin etc.)</i> or methane leak detector</p>	
<p>8. Electrical wiring: Safety checks</p> <p><b>8.1 FOR OE &amp; CONVERTED/RETROFITTED IN-USE VEHICLES</b></p> <p>-</p> <p><b>a.</b> <u>Check whether</u> that current limiting device (fuse) is fitted as per <u>manufacturer</u> specifications and make</p> <p><b>b.</b> Terminals are insulated to prevent shorting</p> <p><b>c.</b> Wiring are taped and clipped with loom &amp; mounted securely.</p> <p><b>d.</b> <u>Battery shall be securely mounted and battery terminal shall be locked properly by means of suitable nut &amp; bolt with washers.</u></p> <p><b>e.</b> Check installation of battery cut-off switch as per chassis manufacturer's recommendations. <u>Location of Battery cut-off switch should be within the reach of driver in seating posture in driving seat.</u></p> <p><b>f.</b> Check routing of high tension cable to avoid accidental earthing and to be placed away from any heat source – as per chassis manufacturer's recommendations/ layout</p> <p><b>g.</b> Check for proper make of high tension cable as per chassis manufacturer's recommendation as well as check for tight fitment of its terminal to the spark-plug</p> <p><b>8.2 FOR OE VEHICLES -</b></p> <p><b>a.</b> Check wiring harness layout under the floor and in the engine compartment to be in accordance with chassis manufacturer's layout / specifications / approval</p> <p><b>b.</b> Check wiring harness in cabin and passenger compartment to be as per chassis manufacturer's guidelines / approval</p> <p><b>c.</b> Cable harness has to be as per the recommendations of OE chassis/ vehicle manufacturers</p> <p><b>8.3 FOR CONVERTED/RETROFITTED IN-USE VEHICLES –</b></p> <p><b>a.</b> <u>Check wiring harness layout under the floor / cabin and passenger compartment for proper sleeving and routing in order to avoid accidental sparking.</u></p>	

<p>9. Service shut-off valve:</p> <ul style="list-style-type: none"> <li>• Safety checks -</li> </ul> <p>a. <u>Make &amp; type</u></p> <p>b. Check operation</p> <p>c. <u>Check whether</u> service shut off valve is securely mounted</p> <p>d. Leak test using non-corrosive foaming agent <u>(i.e. snoop of M/s Swagelok, collin etc.)</u> or methane leak detector</p>	
<p>10. CNG Filter:</p> <p>a. <u>Check whether</u> CNG filter is securely mounted</p> <p>b. Leak test using non-corrosive foaming agent <u>(i.e. snoop of M/s Swagelok, collin etc.)</u> or methane leak detector</p>	
<p>11. CNG Pressure Gauge:</p> <p>a. <u>Make &amp; type</u></p> <p>b. <u>Check whether</u> CNG pressure indicator is securely mounted</p> <p>c. Leak test using non-corrosive foaming agent <u>(i.e. snoop of M/s Swagelok, collin etc.)</u> or methane leak detector</p>	

12. Compliance Plate:

12.1 Installation Check

Check for following	Details for no. of Cylinders					
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	.....	...
<u>a.</u> Cylinder identification No.						
<u>b.</u> Date of last testing <u>and the name of certifying agency</u>						
<u>c.</u> <u>Water capacity (ltr)</u>						
<u>d.</u> <u>Next due date of testing</u>						
<u>e.</u> Date of Installation						
<u>f.</u> Water capacity (ltr) of total installation						
<u>g.</u> Vehicle registration/ identification No. (to be furnished after registration)						
<u>h.</u> Seal / <u>Identification</u> of the checking /inspection agency( <u>who carries out the 3<sup>rd</sup> party inspection</u> )						

<u>i.</u> <u>Check whether compliance plate is installed near filling connection &amp; be clearly visible to the filling agency</u>	
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13. Identification label in front and rear:

a. Located on left side of the front and rear safety glass and shall ensure visibility from front and rear sides

14. Catalytic Convertor(whenever it is part of kit)

a. Verify make and type of the catalytic converter as per the vehicle manufacturer's specification and / as given in the type approval certificate as the case may be.

15. Low pressure hose

a. Verify make and type of the low pressure hose as per the Type Approval specification.

b. Check for kinks, damage or abrasion to the cover

(Note: In case of doubt, Inspecting Agencies will request the OE vehicle manufacturer/retrofitter to supply the sample of material for low pressure hose which has been type approved by the testing agencies.)



16. Following additional points are to be complied at the time of registration/ before endorsement by the competent authority (after conversion) of CNG vehicle for enhancement of safety of vehicle.

a. Fire retardant material conforming to FMVSS 302 for seat/upholstery/roof & side lining & IS:2465 for wiring cables shall be used. The OE / Vehicle manufacturer /retrofitter shall submit declaration with respect to design, manufacturing processes and material conforming the use of fire retardant materials.

(Notes:

- For OE fully built vehicles,type approval is subjected to meeting the requirements as mentioned above.In case of type approval of drive-away chassis,declaration from chassis manufacturer for above tests shall be verified by inspection agency.
- In case of doubt, Inspecting Agencies will request the OE vehicle manufacturer/retrofitter to supply the sample of material for cables/Seat/upholstery/roof & side lining which has been type approved by the testing agencies.

b. One number each of dry powder type fire extinguishers (2 kg) shall be provided in driver's and passenger's compartment.

c. For servicing of CNG vehicle proper instructions, detail operational & service manual with Dos & DON'Ts shall be provided by chassis manufacturer and body builder/retrofitter. Vehicle / chassis manufacturer/retrofitter should devise training module and impart training to drivers and technicians for safe operation of CNG system.

d. Check for First-Aid kit as per CMVR.

e. Distance between the exhaust line , muffler and fuel line shall be a minimum of 75 mm. If not a radiant heat shield of 2mm thickness shall be welded inbetween-

f. Safety plates / shield below the pipe joints shall be welded and proper inspection windows shall be provided near the cylinder joints.

g. Minimum two copies of safety instructions shall be displayed in passenger's compartment.

h. Check for proper venting provided by louvers / holes / mesh on the side skirt so that in case of any leakage the entrapped gas under the floor escapes to the atmosphere.

i. The bus body builder/retrofitter to provide at least two (total minimum area of 550 sq. mm) vent pipes connecting the under floor of the bus to the rooftop for CNG gas to vent out in case of leakage. The vent pipes to be located close to the cylinder valves cluster as per recommendations of chassis manufacturer. Construction should be such that leakage into passenger compartment is avoided.

j. Any other safety recommendations provided or advised by the chassis manufacturers to be complied with.

Note: *The instructions issued by OE manufacturer/retrofitter for third party evaluation, in their instruction manual ,shall contain all the necessary details on the methodology & the procedure for carrying out these checks.*

Signature & Seal with date

## ANNEXURE III

### CHECKLIST FOR THIRD PARTY CHECKING / INSPECTION OF CNG VEHICLES(OTHER THAN CNG BUSES) BEFORE REGISTRATION (NEW AND CONVERTED/RETROFITTED IN-USE)

This checklist is for third party inspection of CNG vehicles (other than CNG Buses) i.e. two, three and four wheeler etc before registration by RTOs. Reference to relevant clauses of Safety Code of Practice, e.g. AIS 028, and guidelines issued by Central Government from time to time should be made wherever appropriate.

<u>A. Details of CNG Vehicle</u>	
<u>1(a) Name and address of OE Vehicle manufacturer</u> <u>1(b) (i) Name and address of the Drive Away Chassis Manufacturer(applicable for new &amp; converted/retrofitted in-use )</u> <u>1(b) (ii) Name of the Retrofitter holding the type approval certificate</u> <u>1(c) Name of the authorized kit installer duly authorized by the original retrofitter</u> <u>1(d) Name and address of Body builder (if applicable)</u>	
<u>2. Name of type approval agency</u>	
<u>3. Reference number of type approval certificate</u> <u>3.1 Validity</u> <u>3.1.1 Gasoline Vehicles(Converted/retrofitted in-use):</u> <u>a. ____ CC of base model tested</u> <u>b. ____ Flexibility available for conversion</u> <u>    +/- 25% of the base model</u> <u>c. Period of validity, i.e. from ---- to ----</u>	
<u>3.1.2 Diesel Vehicles(Converted/retrofitted in-use):</u> <u>a. Type and make of model</u> <u>b. Year of manufacture</u> <u>c. Period of Validity , i.e. from --- to ---</u>	
<u>3.1.3 In the case of OE,</u> <u>a. Validity will be for the base model and its variants given in the type approval certificate</u> <u>b. Period from --- to -- (as given in the type approval certificate)</u>	

<u>4. Name and address of approved inspecting agency at R.T.O.</u>	
<u>5. a) Vehicle Registration No:(if applicable)</u> <u>b) Vehicle type &amp; model</u>	
<u>6. Chassis and engine No.</u> ❖ <u>Original as per RCTC</u> <u>or</u> ❖ <u>New in case of replacement of engine</u>	
<u>7. Year of manufacture</u> a) <u>Chassis in case of drive-away chassis</u> b) <u>Fully built up vehicle</u> c) <u>Month &amp; year of conversion</u>	
<u><b>B. Detail of CNG System</b></u>	
<u>1. Checking of Cylinders as per DOE/ vehicle testing agency approvals</u>	
<u><i>Validity of DOE Certificate</i></u>	
<u><i>Safety checks</i></u> a. <u>Check for corrosion on any CNG components / mountings of gas circuit</u> b. <u>Check whether cylinder is securely mounted within the vehicle and check tightness of nuts and bolts</u> c. <u>Check whether minimum 5 mm clearance is kept between cylinder and vehicle body structure and also in between the cylinders, if applicable.</u> d. <u>Distance between cylinder valve and vehicle body extremities shall not be less 200 mm unless valves are protected (as per the details provided by the kit/vehicle manufacturer/kit supplier and duly vetted and approved by test agencies) to minimize the possibility of damage due to collision, overturning/ other accident.</u> e. <u>Check for reinforcement if cylinder is mounted on floor of the vehicle (minimum dimension of reinforcement thickness &amp; surface area shall not be less than 2.5 mm &amp; 3600 mm<sup>2</sup> respectively). The reinforcement shall be provided on the top &amp; bottom of the floor.</u>	

<p><u>f. Check for non-moisture retaining hard rubber/equivalent material padding/lining (as approved by test agency) provided for inner side of the cylinder mounting band(s).(e.g. silicon coated or silicon rubber)</u></p> <p><u>Notes:</u></p> <ul style="list-style-type: none"> <li>• <u>In case of doubt, Inspecting Agencies will request the OE vehicle manufacturer/retrofitter to supply the sample of material for padding rubber which has been type approved by the testing agencies.</u></li> <li>• <u>Rubber packing if found damaged during inspection it should be replaced by the new material having revised specification</u></li> </ul>	
<p><u>2. Cylinder Valves</u></p>	
<p><u>a. Check specific type &amp; model approved by Vehicle testing agency for the vehicle under inspection.</u></p>	
<p><u>b. Check for operation</u></p>	
<p><u>c. Check for physical damage/distortion to valves</u></p>	
<p><u>d. Check for Shield / protection</u></p>	
<p><u>e. Check for burst disc with fusible plug as approved by DoE</u></p>	
<p><u>f. Check for the vent pipe outlet routing away from exhaust in case of cylinder fitting in the enclosed compartment.</u></p>	
<p><u>g. Leak test using non-corrosive foaming agent(i.e. snoop of M/s Swagelok,collin etc.) or methane leak detector</u></p>	
<p><u>3. Refilling Valve</u></p>	
<ul style="list-style-type: none"> <li>• <u>Safety checks -</u> <ul style="list-style-type: none"> <li><u>a. Check for dust cap / plug</u></li> <li><u>b. Check that engine should not start when dust cap / plug is removed or open</u> <ul style="list-style-type: none"> <li>• <u>Check for proper make &amp; type of interlocking switch as approved by testing agencies.</u></li> </ul> </li> <li><u>c. Check leakage for non-return valve using non-corrosive foaming agent(i.e. snoop of M/s Swagelok,collin etc.) or Methane leak detector</u></li> </ul> </li> </ul>	

<p>4. <u>Fuel Line</u></p>	
<ul style="list-style-type: none"> <li>• <u>Safety checks</u></li> <li>a. <u>Check for corrosion, damage of CNG fuel line</u> <i>(In case of PVC sleeved fuel line, corrosion shall be inspected at the ends, wherever it is exposed. Also inspect for any damage to the sleeving. Sleeve should be firmly gripped to the CNG fuel line)</i></li> <li>b. <u>Check whether fuel line is securely mounted</u></li> <li>c. <u>Check for U and Pigtail bends provided in high pressure piping for flexibility as per approved layout</u></li> <li>d. <u>Check whether effective protection is provided, as per approved layout, to prevent the possibility of damage due to loose objects from road.</u></li> <li>e. <u>Distance between fuel line and exhaust pipe / shield shall not be less than 75 mm and the fuel line should also be properly clamped and routed so as not to touch the engine block</u></li> <li>f. <u>Check the distance between any two clips which shall not be more than 600mm (500mm &amp; 300mm incase of 3/2 wheeler respectively).</u></li> <li>g. <u>Leak test using non-corrosive foaming agent(i.e. snoop of M/s Swagelok,collin etc.) or methane leak detector</u></li> </ul>	
<p>5. <u>Shut Off Valve (Solenoid Valve(s)) wherever separately provided)</u></p>	
<ul style="list-style-type: none"> <li>• <u>Safety checks</u></li> <li>a. <u>Verify the following as per type approval specification</u> <ul style="list-style-type: none"> <li>➤ <u>Make</u></li> <li>➤ <u>Type (if applicable)</u></li> <li>➤ <u>Identification No.</u></li> </ul> </li> <li>b. <u>Check whether shut off valve is securely mounted</u></li> <li>c. <u>Check operation for “Close &amp; Open” as required</u></li> <li>d. <u>Leak test using non-corrosive foaming agent(i.e. snoop of M/s Swagelok,collin etc.) or methane leak detector</u></li> </ul>	

<p>6. <u>Regulator</u></p>	
<ul style="list-style-type: none"> <li>• <u>Safety checks</u></li> </ul> <p><u>a. Verify the following as per type approval specification</u></p> <ul style="list-style-type: none"> <li>➤ <u>Make</u></li> <li>➤ <u>Type(if applicable)</u></li> <li>➤ <u>Identification No</u></li> </ul> <p><u>b. Check whether regulator is securely mounted</u></p> <p><u>c. Leak test using non-corrosive foaming agent(i.e. snoop of M/s Swagelok,collin etc.) or methane leak detector</u></p>	
<p>7. <u>Gas-Air Mixer</u></p>	
<ul style="list-style-type: none"> <li>• <u>Safety checks</u></li> </ul> <p><u>a. Verify the following as per type approval specification</u></p> <ul style="list-style-type: none"> <li>➤ <u>Make</u></li> <li>➤ <u>Type(if applicable)</u></li> <li>➤ <u>Identification No</u></li> </ul> <p><u>b. Check whether gas-air mixer is securely mounted</u></p> <p><u>c. Leak test using non-corrosive foaming agent(i.e. snoop of M/s Swagelok,collin etc.) or methane leak detector</u></p>	

## 8. Electrical wiring: Safety checks

### **8.1 FOR OE & CONVERTED/RETROFITTED IN-USE VEHICLES –**

- a. Check whether that current limiting device (fuse) is fitted as per manufacturer specifications and make
- b. Terminals are insulated to prevent shorting
- c. Wiring are taped and clipped with loom & mounted securely
- d. Battery shall be securely mounted and battery terminal shall be locked properly by means of suitable nut & bolt with washers.
- e. Check installation of battery cut-off switch as per vehicle / chassis manufacturer's recommendations (if applicable). Location of Battery cut-off switch should be within the reach of driver in seating posture in driving seat.
- f. Check routing of high tension cable to avoid accidental earthing and to be placed away from any heat source – as per Vehicle / chassis manufacturer's recommendations / layout or as approved by Test Agency.
- g. Check for proper make of high tension cable connected to Spark Plug as per Vehicle/chassis manufacturer's recommendation. Check for tight fitment of its terminal to the spark-plug

### **8.2 FOR OE VEHICLES -**

- a. Check wiring harness layout under the floor and in the engine compartment to be in accordance with Vehicle/chassis manufacturer's layout / specifications / approval
- b. Check wiring harness in cabin and passenger compartment to be as per vehicle/chassis manufacturer's guidelines / approval
- c. Cable harness has to be as per the recommendations of OE chassis / vehicle manufacturers

### **8.3 FOR CONVERTED/RETROFITTED IN-USE VEHICLES –**

- a. Check wiring harness layout under the floor / cabin and passenger compartment for proper sleeving and routing in order to avoid accidental sparking.

<p>9. <u>Service shut-off valve:</u></p> <ul style="list-style-type: none"> <li>• <u>Safety checks –</u></li> </ul> <p>a. <u>Make &amp; type</u></p> <p>b. <u>Check operation</u></p> <p>c. <u>Check whether service shut off valve is securely mounted</u></p> <p>d. <u>Leak test using non-corrosive foaming agent(i.e. snoop of M/s Swagelok,collin etc.) or methane leak detector</u></p>	
<p>10. <u>CNG Filter: (wherever separately provided)</u></p> <p>a. <u>Check whether CNG filter is securely mounted</u></p> <p>b. <u>Leak test using non-corrosive foaming agent(i.e. snoop of M/s Swagelok,collin etc.) or methane leak detector</u></p>	
<p>11. <u>CNG Pressure Gauge:</u></p> <p>a. <u>Make &amp; type</u></p> <p>b. <u>Check whether CNG pressure indicator is securely mounted</u></p> <p>c. <u>Leak test using non-corrosive foaming agent(i.e. snoop of M/s Swagelok,collin etc.) or methane leak detector</u></p>	



12. Compliance Plate:

• Installation Check

<u>Check for following</u>	<u>Details for no. of Cylinders</u>					
	<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	<u>.....</u>	<u>...</u>
<u>a. Cylinder identification No.</u>						
<u>b. Date of last testing and the name of certifying agency</u>						
<u>c. Water capacity (ltr)</u>						
<u>d. Next due date of testing</u>						
<u>e. Water capacity (ltr) of total installation</u>						
<u>f. Vehicle registration/ identification No. (to be furnished after registration)</u>						
<u>g. Seal /Identification of the checking /inspection agency(who carries out the 3<sup>rd</sup> party inspection)</u>						

<u>h. Check whether compliance plate is installed near filling connection &amp; be clearly visible to the filling agency</u>	
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<p><b>13. <u>Identification label in front and rear:</u></b></p> <p><b>a. <u>Located on left side of the front and rear safety glass and shall ensure visibility from front and rear sides</u></b></p>	
<p><b>14. <u>Compartment/Sub-compartment/Gas tight housing(for internally mounted cylinder/s)</u></b></p> <p><b>a. <u>Check whether Compartment/Sub-compartment/Gas tight housing is in good condition i.e. shall not show any crack/damage.</u></b></p> <p><b>b. <u>Check whether it is firmly clamped to the conduit/vent hose/ducting</u></b></p>	
<p><b>15. <u>Conduits/ducting/vent hose(for internally mounted cylinder/s)</u></b></p> <p><b>a. <u>Check whether Conduits/ducting is in good condition i.e. shall not show any crack/damage</u></b></p>	
<p><b>16. <u>Petrol Shut Off Valve (Solenoid) (if applicable i.e. Gasoline injection vehicle does not require such solenoid valve)</u></b></p> <p><b>a. <u>Check operation</u></b></p> <p><b>b. <u>Check whether Petrol shut off valve is securely mounted</u></b></p> <p><b>c. <u>Leak test (visual inspection)</u></b></p> <p><b>d. <u>Verify the make &amp; type as per the Type Approval specification.</u></b></p>	
<p><b>17. <u>Fuel selection switch(for bi-fuel mode)</u></b></p> <ul style="list-style-type: none"> <li>• <b><u>Check operation</u></b></li> </ul>	
<p><b>18. <u>Catalytic Converter(whenever it is part of kit)</u></b></p> <p><b>a. <u>Verify make and type of the catalytic converter as per the vehicle manufacturer's specification and / as given in the type approval certificate as the case may be.</u></b></p>	
<p><b>19. <u>Low pressure hose</u></b></p> <p><b>a. <u>Verify make and type of the low pressure hose as per the Type Approval specification.</u></b></p> <p><b>b. <u>Check for kinks, damage or abrasion to the cover</u></b></p> <p><i><u>(Note: In case of doubt, Inspecting Agencies will request the OE vehicle manufacturer/retrofitter to supply the sample of material for low pressure hose which has been type approved by the testing agencies.)</u></i></p>	

20. Following additional points are to be complied at the time of registration/before endorsement by the competent authority (after conversion) of CNG vehicle for enhancement of safety of vehicle.

a. Fire retardant material conforming to FMVSS 302 for seat/upholstery/roof & side lining & IS:2465 for wiring cables shall be used. The OE / Vehicle manufacturer/retrofitter shall submit declaration with respect to design, manufacturing processes and material conforming the use of fire retardant materials.

(Notes:

- For OE fully built vehicles, type approval is subjected to meeting the requirements as mentioned above. In case of type approval of drive-away chassis, declaration from chassis manufacturer for above tests shall be verified by inspection agency.
- In case of doubt, Inspecting Agencies will request the OE vehicle manufacturer/retrofitter to supply the sample of material for cables/Seat/upholstery/roof & side lining which has been type approved by the testing agencies.

b. One number each of dry powder type / CO<sub>2</sub> type fire extinguishers (1 kg), for 3 & 4 wheelers (car, LCV, etc) only, shall be provided in driver's and passenger's compartment. In case of 3 wheeler, one number of dry powder type / CO<sub>2</sub> type fire extinguisher (1 kg) shall be provided.

c. For servicing of CNG vehicle proper instructions, detailed operational & service manual with Dos & DON'Ts shall be provided by kit/vehicle manufacturer's. Vehicle / kit manufacturer/ kit supplier should devise training module and impart training to drivers and technicians for safe operation of CNG system.

d. Check for First-Aid kit as per CMVR..

e. Safety plates / shield below the pipe joints shall be welded and proper inspection windows shall be provided near the cylinder joints.

f. Minimum two copies of safety instructions shall be displayed in passenger's compartment.

**g. Check the following for the vehicles other than M1 category; fitted with multi CNG cylinders not incorporating the independent venting system.**

- ☞ Check for proper venting provided by louvers / holes / mesh on the side skirt so that in case of any leakage the entrapped gas under the floor escapes to the atmosphere
- ☞ The Vehicle/kit manufacturer/kit supplier to provide at least two (total minimum area of 550 sq. mm) vent pipes connecting the under floor of the vehicle to the rooftop for CNG gas to vent out in case of leakage. The vent pipes to be located close to the cylinder valves cluster as per recommendations of chassis manufacturer. Construction should be such that leakage into passenger compartment is avoided

h. Any other safety recommendations provided or advised by the Vehicle/kit manufacturer/kit supplier to be complied with.

Note: The instructions issued by OE manufacturer/retrofitter for third party evaluation, in their instruction manual, shall contain all the necessary details on the methodology & the procedure for carrying out these checks.

Signature & Seal with date

## ANNEXURE IV

### CHECKLIST FOR THIRD PARTY CHECKING / INSPECTION OF BUILT UP LPG BUSES (NEW AND CONVERTED/RETROFITTED IN-USE) BEFORE REGISTRATION

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This checklist is for third party inspection of fully built LPG buses before registration by RTOs. Reference to relevant clauses of Safety Code of Practice, e.g. AIS 026, and guidelines issued by Central Government from time to time should be made wherever appropriate.

<b>A. Details of LPG Bus</b>	
8. (a) Name and address of chassis manufacturer <u>(applicable for new &amp; converted/retrofitted in-use)</u>  <u>(b) Name and address of retrofitter (applicable for converted/retrofitted in-use)</u>  <u>(c) Name and address of engine manufacturer (applicable for converted/retrofitted in-use)</u>	
9. Name of type approval agency	
10. Details of type approval certificate	
11. Name and address of bus body builder	
12. Name and address of approved inspecting agency at R.T.O.	
13. Chassis and engine No.	
14. Year of manufacture	
<b>B. Detail of LPG System</b>	
1. Checking of Cylinders as per DOE/ vehicle testing agency approvals	

<ul style="list-style-type: none"> <li>• <b>Validity of DOE Certificate</b> <ul style="list-style-type: none"> <li>• <b>Safety checks</b> <ul style="list-style-type: none"> <li><b>a.</b> Check for corrosion on any LPG components / mountings of gas circuit</li> <li><b>b.</b> <u>Check whether</u> cylinder is securely mounted within the vehicle and check tightness of nuts and bolts</li> <li><b>c.</b> <u>Check whether</u> minimum 5 mm clearance is kept between cylinders and vehicle body structure</li> </ul> </li> </ul> </li> </ul>	
<ul style="list-style-type: none"> <li><b>d.</b> Distance between cylinder valve and bus body extremities shall not be less 200 mm <u>unless valves are protected (as per the details provided by the kit/vehicle manufacturer/kit supplier and duly vetted and approved by test agencies) to minimize the possibility of damage due to collision, overturning/ other accident</u></li> <li><b>e.</b> <u>Check for non-moisture retaining hard rubber/equivalent material padding/lining (as approved by test agency) provided for inner side of the cylinder mounting band(s).(e.g. silicon coated or silicon rubber)</u></li> </ul> <p><u>Notes:</u></p> <ul style="list-style-type: none"> <li>• <u>In case of doubt, Inspecting Agencies will request the OE vehicle manufacturer/retrofitter to supply the sample of material for padding rubber which has been type approved by the testing agencies.</u></li> <li>• <u>Rubber packing if found damaged during inspection it should be replaced by the new material having revised specification</u></li> </ul>	
<p><b>2. Cylinder MULTIFUNCTION Valve(s)Assembly</b></p>	
<p><b>a.</b> <u>Check specific type &amp; model approved by Vehicle testing agency for the vehicle under inspection.</u></p>	
<p><b>b.</b> <u>Check for operation</u></p>	
<p><b>c.</b> <b>Check for Shield</b></p>	
<p><b>d.</b> <b>Check for protection and physical damage to valves</b></p>	
<p><b>e.</b> <u>Leak test using non-corrosive foaming agent(i.e. snoop of M/s Swagelok,collin etc.) or LPG leak detector</u></p>	

<p><b>17. Refilling Valve</b></p>	
<ul style="list-style-type: none"> <li>• <b>Safety checks -</b> <ul style="list-style-type: none"> <li><b>a. Check for dust cap / plug</b></li> <li><b>b. <u>Leak test using non-corrosive foaming agent</u>(i.e. <u>snoop of M/s Swagelok,collin etc.</u>) <u>or LPG leak detector</u></b></li> </ul> </li> </ul>	
<p><b>18. Fuel Line</b></p>	
<ul style="list-style-type: none"> <li>• <b>Safety checks</b> <ul style="list-style-type: none"> <li><b>a. Check for corrosion, <u>damage</u> on LPG fuel line</b> <i>(In case of PVC sleeved fuel line, corrosion shall be inspected at the ends, wherever it is exposed. Also inspect for any damage to the sleeving. Sleeve should be firmly gripped to the LPG fuel line)</i></li> <li><b>b. Check whether fuel line is securely mounted</b></li> <li><b>c. Check for deformation of U and Pigtail bends provided in high pressure piping for flexibility as per approved layout</b></li> <li><b>d. Distance between fuel line and exhaust <u>pipe / shield</u> shall not be less than 75 mm <u>and the fuel line should also be properly clamped and routed so as not to touch the engine block</u></b></li> <li><b>e. <u>Check whether effective protection is provided, as per approved layout, to prevent the possibility of damage due to loose objects from road.</u></b></li> <li><b>f. <u>Check the distance between any two clips which shall not be more than 600mm</u></b></li> <li><b>g. <u>Leak test using non-corrosive foaming agent</u>(i.e. <u>snoop of M/s Swagelok,collin etc.</u>) <u>or LPG leak detector</u></b></li> </ul> </li> </ul>	

<p><b>19. Shut Off Valve (Solenoid Valve(s)) wherever separately provided</b></p>	
<ul style="list-style-type: none"> <li>• <b>Safety checks</b></li> <li>a. <u>Verify the following as per type approval specification</u></li> <li>➤ <u>Make</u></li> <li>➤ <u>Type (if applicable)</u></li> <li>➤ <u>Identification No.</u></li> <li><b>b. Check whether shut off valve is securely mounted</b></li> <li><b>c. Check operation for “Close &amp; Open” as required</b></li> <li><b>d. Leak test using non-corrosive foaming agent (i.e. snoop of M/s Swagelok, collin etc.) or LPG leak detector</b></li> </ul>	
<p><b>20. Regulator/vaporizer</b></p>	
<ul style="list-style-type: none"> <li>• <b>Safety checks</b></li> <li>a. <u>Verify the following as per type approval specification</u></li> <li>➤ <u>Make</u></li> <li>➤ <u>Type (if applicable)</u></li> <li>➤ <u>Identification No.</u></li> <li><b>b. Check whether regulator is securely mounted</b></li> <li><b>c. Leak test using non-corrosive foaming agent (i.e. snoop of M/s Swagelok, collin etc.) or LPG leak detector</b></li> </ul>	
<p><b>21. Gas-Air Mixer</b></p>	
<ul style="list-style-type: none"> <li>• <b>Safety checks</b></li> <li>a. <u>Verify the following as per type approval specification</u></li> <li>➤ <u>Make</u></li> <li>➤ <u>Type (if applicable)</u></li> <li>➤ <u>Identification No.</u></li> <li><b>b. Check whether gas-air mixer is securely mounted</b></li> <li><b>c. Leak test using non-corrosive foaming agent (i.e. snoop of M/s Swagelok, collin etc.) or LPG leak detector</b></li> </ul>	

## 22. Electrical wiring: Safety checks

### **8.1 FOR OE & CONVERTED/RETROFITTED IN-USE VEHICLES –**

- a.** Check whether that current limiting device (fuse) is fitted as per manufacturer specifications and make
- b.** Terminals are insulated to prevent shorting
- c.** Wiring are taped and clipped with loom & mounted securely.
- d.** Battery shall be securely mounted and battery terminal shall be locked properly by means of . suitable nut & bolt with washers.
- e.** Check installation of battery cut-off switch as per chassis manufacturer's recommendations. Location of Battery cut-off switch should be within the reach of driver in seating posture in driving seat.
- f.** Check routing of high tension cable to avoid accidental earthing and to be placed away from any heat source – as per chassis manufacturer's recommendations/ layout
- g.** Check for proper make of high tension cable as per chassis manufacturer's recommendation as well as check for tight fitment of its terminal to the spark-plug

### **8.2 FOR OE VEHICLES -**

- a.** Check wiring harness layout under the floor and in the engine compartment to be in accordance with chassis manufacturer's layout / specifications / approval
- b.** Check wiring harness in cabin and passenger compartment to be as per chassis manufacturer's guidelines / approval
- c.** Cable harness has to be as per the recommendations of OE chassis/ vehicle manufacturers

### **8.3 FOR CONVERTED/RETROFITTED IN-USE VEHICLES –**

- a.** Check wiring harness layout under the floor / cabin and passenger compartment for proper sleeving and routing in order to avoid accidental sparking.

## 23. Excess flow valve:

- **Safety checks -**

### **a. Check operation**

- b.** Leak test using non-corrosive foaming agent (i.e. snoop of M/s Swagelok, collin etc.) or LPG leak detector



<b>24. LPG Filter:</b> <b>a. Check whether LPG filter is securely mounted</b> <b>b. Leak test using non-corrosive foaming agent(i.e. snoop of M/s Swagelok,collin etc.) or LPG leak detector</b>							
<b>25. LPG content Gauge:</b> <b>a. Leak test using non-corrosive foaming agent(i.e. snoop of M/s Swagelok,collin etc.) or LPG leak detector</b>							
<b>26. Compliance Plate:</b> <ul style="list-style-type: none"> <li>Installation Check</li> </ul>							
<b>Check for following</b>		<u>Details for no. of Cylinders</u>					
		<u>1</u>	<u>2</u>	<u>3</u>	<u>4</u>	.....	... ...
<b>a. Cylinder identification No.</b>							
<b>b. Date of last testing <u>and the name of certifying agency</u></b>							
<b>c. <u>Water capacity (ltr)</u></b>							
<b>d. <u>Next due date of testing</u></b>							
<b>e. Date of Installation</b>							
<b>f. Water capacity (ltr) of total installation</b>							
<b>g. Vehicle registration/ identification No. (to be furnished after registration)</b>							
<b>h. Seal /<u>Identification</u> of the checking /inspection agency(<u>who carries out the 3<sup>rd</sup> party inspection</u>)</b>							
<b>i. <u>Check whether compliance plate is installed near filling connection &amp; be clearly visible to the filling agency</u></b>							

<p><b>13. Identification label in front and rear:</b></p> <p><u>a.</u> Located on left side of the front and rear safety glass and shall Check whether visibility from front and rear sides</p>	
<p>14. <u>Catalytic Converter(whenever it is part of kit)</u></p> <ul style="list-style-type: none"> <li>• <u>Verify make and type of the catalytic converter as per the vehicle manufacturer's specification and / as given in the type approval certificate as the case may be.</u></li> </ul>	
<p>15. <u>Low pressure hose</u></p> <p><u>a.</u> <u>Verify make and type of the low pressure hose as per the Type Approval specification.</u></p> <p><u>b.</u> <u>Check for kinks, damage or abrasion to the cover</u></p> <p><u>(Note: In case of doubt, Inspecting Agencies will request the OE vehicle manufacturer/retrofitter to supply the sample of material for low pressure hose which has been type approved by the testing agencies.)</u></p>	

16. Following additional points are to be complied at the time of registration/ before endorsement by the competent authority (after conversion) of LPG vehicle for enhancement of safety of vehicle.

a. Fire retardant material conforming to FMVSS 302 for seat/upholstery/roof & side lining & IS:2465 for wiring cables shall be used. The OE / Vehicle manufacturer/retrofitter shall submit declaration with respect to design, manufacturing processes and material conforming the use of fire retardant materials.

*(Notes:*

- For OE fully built vehicles, type approval is subjected to meeting the requirements as mentioned above. In case of type approval of drive-away chassis, declaration from chassis manufacturer for above tests shall be verified by inspection agency.
- In case of doubt, Inspecting Agencies will request the OE vehicle manufacturer/retrofitter to supply the sample of material for cables/Seat/upholstery/roof & side lining which has been type approved by the testing agencies.

b. One number each of dry powder type fire extinguishers (2 kg) shall be provided in driver's and passenger's compartment.

c. For servicing of LPG vehicle proper instructions, detail operational & service manual with Dos & DON'Ts shall be provided by chassis manufacturer and body builder or retrofitter. Vehicle / chassis manufacturer/ retrofitter should devise training module and impart training to drivers and technicians for safe operation of LPG system.

d. Check for First-Aid kit as per CMVR.

e. Distance between the exhaust line , muffler and fuel line shall be a minimum of 75 mm. If not a radiant heat shield of 2mm thickness shall be welded inbetween.

f. Safety plates / shield below the pipe joints shall be welded and proper inspection windows shall be provided near the ALT joints.

g. Minimum two copies of safety instructions shall be displayed in passenger's compartment.

h. Check for proper venting provided by louvers / holes / mesh on the side skirt so that in case of any leakage the entrapped gas under the floor escapes to the atmosphere.

i. The bus body builder/retrofitter to provide at least two (total minimum area of 550 sq. mm) vent pipes connecting the under floor of the bus to the rooftop for LPG gas to vent out in case of leakage. The vent pipes to be located close to the ALT valves cluster as per recommendations of chassis manufacturer. Construction should be such that leakage into passenger compartment is avoided.

j. Any other safety recommendations provided or advised by the chassis manufacturers to be complied with.

Note: The instructions issued by OE manufacturer/retrofitter for third party evaluation, in their instruction manual ,shall contain all the necessary details on the methodology & the procedure for carrying out these checks.

Signature & Seal with date

## ANNEXURE V

### CHECKLIST FOR THIRD PARTY CHECKING / INSPECTION OF LPG VEHICLES(OTHER THAN LPG BUSES) BEFORE REGISTRATION (NEW AND CONVERTED/RETROFITTED IN-USE)

This checklist is for third party inspection of LPG vehicles (other than LPG Buses) i.e. two, three and four wheeler etc before registration by RTOs. Reference to relevant clauses of Safety Code of Practice, e.g. AIS 026/AIS 027 as the case may be, and guidelines issued by Central Government from time to time should be made wherever appropriate.

<b>A. Details of LPG Vehicle</b>	
<u>1(a) Name and address of OE Vehicle manufacturer</u> <u>1(b) (i) Name and address of the Drive Away Chassis Manufacturer</u> <u>1(b) (ii) Name of the Retrofitter holding the type approval certificate</u> <u>1(c) Name of the authorized kit installer duly authorized by the original retrofitter</u> <u>1(d) Name and address of Body builder (if applicable)</u>	
<u>2. Name of type approval agency</u>	
<u>4. Reference number of type approval certificate</u> <b><u>3.1 Validity</u></b> <b><u>3.1.1 Gasoline vehicles(Converted/retrofitted in-use):</u></b> <u>a. Gasoline CC of base model tested</u> <u>b. Flexibility available for conversion +/- 25% of the base model</u> <u>c. Period of validity, i.e. from ---- to ----</u>	
<b><u>3.1.2 Diesel Vehicles (Converted/retrofitted in-use) :</u></b> <u>a. Type and make of model</u> <u>b. Year of manufacture</u> <u>c. Period of Validity , i.e. from --- to ---</u>	
<b><u>3.1.3 In the case of OE,</u></b> <u>a. Validity will be for the base model and its variants given in the type approval certificate</u> <u>b. Period from --- to -- (as given in the type approval certificate)</u>	

4. <u>Name and address of approved inspecting agency at R.T.O.</u>	
5. <u>Chassis and engine No.</u> ❖ <u>Original as per RCTC</u> _____ <u>or</u> ❖ <u>New incase replacement of engine</u>	
6. <u>a)Vehicle Registration No:(if applicable)</u> <u>b) Vehicle type &amp; model</u>	
7. <u>Year of manufacture</u> <u>a)Chassis incase of drive-away chassis</u> <u>b)Fully built up vehicle</u> <u>c)Month &amp; year of conversion</u>	
<b><u>B. Detail of LPG System</u></b>	
1. <u>Checking of Auto LPG Tank (s)(ALT) as per DOE/ vehicle testing agency approvals</u>	
• <u>Validity of DOE Certificate</u>	

<p><u>Safety checks</u></p> <p><u>a. Check for corrosion on any LPG components / mountings of gas circuit</u></p> <p><u>b. Check whether ALT is securely mounted within the vehicle and check tightness of nuts and bolts</u></p> <p><u>c. Check whether minimum 5 mm clearance is kept between ALT and vehicle body structure and also in between the ALTs, if applicable.</u></p> <p><u>d. Distance between ALT valve and vehicle body extremities shall not be less 200 mm (100 mm incase 2-wheeler) unless valves are protected (as per the details provided by the kit/vehicle manufacturer/kit supplier and duly vetted and approved by test agencies) to minimize the possibility of damage due to collision, overturning/ other accident.</u></p> <p><u>e. Check whether ALT is correctly oriented as specified in type approval certificate for base model (i.e. 0° / 30° / 90° etc w.r.t. horizontal plane)</u></p> <p><u>f. In case the model being inspected is other than the base model for which the type approval has been given and is covered by the flexibility clause of +/- 25%, check if it has got the layout approval or change of orientation, if any.</u></p>	
<p><u>g. Check for reinforcement if ALT is mounted on floor of the vehicle (minimum dimension of reinforcement thickness &amp; surface area shall not be less than 2.5 mm &amp; 3600 mm<sup>2</sup> respectively). The reinforcement shall be provided on the top &amp; bottom of the floor.</u></p> <p><u>h. Check for non-moisture retaining hard rubber/equivalent material padding / lining (as approved by test agency) provided for inner side of the ALT mounting band(s). (e.g.silicon coated / silicon rubber)</u></p> <p><u>Notes:</u></p> <ul style="list-style-type: none"> <li>• <u>In case of doubt, Inspecting Agencies will request the OE vehicle manufacturer/retrofitter to supply the sample of material for padding rubber which has been type approved by the testing agencies.</u></li> <li>• <u>Rubber packing if found damaged during inspection it should be replaced by the new material having revised specification</u></li> </ul>	

2. <u>Multi –function Valve</u>	
a. <u>Check specific type &amp; model approved by Vehicle testing agency for the vehicle under inspection.</u>	
b. <u>Check for operation</u>	
c. <u>Check for physical damage / distortion to valves</u>	
d. <u>Check for the vent pipe outlet routing away from exhaust in case of ALT fitting in the enclosed compartment.</u>	
e. <u>Leak test using non corrosive foaming agent (i.e. snoop of M/s Swagelok,collin etc.) or LPG leak detector</u>	
3. <u>Refilling Valve</u>	
<ul style="list-style-type: none"> <li>• <u>Safety checks -</u> <ul style="list-style-type: none"> <li>a. <u>Check for cover</u></li> <li>b. <u>Check leakage for non-return valve using non corrosive foaming agent(i.e. snoop of M/s Swagelok,collin etc.) or LPG leak detector</u></li> </ul> </li> </ul>	
4. <u>Fuel Line</u> <u>Safety checks</u> <ul style="list-style-type: none"> <li>a. <u>Check for corrosion, deformation and damage on LPG fuel line</u>  <u>(In case of PVC sleeved fuel line , corrosion shall be inspected at the ends, wherever it is exposed. Also inspect for any damage to the sleeving. Sleeve should be firmly gripped to the LPG fuel line)</u></li> <li>b. <u>Check whether fuel line is securely mounted</u></li> <li>c. <u>Check for U and Pigtail bends provided in high pressure piping for flexibility as per approved layout</u></li> <li>d. <u>Check whether effective protection is provided ,as per approved lay-out, to prevent the possibility of damage due to loose objects from road.</u></li> <li>e. <u>Distance between fuel line and exhaust pipe / shield shall not be less than 75 mm and the fuel line should also be properly clamped and routed so as not to touch the engine block</u></li> <li>f. <u>Check the distance between any two clips which shall not be more than 600mm (500mm &amp; 300mm incase of 3/2 wheeler respectively)</u></li> <li>g. <u>Leak test using non-corrosive foaming agent(i.e. snoop of M/s Swagelok,collin etc.) or LPG leak detector</u></li> </ul>	
5. <u>Shut Off Valve (Solenoid Valve(s)) wherever separately provided</u>	

<ul style="list-style-type: none"> <li>• <u>Safety checks</u></li> </ul> <p>a. <u>Verify the following as per type approval specification</u></p> <ul style="list-style-type: none"> <li>➤ <u>Make</u></li> <li>➤ <u>Type(if applicable)</u></li> <li>➤ <u>Identification No</u></li> </ul> <p>b. <u>Check whether shut off valve is securely mounted</u></p> <p>c. <u>Check operation for “Close &amp; Open” as required</u></p> <p>d. <u>Leak test using non-corrosive foaming agent(i.e. snoop of M/s Swagelok,collin etc.) or LPG leak detector</u></p>	
<p>6. <u>Regulator</u></p>	
<ul style="list-style-type: none"> <li>• <u>Safety checks</u></li> </ul> <p>a. <u>Verify the following as per type approval specification</u></p> <ul style="list-style-type: none"> <li>➤ <u>Make</u></li> <li>➤ <u>Type(if applicable)</u></li> <li>➤ <u>Identification No</u></li> </ul> <p>b. <u>Check whether regulator is securely mounted</u></p> <p>c. <u>Leak test using non-corrosive foaming agent (i.e. snoop of M/s Swagelok,collin etc.) or LPG leak detector</u></p>	
<p>7. <u>Gas-Air Mixer</u></p>	
<ul style="list-style-type: none"> <li>• <u>Safety checks</u></li> </ul> <p>a. <u>Verify the following as per type approval specification</u></p> <ul style="list-style-type: none"> <li>➤ <u>Make</u></li> <li>➤ <u>Type(if applicable)</u></li> <li>➤ <u>Identification No</u></li> </ul> <p>b. <u>Check whether gas-air mixer is securely mounted</u></p> <p>c. <u>Leak test using non-corrosive foaming agent(i.e. snoop of M/s Swagelok,collin etc.) or LPG leak detector</u></p>	



8. Electrical wiring: Safety checks

**8.1 FOR OE & CONVERTED/RETROFITTED IN-USE VEHICLES –**

- a. Check whether that current limiting device (fuse) is fitted as per manufacturer specifications and make
- b. Terminals are insulated to prevent shorting
- c. Wiring are taped and clipped with loom & mounted securely
- d. Battery shall be securely mounted and battery terminal shall be locked properly by means of suitable nut & bolt with washers.
- e. Check installation of battery cut-off switch as per vehicle / chassis manufacturer's recommendations (if applicable). Location of Battery cut-off switch should be within the reach of driver in seating posture in driving seat.
- f. Check routing of high tension cable to avoid accidental earthing and to be placed away from any heat source – as per Vehicle / chassis manufacturer's recommendations / layout or as approved by Test Agency.
- g. Check for proper make of high tension cable connected to Spark Plug as per Vehicle/chassis manufacturer's recommendation. Check for tight fitment of its terminal to the spark-plug

**8.2 FOR OE VEHICLES -**

- a. Check wiring harness layout under the floor and in the engine compartment to be in accordance with Vehicle/chassis manufacturer's layout / specifications / approval
- b. Check wiring harness in cabin and passenger compartment to be as per vehicle/chassis manufacturer's guidelines / approval
- c. Cable harness has to be as per the recommendations of OE chassis / vehicle manufacturers

**8.3 FOR CONVERTED/RETROFITTED IN-USE VEHICLES –**

- a. Check wiring harness layout under the floor / cabin and passenger compartment for proper sleeving and routing in order to avoid accidental sparking.

<p>9. <u>Automatic fill limiter(AFL):</u>  a. <u>Check operation of AFL for maximum 80% filling of LPG</u></p>																																																																						
<p>10. <u>LPG Filter: (wherever separately provided)</u>  a. <u>Check whether LPG filter is securely mounted</u>  b. <u>Leak test using non-corrosive foaming agent(i.e. snoop of M/s Swagelok, collin etc.) or LPG leak detector</u></p>																																																																						
<p>11. <u>Compliance Plate:</u>  • <u>Installation Check</u></p>																																																																						
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<p>12. <u>Identification label in front and rear:</u>  a. <u>Located on left side of the front and rear safety glass and shall Check whether visibility from front and rear sides</u></p>																																																																						
<p>13. <u>Compartment/Sub-compartment/Gas tight housing(for internally mounted ALT/s)</u>  a. <u>Check whether Compartment / Sub-compartment/Gas tight housing is in good condition i.e. shall not show any crack/damage.</u>  b. <u>Check whether it is firmly clamped to the conduit/vent hose/ducting</u></p>																																																																						

<p><u>14. Conduits/ducting (for internally mounted ALT/s)</u>  <u>a. Check whether Conduits/ducting is in good condition i.e. shall not show any crack/damage</u></p>	
<p><u>15. Petrol Shut Off Valve (Solenoid) (if applicable i.e. Gasoline injection vehicle does not require such solenoid valve)</u>  <u>a. Check operation</u>  <u>b. Check whether service shut off valve (petrol) is securely mounted</u>  <u>c. Leak test (visual inspection)</u>  <u>d. Verify the make &amp; type as per the Type Approval specification.</u></p>	
<p><u>16. Fuel selection switch (for bi-fuel mode) &amp; indicator for LPG content.</u>  <u>a. Check operation</u></p>	
<p><u>17. Catalytic Converter(whenever it is part of kit)</u>  <u>a. Verify make and type of the catalytic converter as per the vehicle manufacturer's specification and/ as given in the type approval certificate as the case may be.</u></p>	
<p><u>18. Low pressure hose</u>  <u>a. Verify make and type of the low pressure hose as per the Type Approval specification.</u>  <u>b. Check for kinks, damage or abrasion to the cover</u>  <u>(Note: In case of doubt, Inspecting Agencies will request the OE vehicle manufacturer/retrofitter to supply the sample of material for low pressure hose which has been type approved by the testing agencies.)</u></p>	

19. Following additional points are to be complied at the time of registration registration/before endorsement by the competent authority (after conversion) of LPG vehicle for enhancement of safety of vehicle.

a. Fire retardant material conforming to FMVSS 302 for seat/upholstery/roof & side lining & IS:2465 for wiring cables shall be used. The OE / Vehicle/ manufacturer/retrofitter shall submit declaration with respect to design, manufacturing processes and material conforming the use of fire retardant materials.

(Notes:

k. For OE fully built vehicles,type approval is subjected to meeting the requirements as mentioned above.In case of type approval of drive-away chassis,declaration from chassis manufacturer for above tests shall be verified by inspection agency.

l. In case of doubt, Inspecting Agencies will request the OE vehicle manufacturer/retrofitter to supply the sample of material for cables/Seat/upholstery/roof & side lining which has been type approved by the testing agencies.

b. One number each of dry powder/ CO<sub>2</sub> type fire extinguishers (1 kg), for 3-& 4wheelers (car, LCV etc) only, shall be provided in driver's and passenger's compartment. In case of 3 wheeler, one number of dry powder type / CO<sub>2</sub> type fire extinguisher (1 kg) shall be provided .

c. For servicing of LPG vehicle proper instructions, detail operational & service manual with Dos & DON'Ts shall be provided by kit/vehicle manufacturer/retrofitter. Vehicle / kit manufacturer/ kit supplier should devise training module and impart training to drivers and technicians for safe operation of LPG system.

d. Check for First-Aid kit as per CMVR..

e. Safety plates / shield below the pipe joints shall be welded and proper inspection windows shall be provided near the ALT joints.

f. Minimum two copies of safety instructions shall be displayed in passenger's compartment.

g. **Check the following for the vehicles other than M1 category; fitted with multi LPG ALTs not incorporating the independent venting system.**

☛ Check for proper venting provided by louvers / holes / mesh on the side skirt so that in case of any leakage the entrapped gas under the floor escapes to the atmosphere

☛ The Vehicle/kit manufacturer/kit supplier to provide at least two (total minimum area of 550 sq. mm) vent pipes connecting the under floor of the vehicle to the rooftop for LPG gas to vent out in case of leakage. The vent pipes to be located close to the ALT valves cluster as per recommendations of chassis manufacturer. Construction should be such that leakage into passenger compartment is avoided

h. Any other safety recommendations provided or advised by the Vehicle/kit manufacturer/kit supplier to be complied with.

Note: The instructions issued by OE manufacturer/retrofitter for third party evaluation, in their instruction manual ,shall contain all the necessary details on the methodology & the procedure for carrying out these checks.

Signature & Seal with date