

Lovato Autogas Pty Ltd.

---

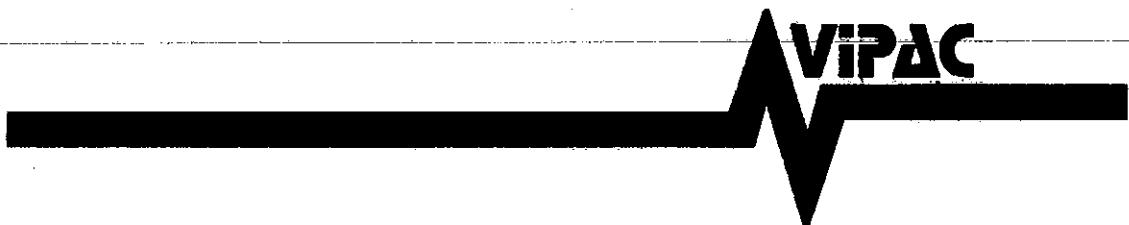
# **Australian Design Rule 79/00**

## **Toyota Landcruiser RV (1HD)**

Report No: 30V-09-0108-TRP-401654-0

---

Vipac Engineers & Scientists Ltd  
Melbourne, Australia  
Approved Research Organisation (ARO.0125)  
DOT. 4009.





## DOCUMENT CONTROL

**REPORT No.: 30V-09-0108-TRP-401654-0**

**AUSTRALIAN DESIGN RULE 79/00**

**FILE:**

30V-09-0108-TRP-401654-0

**PREPARED FOR:**

Lovato Autogas Pty Ltd.  
Unit 1/410 Churchill Road,  
Kilburn,  
South Australia 5084.

**REPORT CODE:**

V 06

**PREPARED BY:**

Vipac Engineers & Scientists Ltd.  
279, Normanby Road,  
Port Melbourne,  
Victoria 3207.

**Contact:** Gary Blucher / Graham Vardy.

**Tel:** (08) 8340 2366.

**Fax:** (08) 8340 3266.

**Tel:** +61 3 9647 9700.

**Fax:** +61 3 9646 4370.

**AUTHOR:**

ROBYN DAVIES

Automotive Engineer

Date: 29<sup>th</sup> April 2009.

E-mail: robynd@vipac.com.au

**REVIEWED BY:**

MAURIZIO DEMONTIS

Team Leader-Automotive

Date: 29<sup>th</sup> April 2009.

E-mail: mauriziod@vipac.com.au

**REVISION HISTORY:**

Revision No.	Date Issued	Reason/Comments
0	29/04/2009	Initial Issue

**DISTRIBUTION:**

Copy No.	Revision No.	Location
1	0	Client
2	0	Vipac Melbourne
3	0	Vipac Melbourne Library

**KEYWORDS:**

AUSTRALIAN DESIGN RULE 79/00



## 1. INTRODUCTION

The following report details the results achieved when a Toyota Landcruiser RV, VIN Number JTELC73J906002582, was tested in accordance with Australian design Rule 79/00, as detailed in the Australian Design Rule, by Vipac Engineers and Scientists Vehicle Emissions Test facility at Port Melbourne during the period 23<sup>rd</sup> – 24<sup>th</sup> April 2009.

The testing was conducted in order to verify the conformance of an aftermarket Liquefied Petroleum Gas Vapour Injection Kit (LPG over Diesel), Part Number "DGA (Diesel Gas Australia) Gen IV 1HD-FTE" manufactured & installed by the client.

The kit as installed contained the following major components:

- DGA Electronic Control Unit With Appropriate 1HD Tuning File.
- Lovato regulator, fuel filter and injector.
- Manchester LPG tank & standard delivery system



## 2. PROCEDURES

The testing was carried out in accordance with the procedures listed in Australian Design Rule 79/00, Emission Control For Light Vehicles. The vehicle was tested using an equivalent inertia figure of 2150Kg, with a road load power absorption figure at 80km/h of 11.44kW utilising the factors outlined within the table of paragraph 3.2.1 Annex 4 – Appendix 2 with respect to an N1 (III) vehicle type.

Pre-conditioning was undertaken prior to all three tests as per clause 5.3.1 of ADR79/00 with the vehicle being driven over three “Extra Urban” drive cycles prior to being soaked overnight under ambient conditions of between 20°C - 30°C. Oil and coolant temperatures were checked prior to the commencement of the single Type 1 test in order to verify that these parameters were each within 2°C of the current ambient air temperature.

The fuels used for the exhaust emission test were commercially available Ultra Low Sulphur Diesel fuel and commercially available Liquefied Petroleum Gas.



### 3. TEST VEHICLE SPECIFICATIONS

<b>MANUFACTURER</b>	Toyota.
<b>MODEL</b>	Landcruiser RV.
<b>ODOMETER</b>	125212Km.
<b>BUILD DATE</b>	2005.
<b>VIN NUMBER</b>	JTELC73J906002582.
<b>ENGINE NUMBER</b>	1HD-0280801.
<b>ENGINE MODEL &amp; TYPE</b>	Toyota 1HD-FTE, 4.164Litre, 4 -Cyl I/L, Direct Injection Compression Ignition.
<b>TRANSMISSION</b>	5 Speed Manual.
<b>TYRE SIZES</b>	265/70 R-16 (Front & Rear).
<b>TYRE PRESSURE</b>	220kPa (driven wheels under test).
<b>KERB MASS (Manufacturers Spec)</b>	2020Kg.
<b>REFERENCE MASS</b>	2120Kg.
<b>EQUIVALENT INERTIA</b>	2150Kg.
<b>ROAD LOAD @ 80 kph</b>	11.44kW.



## 4. TEST RESULTS

<b>AUSTRALIAN DESIGN RULE ADR 79/00 (AVERAGE TAILPIPE EMISSIONS)</b>		
	<b>SPECIFIED grams/km</b>	<b>MEASURED grams/km</b>
<b>Carbon Monoxide (CO)</b>	<b>1.50</b>	<b>1.12</b>
<b>Total Hydrocarbons (THC)</b>	<b>-N/A-</b>	<b>0.19</b>
<b>Oxides Of Nitrogen (NOx)</b>	<b>-N/A-</b>	<b>0.73</b>
<b>Total Hydrocarbons (THC) &amp; Oxides Of Nitrogen (NOx) (Combined)</b>	<b>1.20</b>	<b>0.92</b>
<b>Particulate Matter (PM10)</b>	<b>0.17</b>	<b>0.07</b>

**TABLE 4.1: ADR 79/00 Average Tailpipe Emission Test Results 24/04/09  
Toyota Landcruiser RV Vin No: JTELC73J906002582**

## 5. CONCLUSION

The Exhaust Emission test results of the vehicle when tested in accordance with the Type 1 Test (Average Tailpipe Emissions) procedures incorporated within directive ADR79/00 were within the limits specified for Carbon Monoxide (CO), Total Hydrocarbons (THC) & Oxides Of Nitrogen (NOx) (combined) and Particulate Matter (PM10) for an N1 vehicle of reference mass >1760Kg & GVW >2,500Kg. The published results do not include the relevant Deterioration Factors utilised in lieu of the Type V Test (Durability Of Anti-Pollution Devices).

The vehicle as presented complies with the limits and criteria for an N1 (III) class vehicle (Type I Test) as specified within ADR79/00.

Prepared By:

Robyn.A.Davies. IEng MSOE MIRTE LCGI

Automotive Engineer – Emissions/Vehicle Certification



## 6. INSTRUMENTATION & CALIBRATION

### **Carbon Monoxide (CO) Analyser**

**Make & Model:- Signal Instruments 7100FM**

**Principal Of Operation:- Infrared**

**Method Of Calibration:- Signal Instruments 821 Standard Gas Divider (10 Points)**

**Last Calibrated February 2009**

### **Total Hydrocarbon (THC) Analyser**

**Make & Model:- Signal Instruments 3000HM**

**Principal Of Operation:- Flame Ionisation (FID)**

**Method Of Calibration:- Signal Instruments 821 Standard Gas Divider (10 Points)**

**Last Calibrated February 2009**

### **Oxides Of Nitrogen (NOx) Analyser**

**Make & Model:- Signal Instruments 4000VM**

**Principal Of Operation:- Chemiluminescence**

**Method Of Calibration:- Signal Instruments 821 Standard Gas Divider (10 Points)**

**Last Calibrated February 2009**

### **Carbon Dioxide (CO<sub>2</sub>) Analyser**

**Make & Model:- Signal Instruments 7200FM**

**Principal Of Operation:- Infrared**

**Method Of Calibration:- Signal Instruments 821 Standard Gas Divider (10 Points)**

**Last Calibrated February 2009**

### **Particulate Matter Capture**

**Make & Model:- Vipac Primary Dilution Tunnel Incorporating  
Nova Microtrol 4 Secondary Dilution Tunnel (Mini-Dilution Tunnel)**

**Principal Of Operation:- Primary & Secondary Dilution Of Sample**

**Last Calibrated: Flow Calibration Prior To Testing**

### **Particulate Matter Mass Determination**

**Mettler Toledo Microbalance model XU6**

**Resolution:- 0.0001mg**

**Last Calibrated:- February 2009**



**Constant Volume Sampling System**

**Make & Model:- Beckman Industries (Critical Flow Venturi)**

**Method Of Calibration:- Laminar Flow Element**

**Accuracy:- Standard Deviation Of Calibration Coefficient <0.3%**

**Last Calibrated August 2008**

**Total System Verification**

**Make & Model:- Beckman Industries**

**Method Of Calibration:- Propane Injection (Using CFO)**

**System Efficiency:- >95%**

**Last Calibrated August 2008**

**Inertia Simulation Dynamometer**

**Make & Model:- Cirrus Technologies**

**Calibrated prior to testing:- April 23<sup>rd</sup> 2009**

**Method Of Calibration/Check:- Vehicle Coast-down @ 2150Kg Inertia (RLP 11.44kW)**