

Annexure B

Rear Axle Tyre Pressure Monitoring System

Requirements under the Transport for NSW Bus Procurement Panel

7 March 2017

BC17/18562 – TfNSW

Rear Axle Tyre Pressure Monitoring System -24 February 2017 TfNSW BC17/18562

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Scope of Services and Specifications – Tyre Pressure Monitoring Systems (TPMS) – Rear Axle

1. Introduction Scope of Supply

- 1.1. Rear Tyre Axle Pressure Monitoring Devices (TPMS) are to be introduced as a new standard bus specification feature on all bus types (listed at 1.4) that are purchased by the NSW Government via the Bus Procurement Panel for New Buses procured for Contract Buses in the Sydney Metropolitan, Outer Metropolitan Bus Service Contracts (SOMBSC) and Rural and Regional Contracted bus services (RaRCBS).
- 1.2. Bus Primes supplying buses under the specified contract areas listed hold and are subject to a Deed of Standing Offer ('the Deed') to supply buses to contracted bus operators under the SOMBSC and RaRCBS.
- 1.3. The scope of supply under the TfNSW Bus Procurement Panel and Deed includes the design, risk assessment, supply, installation, warranty provision, support and maintenance of the TPMS.
- 1.4. Contracted Bus Types for Procurement Under the TfNSW Bus Procurement Panel are:
 - Two Door City Buses Diesel and CNG
 - Double Deck Buses
 - 14.5 Metre Two Door City buses
 - Articulated City Buses
 - Category 3 Rural and Regional School Buses
 - Category 4 Rural and Regional School Buses
 - One Door Urban Buses
- 1.5. TfNSW requires suppliers of TPMS to the Bus Prime under this Deed to have proven expertise and be suitably qualified, accredited and registered Supplier(s) to design, supply, install, support and maintain the TPMS in accordance with all requirements of their Deed and the responsibilities held by the Prime.
- 1.6. The TPMS being sought must be fully automatic system which monitors and sends an alarm visual and audio should a fault occur. The System must include all associated Equipment including (but not limited to):
 - a) Monitor – LCD / LED display in driver cabin showing system is active;
 - b) Audible and Visual warning alerts;
 - c) Measurement of Tyre Pressure in PSI, KPA and BAR;
 - d) Capable of monitoring 4 to 20 tyres;
 - e) Monitoring sensors alerting to problem or malfunction on the driver display screen;
 - f) Constant monitoring of tire pressure;
 - g) Owner TPMS manuals;
 - h) System control panel with visual and audible warnings with overrides;
 - i) System dedicated power supply;
 - j) All wiring and connections;
 - k) All mounting brackets.

- 1.7. After installation of the TPMS, the Contract Buses are expected to remain in service up to their respective operational life which is approximately twenty five (25) years. The supplied Systems are required to have an effective and efficient operational life of up to 25 years.

2. General Technical Requirements

- 2.1. The System must be designed to be fail-safe. Regardless of what is occurring on the Contract Bus, the System must operate when activated and be so designed that it does not create potential safety issues.
- 2.2. A detailed Failure Mode Analysis shall be provided for all System designs. This analysis shall indicate the performance of the System under all possible fault or failure modes.
- 2.3. The TPMS must be fully automatic and inclusive of all hardware and fittings for a complete installation. The TPMS must be robust and of good quality and provides for continues monitoring of tyre pressure and temperatures. The TPMS must be able to provide:-
- a) Detection of any leakage of air in all fitted tyres;
 - b) Detect overheating from dragging brakes;
 - c) Failed wheel bearings;
 - d) Tyre failure, and or under inflation;
 - e) Ease of maintenance and repair when necessary;
 - f) Not be affected in performance by road vibration;
 - g) Allowable user Pre-set tyre values;
 - h) Detection of under or over tyre inflation ;
 - i) Alert when tyre temperature rises above the user level;
 - j) Constant monitoring of tyre pressure;
 - k) Measurements of temperature in Celsius;
 - l) Measurements of Tyre pressure in PSI, KPA and BAR.
 - m) Provide graphic user interface;
 - n) Monitoring wireless sensors, power cable and mounting hardware;
 - o) All mounting brackets, clamps and necessary works including all necessary fittings and fixings and consumables items to secure equipment to various makes and models of bus manufacturer and design;
 - p) All required labelling, operating signage and applicable manuals.
- 2.4. After installation of the Systems, the Contract Buses are expected to remain in service up to their respective operational life which is approximately twenty five (25) years, as such the supplied Systems are required to have an effective and efficient operational life of up to 25 years and 11 months and 30 days.
- 2.5. Any TPMS should be capable of complying with recognised testing and or certification process that confirms the performance and reliability of the offered system. Suppliers are to note that such testing processes and operational criteria, such as temperature levels, are detailed in the U.S Department of Transportation release MotorCoach Fire Safety Final Report November 2015 Section 6.8 Wheels Test Procedure and Test Criteria.
- 2.6. As a minimum TPMS must comply with SAE standard J2848 – APR2010.

3. System Installations

3.1. All TPMS components must:

- a) Be suitably robust to provide reliable operations;
- b) Be resistant to vibration and road constant use, heat, oil, and dirt.
- c) Resist vibrations and or accidental impact that could occur during maintenance activities;
- d) Be able to resist any cleaning processes including high pressure and high temperature water cleaning processes;
- e) Be mounted such that they are accessible for System maintenance and inspection;
- f) Be mounted so that no System component(s) inhibits the maintenance access for the Contract Bus and the Contract Bus components.

4. Detector System Requirements

4.1. Monitor – LCD /LED display in driver cabin and easily visible.

- 4.2. Green light to illuminate and show as normal operational performance.
- 4.3. Red light showing problems or malfunction.
- 4.4. Yellow or amber light or other obvious signal indicating issues with the system or low pressure.
- 4.5. When activated, the detection system should provide a reliable and uninterrupted signal to the System control panel.
- 4.6. The failure of the detector system is communicated to the System control Panel both as Audible and Visual alerts.
- 4.7. Low battery indicator on the display sensor.

5. System Control Panel

5.1. The System control panel must provide:

- a) Level 1 low pressure alert activated when the pressure in any of the tires drops 10% to 13% below the programmed baseline tyre pressure for a specific wheel position.
- b) Level low pressure alert activated when the pressure in any of the tyres drops 25% below the programmed baseline tyre pressure.
- c) In both scenarios an audible alarm and red warning light must be activated and the specific tyre position and pressure are shown on the display.
- d) High Pressure setting to provide a warning if the pressure in the tyre increases to more than 25% of the baseline tyre pressure.
- e) "HOT" temperature alarm activation when the temperature of the air in sensor reaches 80 degrees Celsius which provides additional security against damage to the tyres from excessive heat.

- 5.2. The control panel must be visible and accessible to the seated driver/operator.

5.3. The control panel must not affect the forward or sideways vision from the driver seat.

6. Specifications Operational Environment

6.1. Receiver Unit must:

6.2. Operate at the temperature range of -20 degrees to 70 degrees Celsius.

6.3. Operate at the humidity range of 90%.

6.4. Vibration resistant

6.5. Power receiver unit to suit vehicle 12 – 30V DC.

6.6. Sensor Pressure range 0-180 PSI, 12 bar.

6.7. Sensor Pressure sensitivity use 3psi

6.8. Sensor temperature sensitivity 2 degrees Celsius

6.9. Low power consumption in sensor.

7. Alarm and Signal

7.1.1.Lights:

- a) System OK light: (Green);
- b) Fault/Trouble light: (Yellow or other obvious signal);
- c) Fire Indicator (flashing): (Red)

7.1.2.Audible Alarm:

- a) Fire or pressure detection fault;
- b) A means shall be provided to silence the alarm;
- c) The Alarm shall be distinct and recognizable by the driver/operator;
- d) The alarm shall increase in intensity dependent upon the alert level, such as a system fault is a lesser level.

8. Design and Operation manual

8.1. The Bus Prime must supply a complete Design and Operation Manual that is applicable to the Contract Buses supplied under the Deed.

The Manual shall also include:

- a) A technical description of the System;
- b) A technical description of the detection system;
- c) A schematic description showing the detection system, alarm and control unit and Detailed installation processes;
- d) "As Built" sets of drawings and schematics for each Bus Type;
- e) Details of all maintenance, inspection and certification requirements;

- i. With frequencies of all maintenance, inspection and certification requirements.
- ii. Complete details of works required for each activity.
- iii. Any replacement parts required.
- iv. Training and or qualifications required to undertake each activity.

9. Training

- 9.1. The Prime and or supplier of TPMS will be required to provide Bus Operators training documentation setting out details of the content of each module of training, including course content, training outcomes and copies of training documentation in relation to the installed TPMS.
- 9.2. The Prime and or supplier of shall provide train-the-trainer type training applicable to the Systems fitted to the Contract Buses at each nominated Bus Depot (or by agreement group of Bus Depots).
- 9.3. The training must be so configured that there are two main training programs, a train-the-trainer for drivers and operational staff and train-the-trainer for maintenance management and staff.
- 9.4. The Supplier through the Prime will also be required to supply a training video that can be displayed at the depots, the video is to show how the System functions, what the System is intended to project and how the System activates and what the clean-up process involves.

10. Warranty and Spare Parts

- 10.1. The Supplier will warrant the complete System for a period of 2 years from the relevant Date of Completion for each Contract Bus.
- 10.2. All major components to be fully exchangeable in case any component is broken.
- 10.3. The Supplier also shall keep sufficient quantities of spare parts for the System and the Services to comply with its warranty obligations for the duration of the Warranty Period.
- 10.4. The Supplier warrants that spare parts will be available for supply to all Bus Depots for a period of ten (10) years from the Date of Completion of the last Contract Bus.
- 10.5. The Supplier shall ensure that all Spare Parts being provided by the Supplier under the terms of the Contract are generally available ex-stock within 24 hours to each Depot.
- 10.6. The Supplier must ensure at least 95% of the Spare Parts are available “off-the-shelf” for delivery within this period.
- 10.7. Where within ten (10) years of the Date of Completion of the last Contract Bus advances in technology (particularly regarding, but not limited to electrical and electronic equipment) make provision of identical spare parts impractical, the Supplier guarantees that replacement of non-identical spare parts will be interchangeable and will not degrade the performance or life of the System. The cost of modification and installation of any parts, due to non-availability of interchangeable parts will be paid for by the Supplier.

11. Chassis and Body Warranty Compliance

- 11.1. Suppliers must ensure that the complete System does not void any Contract Bus warranties.
- 11.2. Suppliers must obtain approval from the chassis and body suppliers for the Systems in terms of electrical connections, mounting systems and wherever the System controls or activates a function on the Contract Bus chassis or body.

12. Quality Assurance

- 12.1. All Services provided under this Deed shall be subject to the quality management standards detailed in AS/NZS ISO9001:2008.
- 12.2. All work and the system must be able to demonstrated conformance of the Transport for NSW Bus Specifications requirements for TPMS.
- 12.3. Within two weeks of the Commencement Date the Supplier, whether accredited or not, must develop and implement a contract-specific Quality Plan that addresses the processes used for all required inspections, Tests and verifications to be performed by the Supplier and sub-contractors.
- 12.4. A Contract Bus based Quality and Certification document must be developed by the Supplier to allow Bus Operators to sign off that a Contract Bus has been completed with TPMS.
- 12.5. The Supplier must also develop and implement processes that ensure that quality of the installed Systems remains to the highest standard for all Contract Buses fitted.

13. Service Response and Support Levels

- 13.1. The Contractor is required to have in place sufficient personnel and infrastructure to ensure that any type of faulty parts reported by any of the Bus Depots can be responded to and addressed either the same day or within a maximum period of 24 hours.