



# CERTIFICATE OF ACCREDITATION

## The ANSI National Accreditation Board

Hereby attests that

**Transportation Research Center, Inc. (TRC Inc.)**

**10820 State Route 347  
East Liberty, OH 43319**

Fulfills the requirements of

**ISO/IEC 17025:2017**

In the fields of

**CALIBRATION and TESTING**

This certificate is valid only when accompanied by a current scope of accreditation document.  
The current scope of accreditation can be verified at [www.anab.org](http://www.anab.org).

A handwritten signature in black ink, appearing to read 'R. Douglas Leonard Jr.', is positioned above a horizontal line.

R. Douglas Leonard Jr., VP, PILR SBU

Expiry Date: 26 January 2024  
Certificate Number: L2187



This laboratory is accredited in accordance with the recognized International Standard ISO/IEC 17025:2017.  
This accreditation demonstrates technical competence for a defined scope and the operation of a laboratory  
quality management system (refer to joint ISO-ILAC-IAF Communiqué dated April 2017).

**SCOPE OF ACCREDITATION TO ISO/IEC 17025:2017**

**Transportation Research Center, Inc. (TRC Inc.)**

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East Liberty, OH 43319

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**TESTING & CALIBRATION**

Valid to: **January 26, 2024**

Certificate Number: **L2187**

**Testing**

**Mechanical**

Specific Tests and/or Properties Measured	Specification, Standard, Method, or Test Technique	Items, Materials or Product Tested
Intake Valve Stick	TRC Document QWI751.d38 Procedure	Fuels and Fuel Additives
Automotive Spark-Ignition Engine Fuel for Electronic Port Fuel Injector Fouling (PFI)	ASTM D5598	Fuels and Fuel Additives
Intake Valve Stick (SWRI)	QW1751.d56 (Based on SWRI Procedure)	Fuels and Fuel Additives
Vehicle Evaluation of Unleaded Automotive Spark-Ignition Engine Fuel for Intake Valve Deposit Formation	ASTM D5500	Fuels and Fuel Additives
Evaluation, Calibration, and Correlation of E274 Friction Measurement Systems and Equipment	ASTM E2793	Road Surface

**Mechanical**

Specific Tests and/or Properties Measured	Specification, Standard, Method, or Test Technique	Items, Materials or Product Tested
Trailer Running Gear	CAN3-D313-M85	Axle & Brake Assemblies
Transit Bus Testing – Accessibility and Maintainability	QWI751.d60 FTA Bus Testing – Accessibility and Maintainability	Transit Buses
Transit Bus Testing – Noise	QWI751.d63 FTA Bus Testing – Noise	Transit Buses
Transit Bus Testing – Safety	QWI751.d61 FTA Bus Testing – Safety	Transit Buses
Transit Bus Testing – Structure	QWI751.d62 FTA Bus Testing – Structure	Transit Buses

**Mechanical - Crash Test Dummy Certification Testing**

Technology	Parameters	Range, when necessary	Methods Used	Remarks
Head Drop Verification	Peak Head Resultant Acceleration	(115 to 300) g	CFR 49; Part 572; Subparts: B, E, N, O, P, R, T, U, V SAE J2860	Mechanical Testing for Acceptable Function, Dedicated Test Station
	Peak Head Lateral / Longitudinal Acceleration	(Up to 300) g	CFR 49; Part 572; Subparts: B, E, N, O, P, R, T, U, V SAE J2860	

**Mechanical - Crash Test Dummy Certification Testing**

Technology	Parameters	Range, when necessary	Methods Used	Remarks
	Resultant Acceleration Curve Unimodal	Yes / No	CFR 49; Part 572; Subparts: B, E, N, O, P, R, T, U, V SAE J2860	
	Resultant Acceleration Curve Unimodal of Peak	Up to 17 %	CFR 49; Part 572; Subparts: B, E, N, O, P, R, T, U, V SAE J2860	
	Resultant Acceleration Curve Unimodal of Main Pulse	Up to 15 %	CFR 49; Part 572; Subparts: B, E, N, O, P, R, T, U, V SAE J2860	
Neck Verification	Pendulum Impactor Velocity	(Up to 10) m/s	CFR 49; Part 572; Subparts: B, E, N, O, P, R, T, U, V SAE J2860	Mechanical Testing for Acceptable Function, Dedicated Test Station
	Pendulum Integrated Velocity	(Up to 10) m/s	CFR 49; Part 572; Subparts: N, O, P, R, T, U, V SAE J2860	
	Pendulum Acceleration Decay	(Up to 25) g	CFR 49; Part 572; Subparts: B, E,	

**Mechanical - Crash Test Dummy Certification Testing**

Technology	Parameters	Range, when necessary	Methods Used	Remarks
	Probe Acceleration Decay (at -5 g)	(30 to 45) ms	CFR 49; Part 572; Subpart: E	
	Head Resultant Acceleration (Peak)	(0 to 26) g	CFR 49; Part 572; Subpart: B	
	Total Head Rotation (Peak)	(63 to 73) °	CFR 49; Part 572; Subpart: B	
	Maximum Headform Flexion (Peak)	(49 to 59) °	CFR 49; Part 572; Subparts: U, V	
	Maximum Headform Flexion (Time of Peak)	(54 to 66) ms	CFR 49; Part 572; Subparts: U, V	

**Mechanical - Crash Test Dummy Certification Testing**

Technology	Parameters	Range, when necessary	Methods Used	Remarks
Neck Verification	Maximum Headform Flexion Decay	(53 to 88) ms	CFR 49; Part 572; Subpart: U	Mechanical Testing for Acceptable Function, Dedicated Test Station
	Total Headform D-Plane Rotation (Peak)	(57 to 114) °	CFR 49; Part 572; Subparts: E, N, O, P, R, T SAE J2860	
	Total Headform D-Plane Rotation (Time of Peak)	(57 to 82) ms	CFR 49; Part 572; Subpart: E	
	Occipital Condyles Moment (Peak)	(Up to 110) N·m	CFR 49; Part 572; Subparts: E, N, O, P, R, T, V SAE J2860	
	Occipital Condyles Moment Decay (0Nm – 10Nm)	(70 to 150) ms	CFR 49; Part 572; Subparts: E, N, O, P, R, T, V SAE J2860	
Lateral Shoulder Verification	Impactor Velocity	(4 to 5) m/s	CFR 49; Part 572; Subparts: U, V	Mechanical Testing for Acceptable Function, Dedicated Test Station
	Impactor Acceleration	(Up to 20) g	CFR 49; Part 572; Subparts: U, V	
	Shoulder Displacement	(Up to 40) mm	CFR 49; Part 572; Subpart: V	

**Mechanical - Crash Test Dummy Certification Testing**

Technology	Parameters	Range, when necessary	Methods Used	Remarks
	Upper Spine Lateral Acceleration	(Up to 25) g	CFR 49; Part 572; Subpart: V	
Lateral Thorax Verification	Impactor Velocity	(4 to 7) m/s	CFR 49; Part 572; Subparts: U, V	Mechanical Testing for Acceptable Function, Dedicated Test Station
	Impactor Acceleration	(Up to 20) g	CFR 49; Part 572; Subpart: V	
	Peak Impactor Force	(5 000 to 6 500) N	CFR 49; Part 572; Subpart: U	
	Shoulder Displacement	(Up to 40) mm	CFR 49; Part 572; Subpart: V	
	Upper Rib Displacement	(20 to 45) mm	CFR 49; Part 572; Subparts: U, V	
	Center Rib Displacement	(30 to 45) mm	CFR 49; Part 572; Subparts: U, V	
	Lower Rib Displacement	(30 to 45) mm	CFR 49; Part 572; Subparts: U, V	
	Upper Spine Lateral Acceleration	(0 to 45) g	CFR 49; Part 572; Subpart: V	
	Lower Spine Lateral Acceleration	(0 to 40) g	CFR 49; Part 572; Subpart: V	
Rib Module Verification	Displacement (4.0m/s) Drop Height 807-823 mm	(46 to 51) mm	CFR 49; Part 572; Subparts: U	Mechanical Testing for Acceptable Function, Dedicated Test Station
	Displacement (3.0m/s) Drop Height 454-464 mm	(36 to 40) mm	CFR 49; Part 572; Subparts: U	
	Displacement (2.0m/s) Drop Height 202-206 mm	(23.5 to 27.5) mm	CFR 49; Part 572; Subparts: U	
Lateral Abdomen Verification	Impactor Velocity	(3.9 to 4.4) m/s	CFR 49; Part 572; Subparts: U, V	Mechanical Testing for Acceptable Function, Dedicated Test Station
	Impactor Acceleration	(12 to 16) g	CFR 49; Part 572; Subpart: V	
	Impactor Force (Peak)	(4 000 to 4 800) N	CFR 49; Part 572; Subpart: U	
	Abdominal Force (Time of Peak)	(2 200 to 2 700) ms	CFR 49; Part 572; Subpart: U	
	Upper Abdominal Rib Displacement	(36 to 47) mm	CFR 49; Part 572; Subparts: V	

**Mechanical - Crash Test Dummy Certification Testing**

Technology	Parameters	Range, when necessary	Methods Used	Remarks
	Lower Abdominal Rib Displacement	(33 to 40) mm	CFR 49; Part 572; Subparts: V	
	Lower Spine Acceleration	(9 to 14) g	CFR 49; Part 572; Subparts: V	
Thorax (Front) Verification	Impactor Velocity	(4.90 to 6.83) m/s	CFR 49; Part 572; Subparts: B, E, N, O, P, R, T SAE J2860	Mechanical Testing for Acceptable Function, Dedicated Test Station
	Impactor Force	(1 514 to 1 796) N	CFR 49; Part 572; Subparts: R,	
	Impactor Peak Force Chest Deflection (12.5 – 58.0 mm)	(680 to 55 900) N	CFR 49; Part 572; Subparts: N, O, P, T	
	Maximum Chest Compression	(32.0 to 76.0) mm	CFR 49; Part 572; Subparts: B, E, N, O, P, T SAE J2860	
	Internal Hysteresis	(50% to 85%)	CFR 49; Part 572; Subparts: B, E, N, O, P, T SAE J2860	
Torso Flexion Verification	Initial Angle	(Up to 27°)	CFR 49; Part 572; Subparts: B, N, O, P, T SAE J2860	Mechanical Testing for Acceptable Function, Dedicated Test Station
	Average Angle Velocity	(0.5°/s to 1.5°/s)	CFR 49; Part 572; Subparts: B, N, O, P, T SAE J2860	
	Peak Force @ 45° ± 0.5°	(130 to 550) N	CFR 49; Part 572; Subparts: B, N, O, P, T SAE J2860	
Torso Flexion Verification	Final Angle	± 8° / ± 10° / ± 12°	CFR 49; Part 572; Subparts: B, N, O, P, T SAE J2860	
Lateral Lumbar Verification	Pendulum Velocity	(5.95 to 6.15) m/s	CFR 49; Part 572; Subparts: U	Mechanical Testing for Acceptable Function, Dedicated Test Station
	Pendulum Integrated Velocity	Change within Corridor	CFR 49; Part 572; Subparts: U	
	Maximum Headform Flexion (Peak)	(45° to 55°)	CFR 49; Part 572; Subparts: U	
	Maximum Headform Flexion (Time of Peak)	(39 to 53) ms	CFR 49; Part 572; Subparts: U	

**Mechanical - Crash Test Dummy Certification Testing**

Technology	Parameters	Range, when necessary	Methods Used	Remarks
	Headform Flexion Decay (Peak to Zero)	(37 to 57) ms	CFR 49; Part 572; Subparts: U	
Hip Range of Motion Verification	Moment @ 30° (H-Point)	(Up to 94.6) N·m	CFR 49; Part 572; Subparts: E	Mechanical Testing for Acceptable Function, Dedicated Test Station
	Angle @ 203 Nm	(40 to 50) °	CFR 49; Part 572; Subparts: E	
	Average Velocity	(5 to 10) °/s	CFR 49; Part 572; Subparts: E	
Lateral Pelvis Verification	Impactor Velocity	(4.2 to 6.8) m/s	CFR 49; Part 572; Subparts: U, V	Mechanical Testing for Acceptable Function, Dedicated Test Station
	Impactor Acceleration	(38 to 47) g	CFR 49; Part 572; Subpart: V	
	Peak Pelvis Lateral Acceleration after 6 ms	(34 to 42) g	CFR 49; Part 572; Subpart: V	
	Impactor Force (Peak)	(4 700 to 5 400) N	CFR 49; Part 572; Subpart: U	
	Impactor Force (Time of Peak)	(11.8 to 16.1) ms	CFR 49; Part 572; Subpart: U	
	Acetabulum Force	(3 600 to 4 300) N	CFR 49; Part 572; Subpart: V	
	Pubic Symphysis Force (Peak)	(1 230 to 1 590) N	CFR 49; Part 572; Subpart: U	
	Pubic Symphysis Force (Time of Peak)	(12.2 to 17.0) ms	CFR 49; Part 572; Subparts: U	
Lateral Iliac Verification	Pendulum Velocity	(4.2 to 4.4) m/s	CFR 49; Part 572; Subparts: V	Mechanical Testing for Acceptable Function, Dedicated Test Station
	Impactor Acceleration	(36 to 45) g	CFR 49; Part 572; Subparts: V	
	Pelvis Lateral Acceleration (Peak)	(28 to 39) g	CFR 49; Part 572; Subparts: V	
	Iliac Force	(4 100 to 5 100) N	CFR 49; Part 572; Subparts: V	
Knee / Femur Response Verification	Impactor Velocity	(2.07 to 2.13) m/s	CFR 49; Part 572; Subparts: B, E, N, O, T SAE J2860	Mechanical Testing for Acceptable Function,



**Mechanical - Crash Test Dummy Certification Testing**

Technology	Parameters	Range, when necessary	Methods Used	Remarks
				Dedicated Test Station
	Femur Force (Peak)	(Up to 11 500) N	CFR 49; Part 572; Subparts: B, E, N, O, T SAE J2860	Mechanical Testing for Acceptable Function, Dedicated Test Station
Knee Slider Verification	Impactor Velocity	(2.70 to 2.80) m/s	SAE J2856, SAE J2860, SAE J2862	Mechanical Testing for Acceptable Function, Dedicated Test Station
	Peak Deflection	(10.2 to 18.3) mm	SAE J2856, SAE J2860, SAE J2862	Mechanical Testing for Acceptable Function, Dedicated Test Station
	Force (Peak)	(1.26 to 3.1) kN	SAE J2856	Mechanical Testing for Acceptable Function, Dedicated Test Station

## Calibration

### Mass and Mass Related

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Load Cells Compression Tension (up to 5000 lbf)	(50 to 500) lbf	0.16 % Full Scale	Axial Load with Load Cells
	(500 to 5 000) lbf	0.16 % Full Scale	
	(5 000 to 10 000) lbf	0.16 % Full Scale	
	(10 000 to 50 000) lbf	0.17 % Full Scale	

### Acoustics and Vibration

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Accelerometers Excitation Voltage / Frequency Response – Up to 10 V Up to 10 g	100 Hz	1.0 % of reading	Comparison system using shaker and accelerometers
	(10 to <99) Hz	1.5 % of reading	
	(101 to 5000) Hz	1.7 % of reading	
	(5001 to 10000) Hz	2.2 % of reading	

### Dimensional Measurement

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
ATD Knee slider	(0 to 150) mm	0.22 mm	QWI751.i110
ATD Chest Potentiometers	(0 to 150) mm	0.22 mm	QWI751.i110

**Dimensional Measurement**

Parameter/Equipment	Range	Expanded Uncertainty of Measurement (+/-)	Reference Standard, Method, and/or Equipment
Linear and String Potentiometers	(0 to 1000) mm	0.48 mm	QWI751.i110
Rotary Potentiometers	(0 to 360°)	0.96°	QWI751.i110

Calibration and Measurement Capability (CMC) is expressed in terms of the measurement parameter, measurement range, expanded uncertainty of measurement and reference standard, method, and/or equipment. The expanded uncertainty of measurement is expressed as the standard uncertainty of the measurement multiplied by a coverage factor of 2 ( $k=2$ ), corresponding to a confidence level of approximately 95%.

Note:

1. This scope is formatted as part of a single document including Certificate of Accreditation No. L2187.



R. Douglas Leonard Jr., VP, PILR SBU

