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Technical Report

***A Review of Breath Alcohol Ignition
Interlock Device Test Facilities***

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Rapport technique

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1 INTRODUCTION

1.1 Purpose

This document identifies test facilities that are capable of performing the qualification tests outlined in the document *Technical Standard for Vehicular Breath Alcohol Interlock Devices in Canada* [1] and presented in detail in the document *Test Protocol for Vehicular Breath Alcohol Interlock Devices in Canada* [2]. The information presented in this report is directed towards interlock device manufacturers who intend on having their device(s) certified for use in Canada.

1.2 Background

A breath alcohol interlock device is an electro mechanical unit designed to prevent an automobile from starting when the driver's blood alcohol content is higher than a pre-determined limit. Interlock devices are available to qualified individuals who have been convicted of driving while impaired by alcohol. These devices, available through multiple manufactures, normally consist of a hand-held sensor head connected to an electronic control module; however, they can differ in terms of specific design and/or method of use.

Regardless of how an interlock device is manufactured or used, it must be certified under the Canadian standard - *Technical Standard for Vehicular Breath Alcohol Interlock Devices in Canada* - prior to being sold for installation in a Canadian vehicle. This standard describes the performance requirements, technical specifications, physical markings, and the qualification tests required for type acceptance of interlock devices by the Canadian federal government. It identifies the following five major performance test groups:

- Group 1: Durability;
- Group 2: Environmental/Climatic Accuracy;
- Group 3: Electrical;
- Group 4: Special Alcohol Interlock Performance; and
- Group 5: Electromagnetic Interference/Electromagnetic Compatibility.

The specific details of these performance test groups are presented in CSTT-HVC-TR-150, *Test Protocol for Vehicular Breath Alcohol Interlock Devices in Canada*. This test protocol outlines the procedures and methods for testing interlock devices destined for use in Canada. It was developed with the objective of being distributed to, and used by, test facilities that would be performing the qualification tests, as well as manufacturers who must understand the requirements of the standard and prepare devices for testing.

1.3 Limitations

The test facilities listed in this document were identified primarily through web-based searches and on-line database sources. These sources, although considered credible and relatively comprehensive, may not capture every facility capable of performing the qualification tests described in CSTT-HVC-TR-150. This review is not intended to produce an exhaustive list of generic test facilities, but rather to provide a useful reference list of qualified facilities for interlock device manufacturers who intend on obtaining product certification in Canada. As such, a request process for inclusion on the test facility list will be made available to candidate test facilities that were not captured during this review.

In addition, the purpose of this review is not to rank the test facilities, nor is it to endorse any particular testing facility or organization. Numerous test facilities will be evaluated based on a common set of requirements and the test facilities in the resulting list will all be considered equally capable of performing the interlock device testing. The numerical lists presented in this report are organized based on specific test facility commonalities and are not intended to indicate preference or ability.

The testing capabilities of the facilities identified in this report were accurate at the time of review; interlock device manufactures should be advised to verify for any updates prior to testing.

2 REQUIREMENTS DEFINITION

In order to perform the test facility search outlined in Section 3, specific testing requirements have been defined, based on the test protocol CSTT-HVC-TR-150. These requirements, categorized as either general or technical, are specified in Sections 2.1 and 2.2, respectively.

2.1 General Requirements

2.1.1 Facility Characteristics

The test facility shall satisfy, at a minimum, the general requirements specified in Table 1.

Table 1 – General Test Facility Requirements

Characteristic	Requirement
Accreditation	ISO/IEC 17025
Facility Size	Large enough to house a vehicle simulator or an actual vehicle
Ambient Conditions	Test area with controlled ambient conditions (for non-climate tests) as follows: <ul style="list-style-type: none"> ▪ +18°C to + 28°C ▪ < 85% humidity ▪ 78 kPa to 118 kPa
Cleanliness	Above average

The test facility shall be ISO/IEC 17025 accredited. ISO/IEC 17025 (*International Organization for Standardization/International Electrotechnical Commission*) is an international standard that specifies the general requirements for the competence to carry out tests and/or calibrations, including sampling. It covers testing and calibrations performed using standard methods, non-standard methods, and laboratory-developed methods [3]. ISO/IEC 17025 accreditation is obtained through third-party accreditation bodies, such as those listed in Table 8.

The test facility shall be clean, large enough to house a vehicle simulator (or an actual vehicle, depending on the manufacturer's preference), and capable of controlling the ambient conditions of the test area within the ranges specified in Table 1.

2.1.2 Testing Experience

As noted in Table 2, the test facility and testing personnel shall have a minimum of five and three years of testing experience, respectively. Previous interlock device testing experience is not a requirement, however, it will be a parameter of the facility search, as noted in Section 3.

Table 3 lists several recognized interlock device testing guidelines/standards that may be identified during the review.

Table 2 – Testing Experience

Experience	Requirement
Test Facility	General testing: Five or more years
	Interlock device testing : Search parameter only
Personnel	General testing: Three or more years
	Interlock device testing : Search parameter only

Table 3 – Interlock Device Testing Standards

Country	Details
Canada	CSTT-HVC-TR-114/150
	Alberta – Doc. No. 355A02-01
USA	NHTSA - Vol. 57 No. 67/ 1992
	State Regulations (various)
Europe	Cenelec EN 50436-1/-2

2.1.3 Location and Partnerships

The test facility search aimed to explore all possible candidate facilities. As such, the location of the facility was not limited to any particular geographical location. In addition, a test facility which belongs to a parent organization with qualified sister facilities and established testing arrangements (i.e. the qualification tests would be performed at multiple test facilities within the same organization) was also included in the search scope. Furthermore, test facilities that outsource/sub-contract specific testing requirements to a partner facility (i.e. a test facility that is not within the same organization) also formed part of the search, but only under the condition that the partner facility also met the requirements specified in Section 2.1.1, including ISO/IEC 17025 accreditation.

2.2 Technical Requirements

In order to assess the performance of the interlock devices, the test facility shall have, as a minimum, access to the test equipment, consumables, and support items listed in Table 4.

Table 4 – Technical Requirements

Classification	Item
Facility	Climate/humidity chamber ¹
	Shaker table ²
	Dust chamber
	Water spray chamber
	Altitude/vacuum chamber ³
Chemical	2-Propanol
	Acetaldehyde

Classification	Item
	Acetone
	Carbon monoxide
	Dyethylether
	Ethyl acetate
	Methane
	Methanol
	n-heptane
	n-hexane
	n-octane
	n-pentane
	Toluene
Data Acquisition Instruments	Data acquisition system
	Laptop computer
Instruments	3g accelerometers
	Electrical function/wave generator
	Humidity sensor
	Pressure transducer
	Spirometer (<i>or equivalent flow meter</i>)
	Stopwatch and timer
	Thermocouples and temperature probes
	Voltmeter/multimeter
Support Equipment	1 mm steel rod
	Aerosol can of compressed air/CO ₂
	Balloons
	Charcoal/filters
	Cigarettes
	Drinking alcohol
	Distilled water
	Fuses
	Gas sample bags/Tedlar® bags
	Gas volume measuring device
	Glassware and plastic cups
	Hoses/clear tubes
	Talcum powder
	Tape measure
	Transformer
	Variable DC power supply
	Vehicle simulator or manual transmission vehicle

¹ Temperature Range: -40°C to +85°C; Humidity: minimum 90%

² Vibration: up to 1,050 Hz; Amplitude: +/- 5 mm

³ Pressure: up to 557 torr

3 PROCEDURE

3.1 Search Procedure

The search for test facilities capable of performing the qualification tests outlined in the test protocol, CSTT-HVC-TR-150, was conducted as follows:

STEP 1 – Identified test facilities with experience in testing interlock devices

- I. Interviews: Conducted telephone interviews with interlock device manufactures to inquire about the facilities that were used to test their devices
- II. Web-based search: Performed a general search to identify additional test facilities with interlock device testing experience

STEP 2 – Identified test facilities that would meet the requirements in Section 2

- I. Database search: Compiled a preliminary list of test facilities from the on-line accreditation databases noted in Table 6 (Section 3.2) that were candidates to satisfy the technical and general requirements specified in Section 2
- II. Web-based search: Performed a general search to identify additional candidate test facilities, using the sample criteria listed in Table 5

STEP 3 – Narrowed the search results of STEP 1 and STEP 2

- I. Website search: Reviewed the on-line website content of candidate test facilities to ensure that all Section 2 requirements could be satisfied
- II. Interviews: Conducted telephone interviews with test facilities to verify website information and obtain further information regarding testing capabilities

Table 5 – Sample Criteria Used in Test Facility Search

Testing Capability	Sample Descriptors
Durability	Mechanical, drop, vibration, shaker, shock
Environmental	Climate, temperature, humidity, dust, water spray, ingress, altitude, pressure, vacuum
Electrical	EMC, EMI, calibration
Other	Chemical exposure
General	Product certification, transportation

3.2 Search Sources

The primary search sources used in STEP 2 of the test facility search (Section 3.1), were the accreditation and non-profit organizations listed in Table 6. These organizations maintain extensive databases of test facilities and provide information that was integral in reviewing the facility requirements identified in Section 2, including: (1) ISO/IEC 17025 accreditation status, and (2) testing capabilities.

Table 6 – Accreditation Bodies and On-Line Laboratory Listings

Region	Category	Organization
CANADA	Accreditation	Standards Council of Canada (SCC)
	Accreditation	Program for the Accreditation of Laboratories/Canada (PALCAN)
	Accreditation	Canadian Association for Laboratory Accreditations (CALA)
	Accreditation	NRC Calibration Laboratory Assessment Service (CLAS)
USA	Accreditation	American Association of Laboratory Accreditation (A2LA)
	Non-Profit	National Conference of Standards Laboratories (NCSL)
Europe	Accreditation	Deutscher Kalibrierdienst (DKD)
International	Accreditation	Laboratory Accreditation Bureau (LAB)

4 RESULTS

4.1 Preliminary Search Results

STEP 1 and STEP 2 of the test facility search, outlined in Section 3.1, generated a list of 40 test facilities that were eligible for further review in STEP 3. Of these 40, nine were located in Canada, one was based in Germany, and the remaining facilities were located in the United States. As shown in Table 7, six facilities were found to have previous interlock device testing experience – two in Canada, one in Germany, and three in the United States.

Table 7 – Test Facilities with Interlock Device Testing Experience

Interlock Device Manufacturer*			Test Facility	
1	Alcohol Countermeasure Systems/Draeger	Mississauga, ON	CeCERT	Wismar, Germany
			Electronics Test Centre	Airdrie, AB
			Global EMC	Richmond Hill, ON
2	Best Labs	Boardman, OH	Stork Materials Technology	St. Paul, MN
3	Guardian Interlock	Marietta, GA	Underwriters Laboratory	Northbrook, IL
4	Intoxalock	Des Moines, IA	Stork Materials Technology	St. Paul, MN
5	Monitech	Morrisville, NC	C&C Technologies (Repco)	Apex, NC
6	Start Smart	Irving, TX	Stork Materials Technology	St. Paul, MN
			C&C Technologies (Repco)	Apex, NC

*Note: Numerous interlock device manufactures were contacted during the search, however only those listed above provided a response.

Upon further investigation in STEP 3, it became apparent that the majority of the 40 candidate facilities would likely meet the necessary requirements identified in Section 2, resulting in an extensive list of test facilities. However, as noted in Section 1.3, the purpose of this search was not to generate an exhaustive list of capable test facilities, but rather to provide a useful resource to interlock device manufactures who intend on having their devices tested for use in Canada. Therefore, given that the scope of the search focused on the Canadian standard (CSTT-HVC-TR-150 test protocol), and considering various time limitations related to the review, it was decided that a shorter, more focused list of facilities would be investigated as part of the survey in STEP 3. This shortened list focused on two parameters: (1) facilities with previous interlock device testing experience, and (2) facilities within Canada.

The results of the STEP 3 investigation are presented in Section 4.2.

4.2 Final Search Results

The final list of test facilities capable of performing the qualification tests - based on the procedure outlined in Section 3 and the parameters identified in Section 4.1 - are presented in Table 8. There were 11 test facilities identified in total, six of which have interlock device testing experience, and seven of which are in Canada (two with interlock device testing experience).

A more detailed list, specifying how each test facility satisfies the technical, and experience, related requirements of Section 2, is presented in Table A1 (Appendix A).

Table 8 – Test Facilities Capable of Testing Interlock Devices (facility list only)

Test Facility*		Location	Interlock Device Testing Experience (Manufactures)
1	Stork Materials Technology	St. Paul, MN	<ul style="list-style-type: none"> ▪ Best Labs ▪ Intoxalock ▪ Smart Start
2	C&C Technologies (RepcO)	Apex, NC	<ul style="list-style-type: none"> ▪ Smart Start ▪ Monitech
3	Underwriters Laboratory	Northbrook, IL	<ul style="list-style-type: none"> ▪ Guardian Interlock
4	CeCERT	Wismar, DE	<ul style="list-style-type: none"> ▪ Alcohol Countermeasure Systems
5	Electronics Test Centre	Airdrie, AB	<ul style="list-style-type: none"> ▪ Alcohol Countermeasure Systems
6	Global EMC	Richmond Hill, ON	<ul style="list-style-type: none"> ▪ Alcohol Countermeasure Systems
7	Exova	Mississauga, ON	n/a
8	Centre Recherche Industrielle	Montreal, QC	n/a
9	Intertek	Coquitlam, BC	n/a
10	TUV SUD Company	Newmarket, ON	n/a
11	Sci Lab	Kitchener, ON	n/a

* Test facilities are categorized by interlock device testing experience (right-hand column) and Canadian locations (shaded rows); the numbering in this table is not intended to indicate rank or testing ability.

5 ANALYSIS OF RESULTS

The following section provides an analysis of the search results presented in Section 4. This analysis focuses on the two requirement categories presented in Section 2: (1) general requirements, and (2) technical requirements.

5.1 General Requirements

The test facilities listed in Table 8 (and Table A1) have all been verified as ISO/IEC 17025 accredited. In order to achieve and uphold this accreditation, a test facility must, among many other requirements: (1) maintain a clean work environment, and (2) regulate the ambient conditions (e.g. temperature, humidity and pressure) within a specified range. These two requirements, which align directly with those listed in Table 1, are verified by the accreditation bodies through regular audits. The size of the test facilities were all deemed adequate for the qualification testing.

The experience requirements for both the test facility and the test personnel were satisfied and surpassed; the test facility experience ranges between 10 to 50 years, and the test personnel have between 5 and 25 years of experience.

Of the six of the identified test facilities with interlock device testing experience, five have more than five years experience in this area. The survey results indicate that the most commonly used interlock device testing standard is the United States' National Highway Traffic Safety Administration Standard (NHTSA Register Vol. 57, 67, 1992). However, approximately half of the test facilities have indicated that the test requirements are often specified by the client, and therefore the reference standard is often not known to test personnel. The CSTT-HVC-TR-150 test protocol has been used by one test facility for the qualification testing.

The test facility locations, narrowed by the parameter change in Section 4.1, are as follows: six in Canada, one in Germany, and three in the United States. Each of the test facilities engages at least one other testing facility to satisfy the testing requirements; three use the resources of sister locations, and the remaining outsource to partner facilities. These outsourcing arrangements are highlighted in Table A1, for reference. As required, the identified sister and partner facilities have all been verified as ISO/IEC 17025 accredited.

5.2 Technical Requirements

Each of the 11 capable test facilities satisfy the technical requirements listed in Section 2.2., either through in-house resources or by means of outsourcing arrangements. As shown in Table A1, all of the test facilities have in-house climate/humidity chambers (some large enough to house a vehicle), as well as in-house shaker/vibration tables. The dust, water and altitude tests are outsourced by some of the test facilities, and the EMC/EMI testing is outsourced in approximately 50 percent of cases. The chemical-related testing is most commonly outsourced, with only four of the 11 facilities capable of performing the necessary test procedures in-house.

It should be noted that the CSTT-HVC-TR-150 test protocol requires the use of a Spirometer, however, only two of the facilities currently have access to this instrument. Upon discussion with the author of the protocol, it was determined that an equivalent device would be acceptable for testing, as long as the stipulated test requirements could be satisfied.

6 CONCLUSIONS

An extensive search was conducted to identify test facilities that are capable of performing the qualification tests outlined in CSTT-HVC-TR-150. Numerous test facilities were disqualified as a result of not having ISO/IEC 17025 accreditation, or for not satisfying the technical test facility requirements. In the review, interlock device testing experience was considered more critical than geographical location, and the common partnership and outsourcing arrangements were deemed acceptable. The preliminary search results were narrowed to focus on the test facility characteristics most relevant to the CSTT-HVC-TR-150 test protocol, including interlock device testing experience and location within Canada. The final result was a concise list of 11 capable and experienced test facilities.

Interlock device manufactures who intended on having their device(s) certified for use in Canada, must engage one of the test facilities from this list to perform the qualification testing. If a manufacturer wishes to have the tests performed elsewhere, a justification must be presented to the appropriate jurisdictional technical authority, and a site visit by either the technical authority, or the NRC, or both, would likely be required.

If a test facility wishes to be included on the qualified test facility list, they must submit a letter of intent to the appropriate jurisdictional technical authority which details how they satisfy each of the requirements in Section 2, and a site visit may be required.

LIST OF ACRONYMS AND ABBREVIATIONS

°C	Degrees Celsius
CENELEC	European Committee for Electrotechnical Standardization
CO ₂	Carbon Dioxide
CSTT	Centre for Surface Transportation Technology
DC	Direct Current
EMC	Electromagnetic Compatibility
EMI	Electromagnetic Interference
Hz	Hertz
IEC	International Electrotechnical Commission
ISO	International Organization for Standardization
mm	Millimetre
kPa	Kilopascals
NHTSA	National Highway Traffic Safety Administration
NRC	National Research Council Canada
torr	Torrucelli (unit of pressure equal to 1/760 of an atmosphere)

REFERENCES

- [1] Technical Standard for Vehicular Breath Alcohol Interlock Devices in Canada; CSTT-HVC-TR-114; National Research Council, Centre for Surface Transportation Technology; Patten, JD, March 2009.
- [2] Test Protocol for Vehicular Breath Alcohol Interlock Devices in Canada; CSTT-HVC-TR- 150; National Research Council, Centre for Surface Transportation Technology; Patten, JD, January 2011.
- [3] International Standards Organization, ISO-IEC 17025:2005, Updated: January 2011, Accessed: February 22, 2011. Link:
http://www.iso.org/iso/iso_catalogue/catalogue_tc/catalogue_detail.htm?csnumber=39883

Appendix A

List of Interlock Device Test Facilities (detailed)

Table A1 – Test Facilities Capable of Testing Interlock Devices (detailed list)

Test Facility	Location	Use by Interlock Device Manufacturers	Technical Requirements (Table 4)								Experience (Years)			Interlock Device Testing Standards Experience			
			Climate/ Humidity Chamber	Shaker/ Vibration Table	Dust Chamber	Water Spray Chamber	Altitude/ Vacuum Chamber	Electrical/ EMC/EMI	Chemical	Instruments/ Support Equipment	Facility (Min. 5+)	Personnel (Min. 3+)	Interlock Device Testing (Asset only)	CSTT-HVC- TR-114 /150 (CA)	NHTSA Register Vol. 57, 67, 1992 (US)	Cenelec EN 50436-1/-2 (EU)	
1	Stork Materials Technology (Twin City Testing)	St. Paul, MN	<ul style="list-style-type: none"> Smart Start Best Labs Intoxalock/ Consumer Safety Technology 	Yes	Yes	Outsource (Environ Labs, MN)	Outsource (Environ Labs, MN)	Yes	Outsource (TUV Labs, USA)	Outsource for mixing (Air Liquide, USA)	Spirometer - no	50+	10+	10+	No	Yes	No
2	C&C Technologies (RepcO)	Apex, NC	<ul style="list-style-type: none"> Smart Start Monitech 	Yes	Yes	Yes	Yes	Yes	Outsource (TUV Labs, USA)	Outsource (unknown facility)	Spirometer - no	15+	10+	8+	Unknown (Client-specified procedure)		
3	Underwriters Laboratory (UL)	Northbrook, IL	Guardian Interlock	Yes	Yes	Yes	Yes	UL, North Carolina, USA	Yes	Yes	Yes	50+	10+	< 1	No	Yes	No
4	CeCERT	Wismar, Germany	Alcohol Countermeasure Systems	Yes	Yes	Outsource (Aucoteam, DE)	Outsource (Aucoteam, DE)	Yes	Yes	Yes	Yes	15+	5+	10+	Yes	Yes	Yes
5	Electronics Test Centre	Airdrie, AB	Alcohol Countermeasure Systems	Yes	Yes	Yes	Yes	Yes	Yes	Outsource (ISO/IEC 17025 facility)	Spirometer - no	15+	25+	8+	Unknown (Client-specified procedure)		
6	Global EMC	Richmond Hill, ON	Alcohol Countermeasure Systems	Yes	Yes	Outsource (National Technical Systems, USA)	Yes	Outsource (National Technical Systems, USA)	Yes	Outsource (ISO/IEC 17025 facility)	Spirometer - no	10+	10+	5+	Unknown (Client-specified procedure)		
7	Exova	Mississauga, ON	-	Yes (car)	Yes	Exova, Warren, WI, USA	Yes	Yes	Outsource (ISO/IEC 17025 facility)	Yes	Spirometer - no	15+	10+	-	-	-	-
8	Centre Recherche Industrielle de Québec	Montreal, QC	-	Yes	Yes	Yes	Yes	Yes	Yes	CRIQ, Quebec, QC	Spirometer - no	10+	5+	-	-	-	-
9	Intertek	Coquitlam, BC	-	Yes	Yes	Yes	Yes	Intertek, California, USA	Yes	Intertek, Burnaby, BC	Spirometer – at facility in USA	20+	5+	-	-	-	-
10	TUV SUD Company	Newmarket, ON	-	Yes (car)	Yes	Yes	Yes	Yes	Outsource (Global EMC, ON)	Outsource (ISO/IEC 17025 facility)	Spirometer - no	20+	10+	-	-	-	-
11	Sci Lab	Kitchener, ON	-	Yes (car)	Yes	Yes	Yes	Yes	Outsource (Electronics Test Centre, ON)	Yes	Spirometer - equivalent only	20+	15+	-	-	-	-