



Vehicle Standards & Inspection
2260 11th Avenue
Regina, Sask. S4P 2N7

Vehicle Noise Policy

Test Method and Procedure Manual

Note: This document contains information on laws that SGI is involved with the administration of, additional requirements and restrictions may apply and may be subject to change without notice. Diagrams used to help explain the method of measurement and placement of measuring device are directly referenced from the applicable SAE standards. Contents of this document must not be used for any other purpose than that of the provincial inspection program administered by SGI.

Purpose:

In Saskatchewan, there are specific rules around excessive vehicle noise, laid out by the *Traffic Safety Act* and *The Vehicle Equipment Regulations, 1987*.

- *The Traffic Safety Act* (sec. 215) prohibits the operation of a vehicle that produces excessively loud or unnecessary noise.
- *The Vehicle Equipment Regulations, 1987*, (sec. 18 and sec, 223) require all passenger cars, trucks, and motorcycles to be equipped with a muffler that effectively reduces combustion noise.

This test procedure will determine if a vehicle is producing excessive noise related to the above noted legislation, with references to the following standards:

- SAE J1492, Measurement of Light Vehicle Stationary Exhaust System Sound Level Engine Speed Sweep Method
- SAE J2825, Measurement of Exhaust Sound Pressure Levels of Stationary On-Highway Motorcycles

Authority:

The Traffic Safety Act (sec. 279) states a peace officer or person appointed by the administrator (SGI) may order the driver or owner of a vehicle to submit the vehicle to any tests that the peace officer or person considers necessary.

The Vehicle Inspection Procedure Regulation defines an inspection station as a repair facility authorized to conduct vehicle inspections on behalf of SGI in accordance with any instructions published by SGI respecting inspection stations or vehicle inspections conducted pursuant to the Act and Regulations.

Inspection stations that are open to the public shall not charge a customer more than the fees authorized by the SGI for the prescribed inspections.

However, SGI may authorize a shop charge out rate other than those prescribed for a specific vehicle description or type if:

- the inspection of a vehicle requires special equipment not normally required for the inspection of a vehicle of that description or type
- a vehicle has additional equipment than what vehicles of its type or class are normally equipped with

Inspection/testing fee:

SGI-certified inspection stations, as authorized by SGI, shall not charge customers more than the shop's charge out rate multiplied by one hour for completing the noise test. The one-hour includes the time to set up, complete the noise test, record the test results, take a minimum of two photos (one of the vehicle and one of the muffler), email a copy of the test results and photos to vehicleinspection@sgi.sk.ca and provide a printed and/or emailed electronic copy of the test result to the customer.

Instrument(s):

A Class 1 sound level meter meeting the Type 1 and S1A requirements of ANSI S1.4-1983 or IEC 61672-1. The sound level meter shall have the fast-exponential time-averaging characteristic and A-weighting network. Ability to attain automatic and continuous measurements of sound level at a prescribed orientation to the vehicle (tripod) with maximum attained level "hold option."

The calibration of the sound level meter shall be checked and adjusted according to the manufacturer's instructions or using a calibrator meeting the requirements of ANSI S1.40-1984 or IEC 60942 at the start of measurements and rechecked and recorded at the end of them. If the

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calibration readings of the sound level meter change by more than 0.5 dB during a series of measurements, the test shall be considered invalid.

An anemometer with steady-state accuracy of $\pm 10\%$ at 9 m/s (20 mph) wind speed and peak hold ability.

An original equipment engine speed tachometer. Alternatively, other means of determining engine speed with a steady-state accuracy of $\pm 3\%$ at the test speed may be used.

Test environment:

The test site shall be an outdoor open area, consisting of a level concrete, asphalt, or hard-packed earth surface within the typical slope of a paved street or parking lot, and shall be:

- free from snow, shrubbery, trees, grass, loose soil, ashes, or other sound absorbing material
- free of large sound-reflecting surfaces such as parked vehicles, parallel walls or buildings, billboards, etc. within a 3 m (118 in) radius from the microphone location and any point on the vehicle

The ambient sound pressure level (including wind effects) at the test site due to sources other than the vehicle being tested shall be at least 10 dB below the sound pressure level produced by the test vehicle. For example, if a vehicle produces a sound level of 93 dB and the ambient sound level created by the wind is over 83dB, the test is considered inconclusive.

Wind speed at the test site during the test shall be less than 5 m/s, 18 km/h, 11 mph.

Workplace safety:

The procedures described in this policy require the use of tools, and equipment in an environment that may involve safety hazards. Individual performing tests according to this policy agree to be fully familiar with all relevant workplace safety requirements and protocols.

No specific safety warnings are provided within this document. All relevant and appropriate safety precautions (e.g., personal protective equipment, wheel chocks) are the responsibility of the inspector/mechanic/technician and workplace where the test is conducted.

Definitions:

Rated engine speed, S

- Engine speed at which the engine develops its rated maximum net power as defined in SAE 1349.

Target engine speed

- Engine speed for testing defined in the recommended practice.

Target engine speed range

- Allowable range of engine speed for valid test based on target engine speed and 5% tolerance.

Multiple driver selectable exhaust mode (multi-mode exhaust system)

- Any manner of driver ability to control the sound emission of the exhaust system, including controls operated either from within or external to the driver compartment.

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Engine operation conditions:

Light Vehicle target engine speed shall be:

- 75% of the rated engine speed S for vehicles with $S \leq 5000$ rpm
- 3750 rpm for vehicles with a rated engine speed > 5000 rpm and < 7500 rpm
- 50% of the rated engine speed S for vehicles with $S \geq 7500$ rpm with a tolerance of $\pm 5\%$.

If the vehicle can't reach the target engine speed as specified above, the target engine speed shall be 5% below the maximum possible engine speed for this stationary test.

The engine speed shall be gradually increased over a 10 to 15-second interval from idle to the target engine speed, not exceeding the tolerance band as stated above and held constant for at least one second. Then the throttle control shall be rapidly released, and the engine speed shall be returned to idle.

Note: Vehicles equipped with a multi-mode exhaust system shall have the sound level test conducted in all modes that can remain enabled through a power on/off cycle or the vehicle defaults to on engine start-up.

Light vehicle dB level measurements:

The sound level meter shall be set for A-weighting and fast dynamic response, a maximum hold setting should be used.

Measurements shall be made at each exhaust outlet using the microphone location(s) described below for light vehicle. The sound pressure level shall be measured during this entire cycle, and the maximum sound level meter reading shall be taken as the test value.

The test shall be repeated at each exhaust outlet until three measurements are obtained which are within 2 dB of each other. The reported sound level for a given outlet shall be the arithmetic average of the three highest measurements which are within 2 dB of each other.

Motorcycle target engine speed shall be:

Engines with 3 or 4 cylinders

- 5000 rpm (± 200 rpm), or 75% of maximum engine speed, whichever is less.

Less than 3 cylinders or more than 4 cylinders

- 2000 rpm (± 200 rpm), or 75% of maximum engine speed, whichever is less.

In the following "swept rpm" test method, the engine shall gradually increase from idle to the target engine speed. Then the throttle control shall be rapidly released, and the engine speed shall be returned to idle.

Ideally, the engine should be accelerated at a uniform rate from idle to the target speed during a period of at least two seconds.

The test cycle begins when the engine speed is increased above idle and continues until the engine speed reaches the test speed. This may require some trial and error to determine how to manipulate the throttle to achieve a steady increase in speed without causing the maximum engine speed to exceed the target speed by more than 200 rpm.

Motorcycle dB level measurements:

For this Swept rpm test procedure, the sound level meter shall be set for A-weighting and fast dynamic response; a maximum hold setting should be used.

To determine the maximum exhaust sound pressure level, tests shall be made on each side of a motorcycle with an exhaust outlet and recorded. The sound pressure level test result recorded shall be that measured on the loudest side of the motorcycle during the test procedure.

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Microphone orientation:

Light vehicle (passenger cars, multipurpose vehicles, and light trucks)

Ref: SAE J1492 Revised Oct 2021 Standards

The microphone shall be located at a distance of $0.5 \text{ m} \pm 0.01 \text{ m}$ ($20 \text{ in} \pm \frac{1}{2} \text{ in}$) from the reference point of the exhaust pipe defined in Figure 1 and at an angle of $45^\circ (\pm 5^\circ)$ to the vertical plane containing the flow axis of the pipe termination. The microphone shall be at the height of the reference point but not less than 0.2 m (8 in) from the ground surface. The reference axis of the microphone shall lie in a plane parallel to the ground surface and shall be directed towards the reference point on the exhaust outlet.

If two microphone positions are possible, the location farthest laterally from the vehicle's longitudinal centerline shall be used.

If the flow axis of the exhaust outlet pipe is at 90° to the vehicle's longitudinal centerline, the microphone shall be located at the point which is furthest from the engine.

If a vehicle has two or more exhaust outlets spaced less than 0.3 m (12 in) apart and connected to a single silencer, only one measurement shall be made. The microphone shall be located relative to the outlet farthest from the vehicle longitudinal centerline, or when such outlet does not exist, to the outlet which is highest above the ground.

For vehicles having an exhaust provided with outlets spaced more than 0.3 m (12 in) apart, one measurement is made for each outlet as if it were the only outlet, and the highest sound pressure level shall be noted.

For vehicles with a vertical exhaust (e.g., commercial vehicles), the microphone shall be placed at the height of the exhaust outlet. Its axis shall be vertical and oriented upwards. It shall be placed at a distance of $0.5 \text{ m} \pm 0.01 \text{ m}$ ($20 \text{ in} \pm \frac{1}{2} \text{ in}$) from the exhaust pipe reference point as defined in Figure 1, but never less than 0.2 m (8 in) from the side of the vehicle nearest to the exhaust.

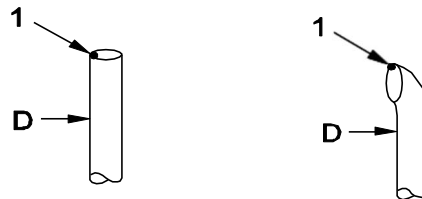
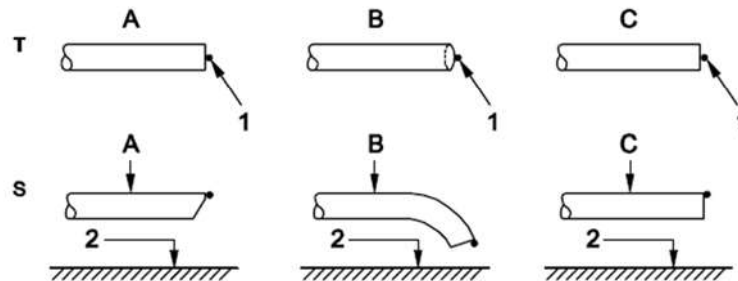
For vehicles where the reference point of the exhaust pipe is not accessible, or located under the vehicle body, as shown in Figures 2b and 2c, because of the presence of obstacles which form part of the vehicle (e.g., spare wheel, fuel tank, battery compartment), the microphone shall be located at least 0.2 m from the nearest obstacle, including the vehicle body, and its axis of maximum sensitivity shall face the exhaust outlet from the position least concealed by the above mentioned obstacles.

When several positions are possible, as shown in Figure 2c, the microphone position giving the lowest value of d_1 or d_2 shall be used.

Figures 2a - d show examples of the position of the microphone, depending on the location of the exhaust pipe.

NOTE: When the exhaust outlet terminates under the vehicle body, the reference point may be moved to the outer surface of the vehicle body.

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T = Top view S = Side view
 A = Mitered pipe B = Bent down pipe
 C = Straight pipe D = Vertical pipe
 1 = Reference point 2 = Road surface

FIGURE 1 - Outlet pipe details

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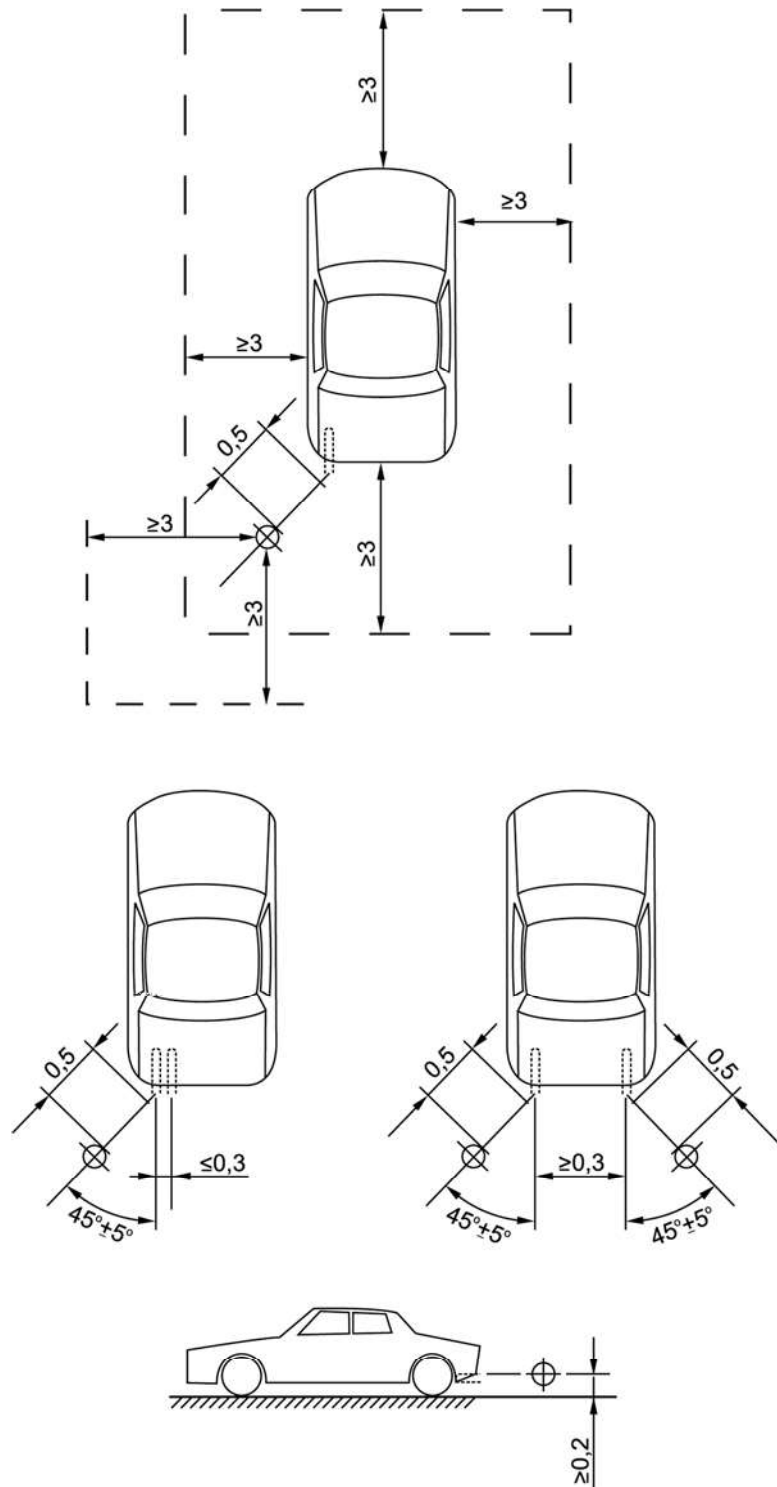


Figure 2A – Examples of microphone positions for various exhaust locations:
Rear accessible exhaust outlet

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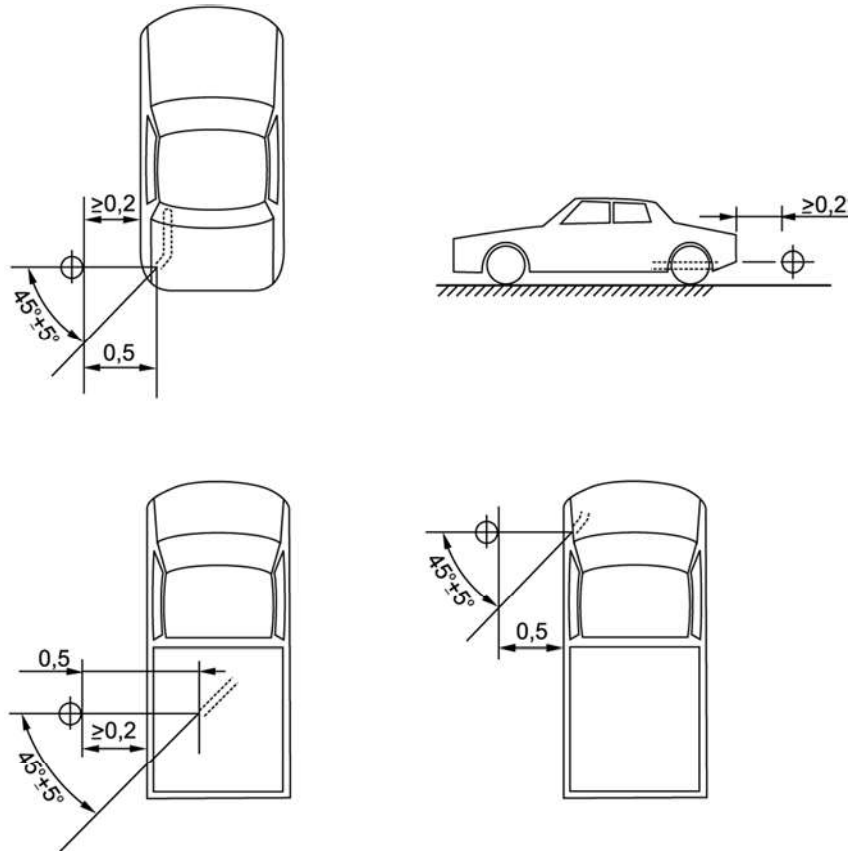


Figure 2B – Examples of microphone positions for various exhaust locations:
Angled side outlet and underbody angled outlet

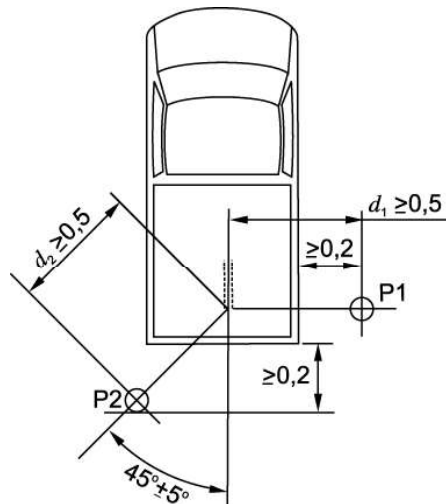


Figure 2C – Examples of microphone positions for various exhaust locations:
Underbody rear outlet

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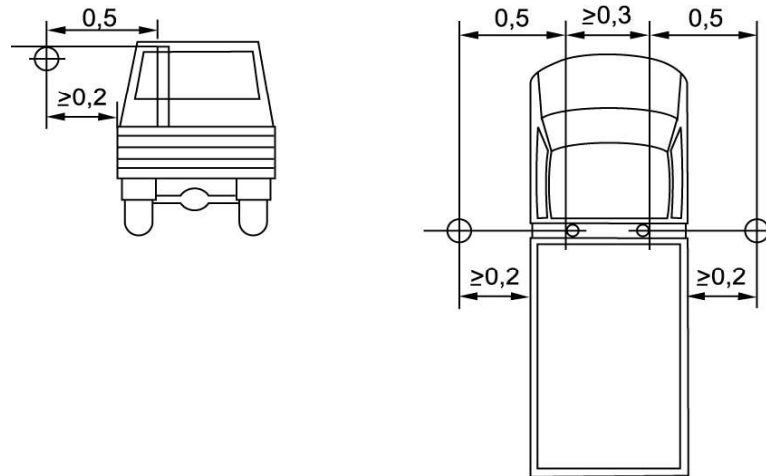


Figure 2D – Examples of microphone location for various exhaust locations:
Vertical Outlet

Microphone orientation:

Motorcycle

Ref: SAE J2825 reaffirmed July 2020

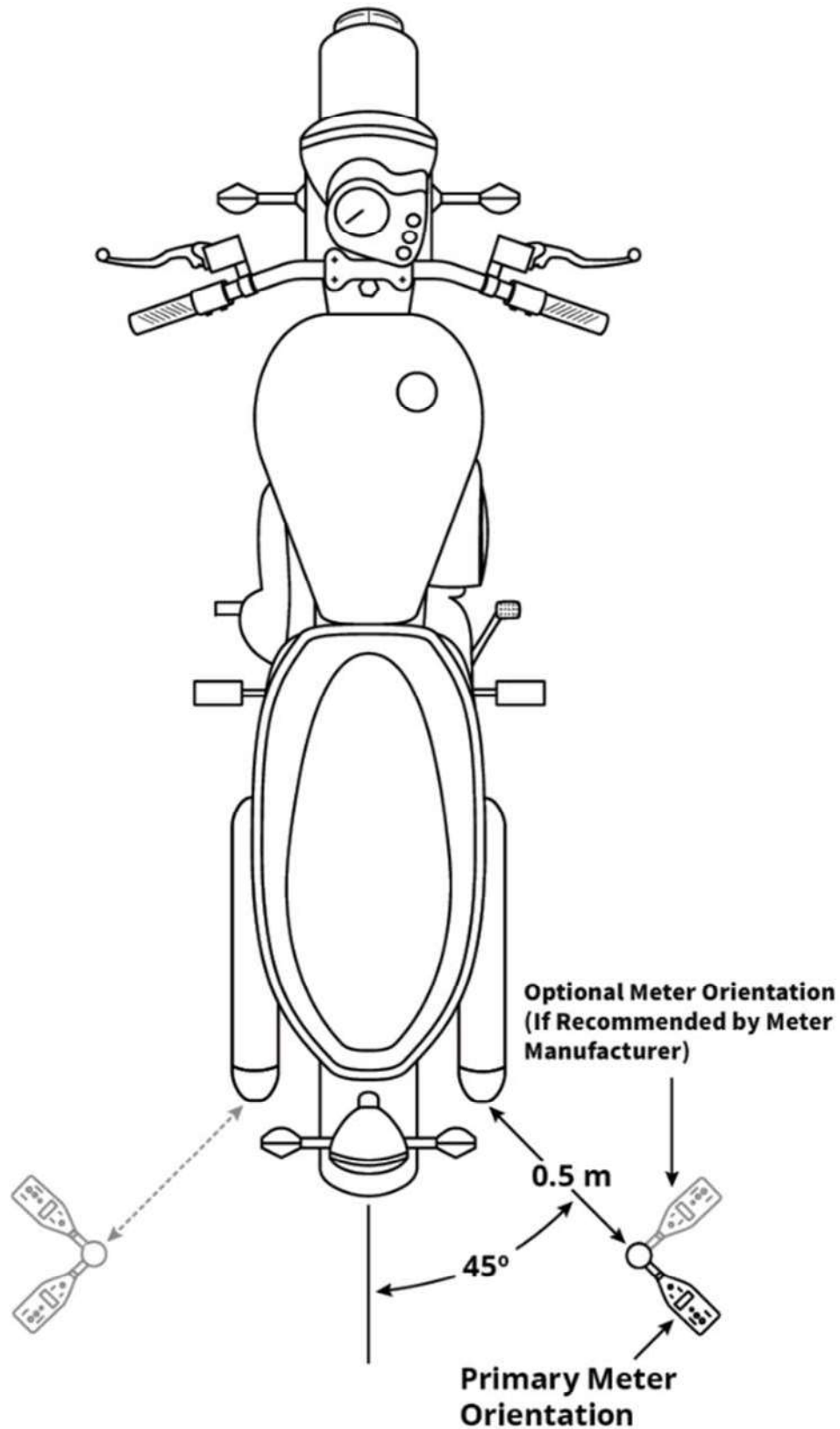
The microphone shall be located behind the exhaust outlet, $0.5 \text{ m} \pm 0.01 \text{ m}$ ($20 \text{ in} \pm 1/2 \text{ in}$) from the exhaust outlet, and within 0.01 m ($1/2 \text{ in}$) of the same height as the exhaust outlet, but at least 0.2 m (8 in) above the ground at a $45 \text{ degrees} \pm 10 \text{ degrees}$ angle to the normal line of travel of the motorcycle.

The longitudinal axis of the microphone shall be in a plane parallel to the ground plane. The axis of the microphone shall be oriented as specified by the instrument manufacturer (see Figure 1).

If there is more than one exhaust outlet per side, refer to Figure 2 to determine the exhaust outlet for microphone placement.

No wire or other rigid means of distance measurement shall be attached to the sound measuring system. If there is more than one exhaust outlet per side, refer to Figure 2 to determine the exhaust outlet for microphone placement.

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FIGURE 1 - Orientation of sound level meter

	Vertical Alignment	Longitudinal Alignment	Microphone Location with Respect to:
	Same height above the ground	Different fore-aft locations	Rearmost outlet
	Different height above the ground	Same fore-aft location	Lowermost outlet
	Different height above the ground	Different fore-aft locations	Rearmost/Uppermost outlet
	Lowermost outlet located forward of the uppermost outlet		
	Different height above the ground	Different fore-aft locations	Rearmost/Lowermost outlet
	Lowermost outlet located rearward of the uppermost outlet		

FIGURE 2 - MICROPHONE LOCATION FOR MOTORCYCLES HAVING MULTIPLE EXHAUST OUTLETS ON A SIDE

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Procedure:

Step 1. Ensure the test vehicle is equipped with a muffler as prescribed by the Light Vehicle Inspection Manual.

Take a minimum of two photos, including:

- a photo of the equipped muffler/exhaust system
- a photo of the vehicle

Step 2. Determine and record the target test engine speed (rpm) of the vehicle.

Step 3. Record the ambient sound pressure level (10 dB below the dB level produced by the vehicle).

Ensure the test location is free of sound-reflecting surfaces and sound-absorbing materials.

Step 4. Record the wind speed. It must be less than 5 m/s, 18 km/h, or 11 mph.

Step 5. Prepare the vehicle by ensuring:

- the vehicle is at normal operating temperature, as specified by the manufacturer
- the vehicle's air conditioner (if applicable) is turned off
- the engine hood or compartment cover is in place and closed
- the vehicle transmission is in neutral position and the clutch engaged, or in parking position for automatic transmission with the parking brake applied for safety

For motorcycles:

- A person can sit on the motorcycle in normal riding position with one or both feet on the ground. Either or both brakes can be applied to keep the motorcycle from moving.
- Alternatively, the motorcycle can be placed on its center stand or the front wheel of the motorcycle can be placed in a restraint and the motorcycle can be held in the vertical position with or without a person sitting on it.

Keep in mind:

- If the vehicle is a multi-mode exhaust system equipped, you must determine which mode the tests will be conducted in.
- If the vehicle is fitted with a fan(s) having an automatic actuating mechanism, this system must not be interfered with during the sound pressure level measurements.
- If no neutral is provided, contact SGI's Vehicle Standards and Inspection before proceeding with the test.

Safety check:

- Follow all relevant workplace safety requirements and protocols where the test is conducted. Wear required personal protective equipment (PPE), such as hearing protection and ensure the vehicles wheels are chocked.

Step 6. Calibrate the dB meter, position the meter as described in the microphone orientation section and reset the meter.

Ensure meter is set for A- weighting fast response, with max-hold enabled.

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Step 7. Instruct the person (customer) in control of the vehicle to gradually increase the engine speed from idle to the target engine speed. Then rapidly release the throttle control, returning the engine speed to idle.

Step 8. Record the dB meter measurement and reset the meter.

Light vehicles

- repeat steps 7 and 8 at each exhaust outlet until three measurements are obtained within 2 dB of each other
- all three measurements must be used to calculate the average

Motorcycles

- acquire one successful test measurement per side with an exhaust outlet

Step 9. Double check the dB meter calibration ensuring it has not changed by more than 0.5 dB from the previous calibration to conclude the test.

Step 10.

- Email or provide a copy of the completed test results to the customer.
- Email a copy of the completed test results along with the digital photos taken to vehicleinspection@sgi.sk.ca with "SGI Noise Test" in the subject line.

Saskatchewan Government Insurance vehicle noise test limits for light vehicles and motorcycles:

- less than or equal to 101.3 dB will pass*
- between 101.3 – 103.3 dB will pass with a warning**
- if greater than 103.3 dB will fail

*The test results do not include any vehicle condition or driver action outside of this policy and referenced SAE standards.

**Continuing to operate a vehicle producing noise levels between 101.3 dB and 103.3 dB may result in further action from enforcement, corrective measures are advised to reduce the vehicle noise level to 101.3 dB or less.

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