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CHAPTER 340
DEPARTMENT OF ENVIRONMENTAL QUALITY

FILING CAPTION: Noise Control Regulations

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RULES:
340-035-0015, 340-035-0025, 340-035-0030, 340-035-0035, 340-035-0040, 340-035-0045

AMEND: 340-035-0015

RULE TITLE: Definitions

NOTICE FILED DATE: 04/13/2016

RULE SUMMARY: Existing tables added to rule text.

RULE TEXT:
As used in this division:
(1) “Air Carrier Airport” means any airport that serves air carriers holding Certificates of Public Convenience and Necessity issued by the Civil Aeronautic Board.
(2) “Airport Master Plan” means any long-term development plan for the airport established by the airport proprietor.
(3) “Airport Noise Abatement Program” means a Commis-sion-approved program designed to achieve noise compatability between an airport and its environs.
(4) “Airport Proprietor” means the person who holds title to an airport.
(5) “Ambient Noise” means the all-encompassing noise associated with a given environment, being usually a composite of sounds from many sources near and far.
(6) “Annual Average Day-Night Airport Noise Level” means the average, on an energy basis, of the daily Day-Night Airport Noise Level over a 12-month period.
(7) “Any One Hour” means any period of 60 consecutive minutes during the 24-hour day.
(8) “Closed Course Motorcycle Racing Vehicle” means any motorcycle racing vehicle that is operated in competition or practice session on a closed course motor sports facility, i.e., where public access is restricted and admission is generally charged.
(9) “Commission” means the Environmental Quality Commission.
(10) “Construction” shall mean building or demolition work and shall include all activities thereto such as clearing of land, earthmoving, and landscaping, but shall not include the production of construction materials.
(11) “Day-Night Airport Noise Level (Ldn)” means the Equivalent Noise Level produced by airport/aircraft operations during a 24-hour time period, with a 10 decibel penalty applied to the level measured during the nighttime hours of 10

p.m. to 7 a.m.
(12) “Department” means the Department of Environmental Quality.
(13) “Director” means the Director of the Department.
(14) “Drag Racing Vehicle” means any racing vehicle used to compete in any acceleration competition initiated from a standing start and continued over a straight line course.
(15) “Emergency Equipment” means noise emitting devices required to avoid or reduce the severity of accidents. Such equipment includes, but is not limited to, safety valves and other unregulated pressure relief devices.
(16) “Equivalent Noise Level (Leq)” means the equivalent steady state sound level in A-weighted decibels for a stated period of time which contains the same acoustic energy as the actual time-varying sound level for the same period of time.
(17) “Existing Industrial or Commercial Noise Source” means any industrial or commercial noise source for which installation or construction was commenced prior to January 1, 1975.
(18) “Farm Tractor” means any motor vehicle designed primarily for use in agricultural operations for drawing or operating plows, mowing machines, or other implements of husbandry.
(19) “Four Wheel Drive Racing Vehicle” means any four-wheeled racing vehicle with at least one wheel on the front and rear axle driven by the engine or any racing vehicle participating in an event with predominantly four wheel drive racing vehicles.
(20) “Go-Kart Racing Vehicle” means a light-weight four-wheeled racing vehicle of the type commonly known as a go-kart.
(21) “Impulse Sound” means either a single pressure peak or a single burst (multiple pressure peaks) for a duration of less than one second as measured on a peak unweighted sound pressure measuring instrument or “C” weighted, slow response instrument and specified by dB and dBC respectively.
(22) “In-Use Motor Vehicle” means any motor vehicle which is not a new motor vehicle.
(23) “Industrial or Commercial Noise Source” means that source of noise which generates industrial or commercial noise levels.
(24) “Industrial or Commercial Noise Levels” means those noises generated by a combination of equipment, facilities, operations, or activities employed in the production, storage, handling, sale, purchase, exchange, or maintenance of a product, commodity, or service and those noise levels generated in the storage or disposal of waste products.
(25) “Motorboat” as used in OAR 340-035-0025 means a watercraft propelled by an internal combustion engine but does not include a boat powered by an outboard motor or an inboard/outboard power package designed to exhaust beneath the surface of the water.
(26) “Motorcycle” means any motor vehicle, except farm tractors, designed to travel on not more than three wheels which are in contact with the ground.
(27) “Motor Sports Advisory Committee” means a committee appointed by the Director, from among the nominees, for the purpose of technical advice on racing activities and to recommend Exceptions to these rules as specified in OAR 340-035-0040(12). This Committee shall consist of:
(a) One permanent public member nominated by a noise impacted group or association; and
(b) One representative of each of the racing vehicle types identified in OAR 340-035-0040(2) as nominated by the respective sanctioning bodies; and
(c) The program manager of the Department’s noise pollution control section who shall also serve as the departmental staff liaison to this body; and
(d) An attorney; and
(e) An acoustical engineer.
(28) “Motor Sports Facility” means any facility, track or course upon which racing events are conducted.
(29) “Motor Sports Facility Noise Impact Boundaries” means the daily 55 dBA day-night (Ldn) noise contours around the motor sports facility representing events that may occur on the day of maximum projected use.
(30) “Motor Sports Facility Owner” means the owner or operator of a motor sports facility or an agent or designee of the

owner or operator. When a Racing Event is held on public land, the event organizer (i.e., promoter) shall be considered the motor sports facility owner for the purposes of these rules.
(31) “Motor Vehicle” means any vehicle which is, or is designed to be self-propelled or is designed or used for transporting persons or property. This definition excludes airplanes, but includes watercraft.
(32) “New Airport” means any airport for which installation, construction, or expansion of a runway commenced after January 1, 1980.
(33) “New Industrial or Commercial Noise Source” means any industrial or commercial noise source for which installation or construction was commenced after January 1, 1975 on a site not previously occupied by the industrial or commercial noise source in question.
(34) “New Motor Sports Facility” is any permanent motor sports facility for which construction or installation was commenced after January 1, 1982. Any recreational park or similar facility which initiates sanctioned racing after this date shall be considered a new motor sports facility.
(35) “New Motor Vehicle” means a motor vehicle whose equitable or legal title has never been transferred to a person who in good faith purchases the new motor vehicle for purposes other than resale. The model year of such vehicle shall be the year so specified by the manufacturer, or if not so specified, the calendar year in which the new motor vehicle was manufactured.
(36) “Noise Impact Boundary” means a contour around the airport, any point on which is equal to the airport noise criterion.
(37) “Noise Level” means weighted sound pressure level measured by use of a metering characteristic with an “A” frequency weighting network and reported as dBA.
(38) “Noise Sensitive Property” means real property normally used for sleeping, or normally used as schools, churches, hospitals or public libraries. Property used in industrial or agricultural activities is not Noise Sensitive Property unless it meets the above criteria in more than an incidental manner.
(39) “Octave Band Sound Pressure Level” means the sound pressure level for the sound being measured within the specified octave band. The reference pressure is 20 micropascals (20 micronewtons per square meter).
(40) “Off-Road Recreational Vehicle” means any motor vehicle, including water craft, used off public roads for recreational purposes. When a road vehicle is operated off-road the vehicle shall be considered an off-road recreational vehicle if it is being operated for recreational purposes.
(41) “One-Third Octave Band Sound Pressure Level” means the sound pressure level for the sound being measured within the specified one-third octave band at the preferred frequencies. The reference pressure is 20 micropascals (20 micronewtons per square meter).
(42) “Open Course Motorcycle Racing Vehicle” means any motorcycle racing vehicle that is operated in competition on an open course motor sports facility, i.e., where public access is not generally restricted. This definition is intended to include the several types of motorcycles such as “enduro” and “cross country” that are used in events held in trail or other off-road environments.
(43) “Oval Course Racing Vehicle” means any racing vehicle, not a motorcycle and not a sports car, which is operated upon a closed, oval-type motor sports facility.
(44) “Person” means the United States Government and agencies thereof, any state, individual, public or private corporation, political subdivision, governmental agency, municipalty, industry, co-partnership, association, firm, trust, estate, or any other legal entity whatever.
(45) “Practice Sessions” means any period of time during which racing vehicles are operated at a motor sports facility, other than during racing events. Driver training sessions or similar activities which are not held in anticipation of a subsequent racing event, and which include only vehicles with a stock exhaust system, shall not be considered practice sessions.
(46) “Preferred Frequencies” means those mean frequencies in Hertz preferred for acoustical measurements which for this purpose shall consist of the following set of values: 20, 25, 31.5, 40, 50, 63, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1000, 1250, 1600, 2000, 2500, 3150, 4000, 5000, 6300, 8000, 10,000, 12,500.

(47) “Previously Unused Industrial or Commercial Site” means property which has not been used by any industrial or commercial noise source during the 20 years immediately preceding commencement of construction of a new industrial or commercial source on that property. Agricultural activities and silvicultural activities generating infrequent noise emissions shall not be considered as industrial or commercial operations for the purposes of this definition.
(48) “Propulsion Noise” means that noise created in the propulsion of a motor vehicle. This includes, but is not limited to, exhaust system noise, induction system noise, tire noise, cooling system noise, aerodynamic noise, and, where appropriate in the test procedure, braking system noise. This does not include noise created by road vehicle auxiliary equipment such as power take-offs and compressors.
(49) “Public Roads” means any street, alley, road, highway, freeway, thoroughfare, or section thereof in this state used by the public or dedicated or appropriated to public use.
(50) “Quiet Area” means any land or facility designated by the Commission as an appropriate area where the qualities of serenity, tranquility, and quiet are of extraordinary significance and serve an important public need, such as, without being limited to, a wilderness area, national park, state park, game reserve, wildlife breeding area, or amphitheater. The Department shall submit areas suggested by the public as quiet areas, to the Commission, with the Department’s recommendation.
(51) “Racing Events” means any time, speed or distance competition using motor vehicles, conducted under a permit issued by the governmental authority having jurisdiction or under the auspices of a recognized sanctioning body. This definition includes, but is not limited to, events on the surface of land and water. Any motor sports event not meeting this definition shall be subject to the ambient noise limits of OAR 340-035-0030(1)(d).
(52) “Racing Vehicle” means any Motor Vehicle that is designed to be used exclusively in Racing Events or any New Motor Vehicle that has not been certified by its manufacturer as meeting the applicable noise limits of OAR 340-035-0025 or any vehicle participating in or practicing for a Racing Event.
(53) “Recreational Park” means a facility open to the public for the operation of off-road recreational vehicles.
(54) “Road Vehicle” means any motor vehicle registered for use on public roads, including any attached trailing vehicles.
(55) “Road Vehicle Auxiliary Equipment” means those mechanical devices which are built in or attached to a road vehicle and are used primarily for the handling or storage of products in that motor vehicle. This includes, but is not limited to, refrigeration units, compressors, compactors, chippers, power lifts, mixers, pumps, blowers, and other mechanical devices.
(56) “Sound Pressure Level” (SPL) means 20 times the logarithm to the base 10 of the ratio of the root-mean-square pressure of the sound to the reference pressure. SPL is given in decibels (dB). The reference pressure is 20 micropascals (20 micronewtons per square meter).
(57) “Special Motor Racing Event” means any racing event in which a substantial or significant number of out-of-state racing vehicles are competing or any event which has a special significance to the community and which has been recommended as a special motor racing event by the motor sports advisory committee and approved by the Department.
(58) “Sports Car Racing Vehicle” means any racing vehicle which meets the requirements and specifications of the competition rules of any sports car organization.
(59) “Statistical Noise Level” means the noise level which is equalled or exceeded a stated percentage of the time. An L10 = 65 dBA implies that in any hour of the day 65 dBA can be equalled or exceeded only 10% of the time, or for 6 minutes.
(60) “Stock Exhaust System” means an original equipment manufacturer exhaust system or a replacement for original equipment for a street legal vehicle whose noise emissions do not exceed those of the original equipment.
(61) “Temporary Autocross or Solo Course” means any area upon which a paved course motor sports facility is temporarily established. Typically such courses are placed on parking lots, or other large paved areas, for periods of one or two days.
(62) “Top Fuel-Burning Drag Racing Vehicle” means a drag racing vehicle that operates using principally alcohol (more than 50 percent) or utilizes nitromethane as a component of its operating fuel and commonly known as top fuel and

funny cars.
(63) “Trackside” means a sound measuring point of 50 feet from the racing vehicle and specified in Motor Race Vehicle and Facility Sound Measurement and Procedure Manual, NPCS-35.
(64) “Warning Device” means any device which signals an unsafe or potentially dangerous situation.
(65) “Watercraft Racing Vehicle” means any racing vehicle which is operated upon or immediately above the surface of water.
(66) “Well Maintained Muffler” means a device or combination of devices which effectively decreases the sound energy of internal combustion engine exhaust without a muffler by a minimum of 5 dBA at trackside. A well maintained muffler shall be free of defects or modifications that reduce its sound reduction capabilities. Each outlet of a multiple exhaust system shall comply with the requirements of this subsection, notwithstanding the total engine displacement versus muffler length requirements. Such a muffler shall be a:
(a) Reverse gas flow device incorporating a multitube and baffle design; or a
(b) Perforated straight core device, fully surrounded from beginning to end with a sound absorbing medium, not installed on a rotary engine:
(A) At least 20 inches in inner core length when installed on any drag race engine exceeding 1600 cc (96.7 cubic inches) displacement; or
(B) At least 12 inches in inner core length when installed on any non-motorcycle drag race engine equal to or less than 1600 cc (96.7 cubic inches) displacement; or
(C) At least 6 inches in inner core length and installed at the outlet end of any four-cycle motorcycle drag race engine; or
(D) At least 8 inches in inner core length when installed on any two-cycle motorcycle drag race engine; or an
(c) Annular swirl flow (auger-type) device of:
(A) At least 16 inches in swirl chamber length when installed on any drag race engine exceeding 1600 cc (96.7 cubic inches) displacement; or
(B) At least 10 inches in swirl chamber length when installed on any drag race engine equal to or less than 1600 cc (96.7 cubic inches) displacement; or a
(d) Stacked 360° diffuser disc device; or a
(e) Turbocharger; or a
(f) Go-kart muffler as defined by the International Karting Federation as specified in Motor Race Vehicle and Facility Sound Measurement and Procedure Manual, NPCS-35; or an
(g) Original equipment manufacturer motorcycle muffler when installed on a motorcycle model such muffler was designated for by the manufacturer; or
(h) Boat motor whose exhaust exits beneath the water surface during operation; or a
(i) Formula Vee four-into-one header/collector when installed on a Formula Vee sports car racing vehicle; or a
(j) Hughes-type Racing muffler; or
(k) Any other device demonstrated effective and approved by the motor sports advisory committee and the Department.
[Ed. Note: Manuals and tables are not included in rule text. Click here to view a PDF of these documents.]

STATUTORY/OTHER AUTHORITY: ORS 467

STATUTES/OTHER IMPLEMENTED: ORS 467.030

Motor Race Vehicle and Facility Sound Measurement and Procedure Manual

NPCS - 35

DEQ
State of Oregon
Department of
Environmental
Quality

REVISION RECORD

INSTRUCTIONS FOR USE: All revisions of this manual will be numbered to assure each manual holder that he has received all revisions. The date, a description of the revision, and the initials of the person inserting the revision shall be listed.

Rev. No.	Date	Description of Revision	Initial
1.	1-8-'83	Delete muffler lengths on non-drag	~~HH~~
2.			
3.			
4.			
5.			
6.			
7.			
8.			
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11.			
12.			
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CHAPTER 1

INTRODUCTION

1.1 Policy.

1.1.1 The Environmental Quality Commission (EQC), through the Department of Environmental Quality (DEQ) shall establish a noise measurement program to implement the laws and regulations applying to Motor Sports Vehicles and Facilities.

1.1.2 The person owning or controlling the motor sports facility shall be responsible for compliance with the Oregon Noise Control Regulations for Motor Sports Vehicles and Facilities (OAR 340-35-040).

1.1.3 This manual contains procedures to be followed in complying with the Motor Sports Vehicles and Facilities Noise Control Regulations. Guidance is provided in the "Notes" and "Comments".

Authority. The statutory and administrative law governing authority which provide guidance and direction for this manual are contained in:

a) Oregon Revised Statutes, Chapter 467
b) Oregon Administrative Rules for Noise Control

i)	OAR 340-35-005	Policy
ii)	OAR 340-35-010	Exceptions
iii)	OAR 340-35-015	Definitions
iv)	OAR 340-35-040	Noise Control Regulations for Motor Sports Vehicles and Facilities
v)	OAR 340-35-100	Variances

Noise Regulations for Motor Sports Vehicles and Facilities. The DEQ Noise Control Regulations for Motor Sports Vehicles and Facilities contain two basic requirements for racing vehicles:

1) Vehicles shall be equipped with a "properly installed and well maintained muffling" system; and

2) Vehicles shall not exceed the maximum allowable noise emission limits for that vehicle.

Facilities located over two miles from the nearest "noise sensitive property" (residences) and/or any Top Fuel Burning Drag race vehicles are exempt from the above requirements due to lack of available control technology.

Penalties. The motor sports facility and racing vehicle owner is subject to penalties set forth by the Environmental Quality Commission in OAR 340-12-052, Noise Control Schedule of Civil Penalties, for violation of the Noise Control Regulations for Motor Sports Vehicles and Facilities. Penalties may be as great as $500 for each violation.

1.5 General Vehicle Inspection Procedure. As stated in the policy section, the facility owner is required to inspect the race vehicles for compliance with the noise regulations. The following general procedures shall be followed when inspecting race vehicles:

1. Prior to a racing event (normally during the technical inspection of the vehicle), the facility owner shall inspect the muffler system to determine if the vehicle has a "properly installed and well maintained muffling" system (see Chapter 3).

2. If the vehicle has failed to meet the muffler requirements during the above inspection, then the race vehicle does not comply with the regulations and must therefore install a "properly installed and well maintained muffling" system.

3. If the vehicle meets the muffler requirements, then the vehicle (except for a drag race vehicle) shall be sound measured to determine if it meets the maximum allowable noise emission limits.

   Vehicles other than motorcycles shall be noise tested while moving around the course (preferably during practice sessions). Open course motorcycles shall be tested while stationary (normally during technical inspection after the muffler inspection). Closed course motorcycles shall be tested while either stationary or moving at the option of the facility owner. (See Chapter 4 and 5).

4. If the vehicle has failed to meet the maximum allowable noise emission limits, then the vehicle does not comply with the regulations and the muffling system must be improved to comply with the emission standards.

5. All vehicles who fail to meet either the muffler requirements or the maximum allowable noise emission limits shall be recorded on Form NPCS-35-1.

CHAPTER 2

TRAINING

Sound Measurement Equipment. Prior to a race event, the person(s) designated to inspect racing vehicles for compliance with the noise control regulations shall become familiar with the sound measurement equipment (this person will be referred to in this procedure manual as the Noise Control Steward or NCS). The Noise Control Steward shall have read the manufacturer's instruction manual for the sound equipment. The NCS also shall have sufficient hands-on experience to feel comfortable operating the equipment.

Noise Control Racing Rules and Procedure Manual. The Noise Control Steward shall have a good working knowledge of the Department of Environmental Quality Noise Control Standards for Motor Sports Vehicles and Facilities (OAR 340-35-040) and its companion document the Sound Measurement Procedure Manual (NPCS-35).

Race Vehicle and Facility. The Noise Control Steward shall have a good working knowledge of the racing vehicles and facility being monitored. This includes:
a) Knowing the driving characteristics of the race vehicles,
b) Knowing the layout of the track, and
c) Knowing the requirements for approved racing muffler systems.

This information will be useful in locating the proper measurement sites and for inspecting vehicles.

CHAPTER 3

MUFFLER SYSTEMS

General. The DEQ regulation requires all types of race vehicles (except Top Fuel Burning Drag vehicles) to be equipped with a "properly installed and well maintained muffling" system. During the vehicle inspection prior to the racing event, the vehicle's muffling system shall be visually inspected by the Noise Control Steward. If the muffling system fails to meet the DEQ muffler requirements, then the vehicle shall not operate at the race facility until the muffling system complies. This chapter describes the procedures for visual inspection of the vehicle's muffling system.

Top Fuel Burning Drag Vehicles. Drag vehicles operating on more than 50% alcohol fuel or on nitromethane are defined as Top Fuel Burning Drag vehicles and are commonly known as Funny cars and Top Fuel cars. Due to the lack of muffler technology needed to quiet this vehicle class, they are not required to have a muffler system under this rule.

"Properly Installed" Mufflers. A properly installed muffling system is:

a) Correctly installed per manufacturer's instructions,
b) Fully functional,
c) Has no leaks or holes in the walls of the exhaust tubing and muffler body, and
d) Has no defect or modifications to reduce its sound reduction capabilities.

"Well Maintained Muffler" Systems. The DEQ noise regulations specifically state what constitutes a "well maintained muffler" system. If "properly installed" and "well maintained," the following systems meet the requirements of the rule. Note that each and every exhaust outlet must have a muffler located upstream from the outlet.

3.4.1 Reverse Flow (Baffle) Mufflers. See Figure 3-1 for examples of reverse flow mufflers. The reverse flow devices incorporate a multitube and baffled design. The exhaust gases do not flow straight through these devices, but take a multipath, back and forth route through the device.

3.4.2 Perforated Straight Core with Sound Absorbing Medium. See Figure 3-2 for examples of the perforated straight core with sound absorbing medium mufflers. In order for a straight core device to comply with the requirements, it must meet all the following criteria:

a) The central core tube shall be perforated,
b) The core shall be fully surrounded from beginning to end with an absorbing medium (e.g., fiberglass, steel wool, etc.).
c) The muffler shall not be installed on a rotary engine, and
d) The muffler shall meet the following length requirements when used on any drag racing vehicle:

(i) For any engine exceeding 1600 cc (96.7 cu. in.) displacement, the muffler shall be at least 20 inches (50.8 cm) in inner core length; or
For any non-motorcycle engine equal to or less than 1600 cc (96.7 cu. in.), the muffler shall be at least 12 inches (30.5 cm) in inner core length; or

(iii) For any four-cycle motorcycle engine, the muffler shall be at least six inches (15.24 cm) in inner core length; or
For any two-cycle motorcycle engine, the muffler shall be at least eight inches (20.32 cm) in inner core length.

Note: The "inner core length" means the length of the main body of the muffler, not including the exhaust tubing leading to and from the main body of the muffler (see Figure 3-2).

3.4.3 Annular Swirl Flow (Auger-Type) Mufflers. See Figure 3.3 for an auger type muffler. The exhaust gases in the annular swirl flow muffler follows a circular path down the length of the muffler. The inner design is like an auger. In order for these devices to comply with the noise requirements, they shall meet the following length requirements when used on any drag race vehicles:

a) For any engine exceeding 1600 cc (96.7 cu. in.), the muffler swirl chamber shall be at least 16 inches (40.64 cm) in length; or

b) For any engine equal to or less than 1600 cc (96.7 cu. in.), the muffler swirl chamber shall be at least 10 inches (25.4 cm) in length.

3.4.4 Stacked 360° Diffuser Disc Mufflers. See Figure 3-4 for an examle of a Diffuser Disc muffler. This type of muffler works by causing the exhaust gases to bend 90° and then flow through the stacked 360° diffuser discs.

3.4.5 Turbocharger. A turbocharger is an exhaust gas driven supercharger. Turbochargers meet the requirements for a "well maintained muffler" system. However, superchargers mechanically driven by the engine are not defined as a "well maintained muffler" system and thus do not meet DEQ muffler requirements.

3.4.6 Go-Kart Mufflers. Go-Karts must be equipped with a muffler as specified by the International Karting Federation. See Figure 3-5 for the specifications on go-kart mufflers.

3.4.7 Original Manufacturers Muffler on a Motorcycle. The original muffling equipment installed on a motorcycle and designated for use on the motorcycle by the manufacturer, meets the DEQ muffler requirements. The original motorcycle mufflers are generally of reverse flow, baffle and perforated straight core designs.

3.4.8 Underwater Exhausted Outboard Boat Motors. Watercraft with motors whose exhaust exits beneath the water

surface during operation are defined as a "well maintained" muffler and meet the DEQ muffler requirements.

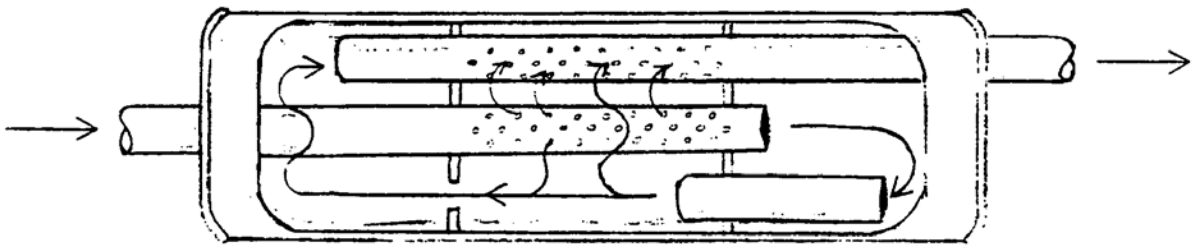
3.4.9 Other Approved Muffling Devices. Any other muffling device demonstrated effective and approved by the Motor Sports Advisory Committee and the Department of Environmental Quality will then by designated a "well maintained muffler" system.

Other Not Approved Devices. Other devices not meeting the criteria outlined in Section 3.1 to 3.4.9 for a "properly installed and well maintained muffling" system are illegal and shall not be used on vehicles operating at any Motor Sports Facility; except where specific exemption, exception and/or variances apply.

Form NPCS-35-1. Form NPCS-35-1 contains a condensed version of the information outlined in this chapter. Also, the form contains space for a description of the muffling system and whether it passed or failed the "properly installed" and "well maintained muffling" system requirements.

Fig. 3 - 1 Reverse Flow, Baffled Mufflers

Typical Baffled Muffler



Other Baffled Muffler Designs

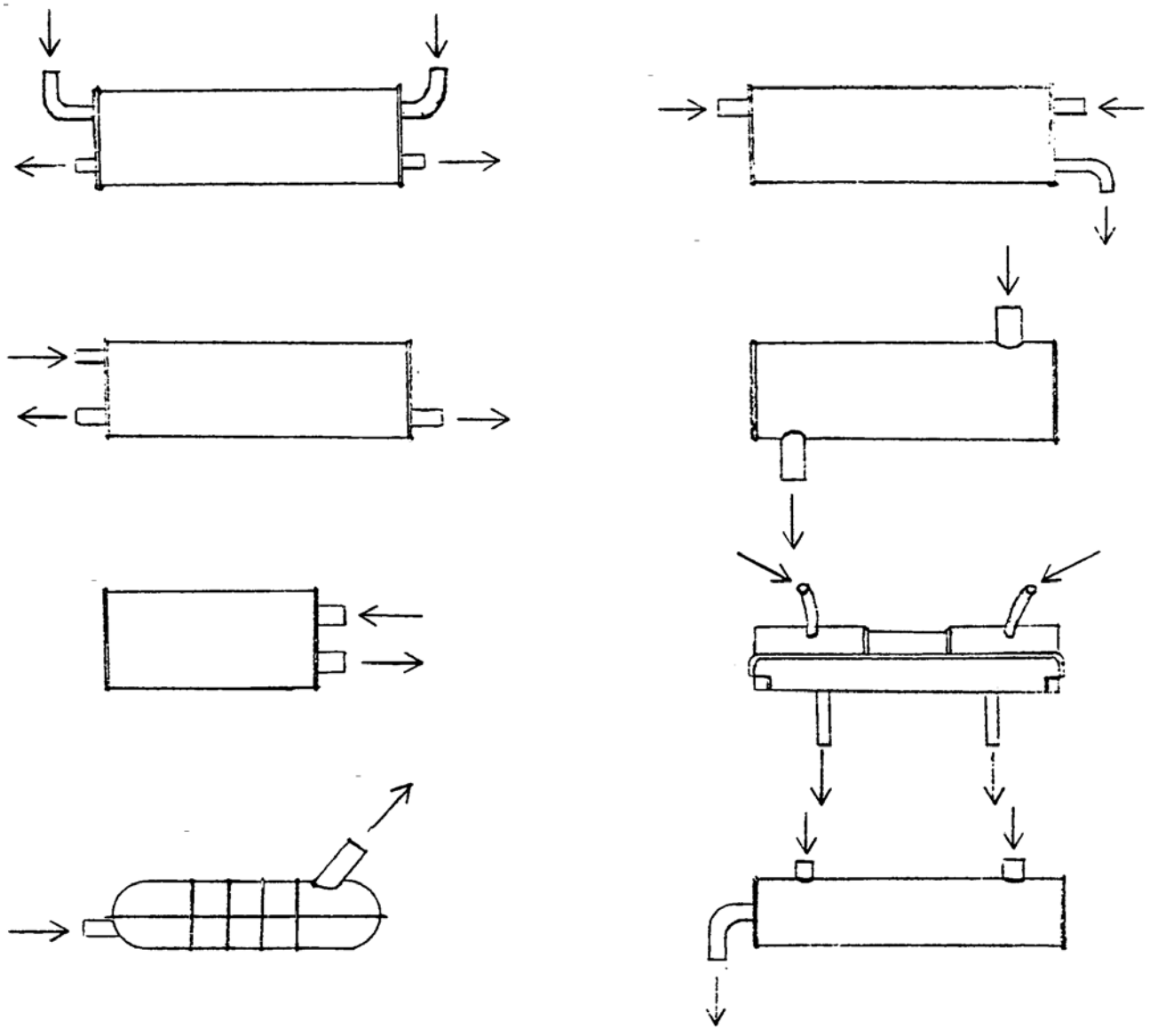
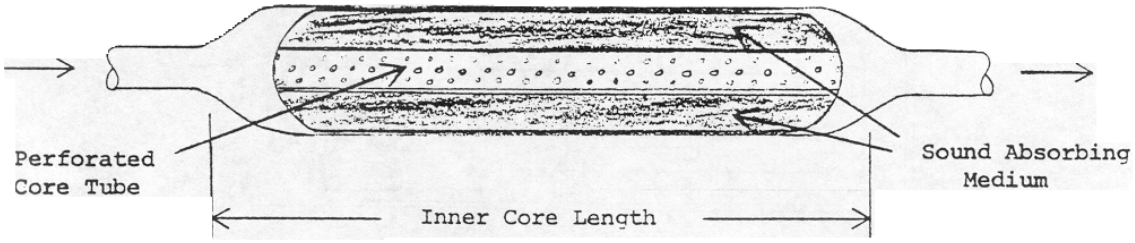


Fig. 3 - 2 Perforated Straight Core Muffler

Typical Straight Core Muffler



Another Type of Straight Core Muffler

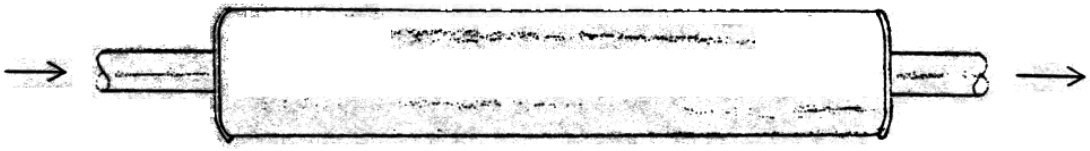


Fig. 3 - 3 Annular Swirl Flow (Auger-Type) Muffler

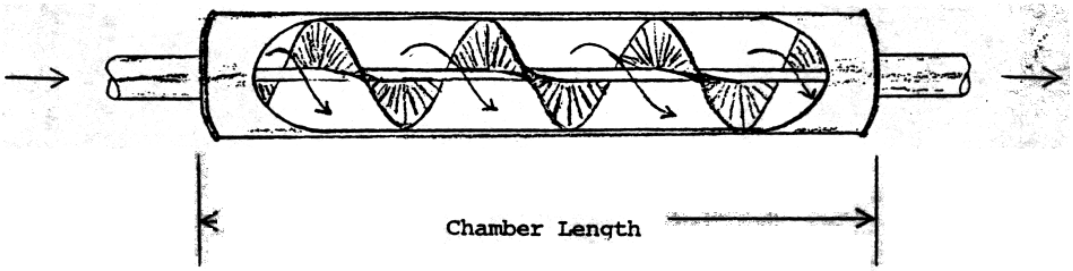


Fig. 3 - 4 Stacked 360° Diffuser Disc Muffler

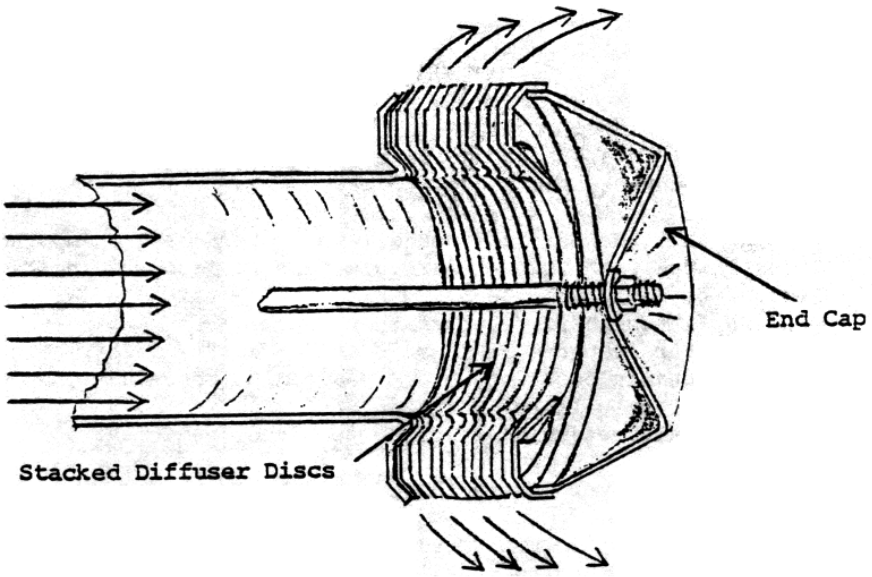
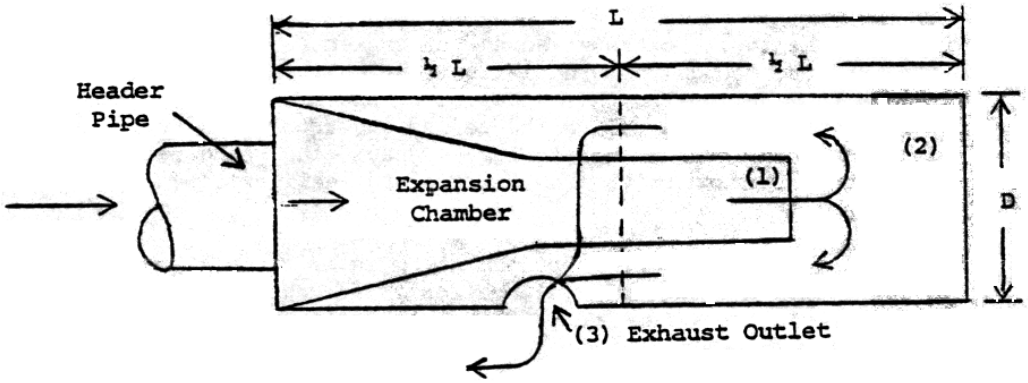


Fig. 3 - 5 Go-Kart Muffler Requirements



All go-kart exhaust systems shall be equipped with a muffler meeting the following specifications:

a) No minimum or maximum muffler length (L) or diameter (D) is required.

b) The expansion chamber must outlet (1) into the rear half of the muffler (2), that portion farthest from the header pipe.

c) The exhaust gas outlet hole to atmostphere (3) may be of any shape, but shall not exceed .7854 sq. inches or the equivalent of a 1-inch diameter circle. Two 1-inch diameter, or smaller, exhaust outlet holes may be used on a single cylinder, 270 cc open class go-kart engine. This applies only to large displacement single cylinder engines in the 270 cc open class. If more than one outlet hole is used on a 270 cc single cylinder engine, no more than two holes may be used, both must be round, and neither hole may exceed 1-inch diameter.

d) Multiple exhaust gas outlet holes to atmosphere are preferred.

e) There may be no physical connection between the expansion chamber outlet (1) and the exhaust gas hole to atmosphere (3).

f) Adjustable pipes <u>are not legal</u> in sprint racing of go-karts.

CHAPTER 4

INSTRUMENTATION

General. This chapter describes the requirements for the sound measurement equipment and its use.

Sound Level Meter. All sound level meters used in monitoring compliance with the noise regulations at motor racing facilities shall be equipped with:

a) An "A" weighting electronic network,
b) A meter response similar to ANSI "Fast" and ANSI "Slow". (Depending on the type of measurement procedure.)
c) A battery voltage indicator, and
d) Adequate measuring range to test race vehicles.

Such sound level meters shall also:

a) Conform to minimum specifications set forth in American National Standard Institute (ANSI) Standards Number S1.4-1971 for type 2 sound level meters, or
b) Shall be an Oregon Department of Environmental Quality approved sound level meter for use in measuring racing vehicles for the purpose of this rule.

Sound Level Meter Calibration.

4.3.1 Field Calibration. To assure sound measurement accuracy in the field, DEQ recommends that the measurement equipment include an acoustical calibrator which couples to the microphone. Sound meters should be field calibrated before and after, and every two hours during vehicle monitoring. Consult the sound meter's manufacturer's instruction manual for proper calibration procedures.

4.3.2 Annual Calibration. Every year the sound meter and calibrator should receive a laboratory calibration in accordance with manufacturer's specifications. This calibration should be traceable to the National Bureau of Standards.

4.4 Accessories. The following accessories are valuable in gathering sound measurements:

a) A microphone wind screen (see Section 4.5)
b) Motor Racing Record Forms (NPCS-35-1)
c) Clipboard
d) Tripod to hold the sound level meter
e) Spare batteries
f) Screwdriver for sound meter calibration
g) A tape measure
h) Ear protectors
i) A tachometer for stationary noise testing

Sound Measurement Precautions.

Wind. Wind blowing on the microphone can create additional noise in the sound meter. To minimize wind noise, a windscreen on the microphone is recommended whenever measurements are taken. The windscreen should be furnished with the meter by the manufacturer and made of open cell polyurethane foam. This type of windscreen will protect the microphone from wind, dust, accidental shocks, and moisture, while not affecting the sound measurements. Consult the sound meter instruction manual for more details.

Precipation. Water can damage microphone diaphragms. Hence, the microphone should be protected from moisture at all times. The wind screen will protect the microphone during all but the heaviest rain showers.

4.5.3 Background Sound Levels. Sounds from other vehicles or activities can affect sound level measurements made during race vehicle monitoring. To avoid this, it is recommended that the sound level of the race vehicle being measured rise at least 6 dBA before and fall at least 6 dBA after the maximum sound level occurs.

Equipment Set Up and Use.

4.6.1 Calibration. The meter should be periodically field calibrated as outlined in section 4.3.1 and following the manufacturer's instruction manual.

4.6.2 Battery Check. The batteries in the sound meter and calibrator are to be checked whenever performing field calibrations.

4.6.3 "A"-Weighting. The "A"-weighting electronic network on the meter is to be engaged and used during vehicle testing (i.e., not the "B", "C", "D", or flat networks).

4.6.4 "Fast" and "Slow". For the moving vehicle test, the fast meter response network is to be engaged and used during testing. For the stationary vehicle test, the slow meter response is to be engaged and used during testing.

4.6.5 Microphone Height. The microphone shall be placed on a tripod if an extension cable is used. If a cable is not used, the sound meter with the microphone attached may be hand held or placed on a tripod. Ideally, the microphone should be positioned 4 $\pm$ 1/2 feet (1.2 $\pm$ .15 meters) above the ground or water for the moving test and at the same height as the exhaust outlet for the stationary test. See Chapter 5 for more details.

4.6.6 Microphone Orientation. Care should be taken to correctly orient the microphone to the race vehicle. Some microphones are designed to be pointed directly at the noise source, while others are designed to be pointed perpendicular to the sound so that

the sound grazes the microphone diaphragm. Consult the sound meter instruction manual for the proper microphone orientation.

4.6.7 Personnel Location. Care should be exercised to prevent interference with sound measurements caused by personnel in the measuring area. No person should stand between the race vehicle and the sound meter. The person taking sound measurements should stand back from the microphone as much as possible and to one side of the sound path. This will minimize sound reflections off the body. Consult the manufacturer's instruction manual for more details. Bystanders should stand behind the test personnel to minimize body reflections.

4.6.8 Range Setting. Set the meter to the appropriate range to measure the anticipated sound level.

CHAPTER 5

SOUND MEASUREMENT SITES AND PROCEDURES

5.1 General. The DEQ noise regulations for motor sports facilities require all race vehicles , except for drag vehicles, to meet specific maximum allowable sound emission limits. Also the noise regulations specify the type of noise test procedures to be followed. The non-motorcycle race vehicle categories are only noise tested while moving about the race course. Open course motorcycles are tested only while stationary. Closed course motorcycles are tested either while moving or while stationary at the option of the Noise Control Steward.

For the moving vehicles noise test, the vehicle is first inspected to determine if it complies with the muffler requirements (See Chapter 3). If the muffler complies, then the vehicle can be allowed to operate on the facility for practice runs prior to the race event. During these practice runs, the Noise Control Steward shall take sound measurements to determine if the vehicle complies with the noise emission limits. If it fails the emission limits, then the vehicle shall not be allowed to operate further on the facility until the emissions are lowered. Section 5.2 describes the moving vehicle sound measurement procedures.

For the stationary vehicle test, the muffler system is first inspected for compliance with the muffler requirements. If it complies, then the vehicle is stationary noise tested, per the test procedures in Section 5.3. If the vehicle fails the muffler requirements and/or the noise emission limits, it shall not be allowed to operate on the race facility until it complies.

5.2 Moving Vehicle Sound Measurement Procedure.

5.2.1 Microphone Height. Ideally, the sound measurement area for the moving vehicle test should be flat and the microphone positioned $4 \pm 1/2$ feet ($1.2 \pm .15$ meters) above the plane of the ground or water surface. In practice, this is sometimes difficult to achieve. Figure 5-1 shows some acceptable microphone heights. In general, the NCS should maintain at least 3-1/2 feet of line-of-site clearance between the microphone and the vehicle above the surrounding ground terrain.

5.2.2 Blockage of the Sound Path. The ideal moving vehicle measurement site is shown in Figure 5-2. The ideal site is flat and is clear of objects within the area between the vehicle path and the microphone position for a distance of 100 feet (30.5 meters) in each direction along the track. Objects located within the measurement area between the vehicle and the microphone can potentially influence the sound level measurements. Any site where an object "significantly" blocks the sound path is not a legitimate test site and shall not be used for monitoring compliance with the noise standards for racing facilities.

At most moving vehicle test sites, there will be something located within the measurement area that may block sound (i.e., Armco safety barriers, hay bales, fences, bleachers, other race vehicles, trees, piles of dirt, etc.). Fortunately, not everything will "significantly" block the sound path. If the following conditions are met, then a moving vehicle test site is not "significantly" blocked and is therefore an acceptable test site:

1) In general, there must be good line-of-sight clearance between the microphone and the vehicle exhaust outlets (excluding shielding by the vehicle body) for most of the vehicle's pass by. More precisely, the line-of-sight view of exhaust outlets must be at least 80% open area during the pass by, and
2) The area immediately in front of the microphone must be clear of obstruction.

If the Noise Control Steward has any doubts about the site, then choose an alternate measurement site.

Reflective Surfaces. Objects with large flat surfaces (excluding the ground or water surface) which are basically parallel to the track and located behind the microphone or on the other side of the track, can increase the measured sound level. The ideal moving vehicle measurement site has no reflective surfaces located in an area less than 100 feet (30.5 meters) from the microphone and the microphone point (see Figure 5.2). Since an ideal site with no reflective surfaces is not always available, then the next best thing is to <u>not</u> measure at sites where reflective surfaces are less than the following distances away from the microphone or the race vehicle:

a) 10 feet (3.0 meters) for the 50 ft. (15.24 m) measurement sites, or
b) 20 feet (6.0 meters) for the 100 ft. (30.5 m) measurement sites.

50 Ft. Trackside Measurement Point. The DEQ noise regulations for racing facilities specifies a moving vehicle sound measurement position (microphone location) at "trackside." "Trackside" is defined as 50 feet (15.24 meters) from the edge race vehicle. For the purpose of this rule, this means the sound measurements shall be made 50 feet (15.24 meters) from the edge of the Driving Groove. The Driving Groove is the path that most race vehicles follow around the race course. In order to determine the driving groove, the Noise Control Steward must draw upon his knowledge of the race vehicles and the race course.

After the driving groove has been located, the NCS shall measure 50 feet (15.24 meters) from the edge and perpendicular to the driving groove. This is the position where sound measurements will be taken.

Note: It is recommended that a mark be placed at the edge of the driving groove, perpendicular to the microphone. This can be used to determine the location of each vehicle with respect to the 50 foot monitoring distance. (See

Section 5.4.2 for more details)

5.2.5 Alternate 100 ft. Trackside Measurement Point. If it is determined that a measurement at 50 ft. (15.24 meters) is unsafe or not feasible, then measurements may be taken at 100 ft. (30.5 meters) for the driving groove. If the 100 foot distance is used a 6 dBA correction shall be added to the observed sound reading or 6 dBA may be subtracted from the required maximum sound emission limits specified in the noise regulations. (The sound emission limits list in form NPCS-35-1 were adjusted.)

5.2.6 Choosing Loudest Moving Vehicle Measurement Location. Given the general test site constraints outlined in Section 5.2.1 to 5.2.5, many possible measurement locations are typically available at racing facilities. The moving vehicle standards require race vehicles not exceed a specified noise emission level under all operating conditions (acceleration, deceleration, cruising, full out, etc.). The Noise Control Steward shall therefore monitor for compliance with the moving vehicle limits at those measurement sites where the vehicle is producing its maximum noise levels.

Comment: The Noise Control Steward must measure at the noisiest site. A non-complying vehicle may pass or fail depending on the ability of the steward to choose the noisiest site. The owner of a vehicle that passes or fails due to improper measurement procedures will lose confidence in the validity and the need for the rules. In such a case, the Steward will have compromised the track, sanctioning organization, and the vehicle owner.

Generally, race vehicles produce their maximum noise levels when they are accelerating near the highest engine RPM. Determining the point of maximum sound emissions takes a knowledge of the vehicle and the race course. Even then, vehicles may need to be tested at several sites before a final test site is selected. Long, straight sections of the track tend to be noisier than the corners. Also, vehicles may be noisier on one side than the other, depending on the location of the exhaust outlet. Measurements shall be made on the noisiest side of the vehicle.

5.3 Stationary Vehicle Sound Measurement Procedure.

5.3.1 Test site. The test site should be relatively flat and free of loose or powdered snow, plowed soil, grass of height greater than 6 inches (.15 meters), brush, trees, or other extraneous material. Also the site should be free of large sound reflective surfaces (other than the ground) such as parked vehicles, sign boards, buildings, or hillsides; located within 15 ft. (4.6 meters) radius of the vehicle being tested.

5.3.2 Microphone Location. The microphone shall be located with respect to the rear most exhaust outlet on either side of the vehicle as follows:

a) 20 inches ± 1/2 in. (0.5 meters ± .01 m) from the exhaust outlet,
b) At a 45-degree angle (± 10 degree), from the axis of the outlet,
c) At the same height as the exhaust outlet, and
d) With its longitudinal axis parallel to the ground.

Figure 5-3 shows the microphone location.

Note: For microphones designed for grazing noise measurement (see Section 4.6.6), point the microphone rearward away from the engine. Further no wire or other means of distance measurement shall be attached to the microphone. This may lead to erroneous readings.

5.3.3 Vehicle Operations. The rider shall sit astride of the motorcycle in a normal riding position with both feet on the ground. The engine shall be operated at the normal operating temperatures with gear box in neutral. If no neutral is provided the motorcycle shall be operated either with the rear wheel clear of the ground, or with the drive chain or belt removed. The sound level measurement shall be made with the engine speed stabilized at one of the following values. (The preferred test procedure is listed first; the least preferred test procedure is last):

a) The engine speed shall be stabilized at 50% (1/2) of the manufacturer's recommend maximum engine speed ("Red Line RPM"), or
b) If no "Red Line RPM" is published for the vehicle, then stabilize the engine speed at 60% of the engine speed at which maximum horsepower is developed, or
c) If neither "Red Line RPM" nor maximum horsepower RPM information is available, then calculate the test RPM from the following formulae:

$$RPM = \frac{306{,}000}{\text{stroke in mm}} \quad \text{or} \quad RPM = \frac{12{,}000}{\text{stroke in inches}}$$

d) If engine test speed cannot be determined from steps a, b, and c above or if a tachometer is not available, then test the motorcycle at 1/2 of full open throttle.

Comment: During stationary noise testing, the Noise Control Steward should make certain the tachometer is accurately measuring the engine speed. Also do not allow the exhaust to impinge on the microphone.

5.4 Sound Measurements

5.4.1 Preliminary Steps. The following steps should be followed before taking sound measurements.

a) Check battery
b) Calibrate sound meter
c) Switch meter to "A" weighting scale.
d) Set meter to correct a range setting
e) Windscreen - on
f) No significant blockage of the sound path
g) No reflective surfaces
h) Test personnel located correctly behind meter
i) No significant background noises.
j) For moving vehicle sound testing:
   * Select the loudest measurement site
   * Determine the Driving Groove
   * Place the meter at 50 (or 100 ft.) from Driving Groove
   * Set meter on "Fast" response
   * Set meter at 4 ± 1/2 ft. above terrain
   * Point microphone correctly
   * Monitor the loudest side of vehicle
k) For stationary vehicle sound testing:
   * Vehicle at normal temperature and in neutral.
   * Vehicle operator in normal riding position.
   * Attach and check tachometer.
   * Determine the engine test speed.
   * Monitor the rear most exhaust outlet for each side.
   * Set the meter to "slow" response
   * Place microphone 20 inches from exhaust outlet.
   * Place microphone 45° from the axis of the outlet.
   * Place microphone at the same height as the outlet.
   * Place longitudinal axis of the microphone parallel to the ground.
   * Point the microphone correctly.
   * Monitor both sides of the vehicle.
   * Stabilize the engine at the engine test speed.

5.4.2 Moving Vehicle Measurements. The measured noise emission level for a moving race vehicle shall be the maximum sound level reading displayed on a meter position 50 or 100 feet (15.2 or 30.5 meters) from the vehicle's driving groove, taken during the vehicle's pass by. To avoid background noise from affecting the sound measurements, the sound level should ideally rise and fall at least 6 dBA from the maximum noise level. Also, the sound meter's "Fast" response should be used.

Ideally, all moving vehicles will follow the driving groove and the sound measurements will be made at the proper measurement distance. However, this may not always be the case. The following comments may be of value to minimize the time it takes for testing vehicles:

Comment: If the moving vehicle is measured on its noisiest side and under its noisiest operating conditions, then the following statements can be considered valid:

a) If the vehicle passes less than 50 (or 100) feet fom the microphone and does not exceed the noise emission limits, then it does not violate the noise limits at 50 (or 100) feet.
b) If the vehicle passes greater than 50 (or 100) feet and exceeds the emission limits, then it does violate the noise limits at 50 (or 100) feet.
c) If the vehicle passes less than 50 (or 100) feet and exceeds the emission limits, then the situation is uncertain and the vehicle shall be remeasured.
d) If the vehicle passes greater than 50 (or 100) feet and does not exceed the emission limits, then the situation is again uncertain and the vehicle shall be remeasured.

5.4.3 Stationary Vehicle Measurements. The reported noise emission level for the stationary vehicle shall be the highest sound level reading displayed on the meter during steady state operation at the proper engine speed. Sound level readings obtained during acceleration or deceleration of the engine are not included. If there are exhaust outlets on both sides of the vehicle, then readings shall be obtained on both sides and the highest reading reported as the vehicle's emission level. The sound meters "Slow" response should be used for stationary testing. Although the "Fast" response is acceptable. Further, to avoid background noise from affecting the sound measurements, the sound level should ideally rise and fall at least 6 dBA from the maximum noise level.

5.4.4 Recording Sound Level Measurements. Noise data for all race vehicles which exceed the maximum allowable noise emissions shall be recorded on form NPCS-35-1. The race facility owner shall keep such recorded noise data for a period of at least one calendar year and, upon request, shall make such data available to the Department. The owner may also submit the data to the Department for storage.

5.5 Form NPCS-35-1. Form NPCS-35-1 is used to record muffler and sound level data on all race vehicles exceeding the DEQ noise standards. Figure 5-4 shows an example of Form NPCS-35-1. Enclosed in this procedure manual is a master form of NPCS-35-1 to be photocopied and used to record race data. The following describes form NPCS-35-1 and the information to be recorded on it:

a) The name and location of the racing facility.
b) The name of the sponsoring organization, if any.
c) Name of the individual who inspected the vehicles for compliance with the noise standards.
d) Mark the type of racing event and the appropriate maximum allowable noise emission limits for the event.
e) Description of the sound level meter (make and model).

f) Location of the measurement site and distance from race vehicle.

g) A check list for use in taking sound level measurements is included on the form.

h) The description of the racing vehicle (type of vehicle, vehicle number, driver's name, etc.).

i) The maximum measured sound level expressed in dBA (decibels measured on an "A" weighted sound meter). This is at 20 inch, 50 ft., or 100 ft. depending on what type of test was performed as indicated in item d and f above. Also include with the sound level, the test RPM for the 20 inch stationary test.

j) A list of muffling systems which meet the requirements for a "Well Maintained Muffling System" is included on the form.

k) Indicate on the form whether the vehicle passed or failed the visual inspection of the muffling system (whether or not the vehicle meets the "properly installed and well maintained muffler" requirements).

l) Describe the muffler system and given the reason(s) for vehicle passing or failing the visual inspection of the muffling system. (See list of "Well Maintained Muffling Systems" included on the form.)

m) Indicate any results or actions taken on the vehicle (i.e. not allowed to race, muffler was fixed and retested, etc.).

Note: Form NPCS-35-1 is designed to provide the user with most of the important information contained in the DEQ race noise standards and procedure manual. However, this form could not contain all the information. Consult the standards and the manual if questions arise.

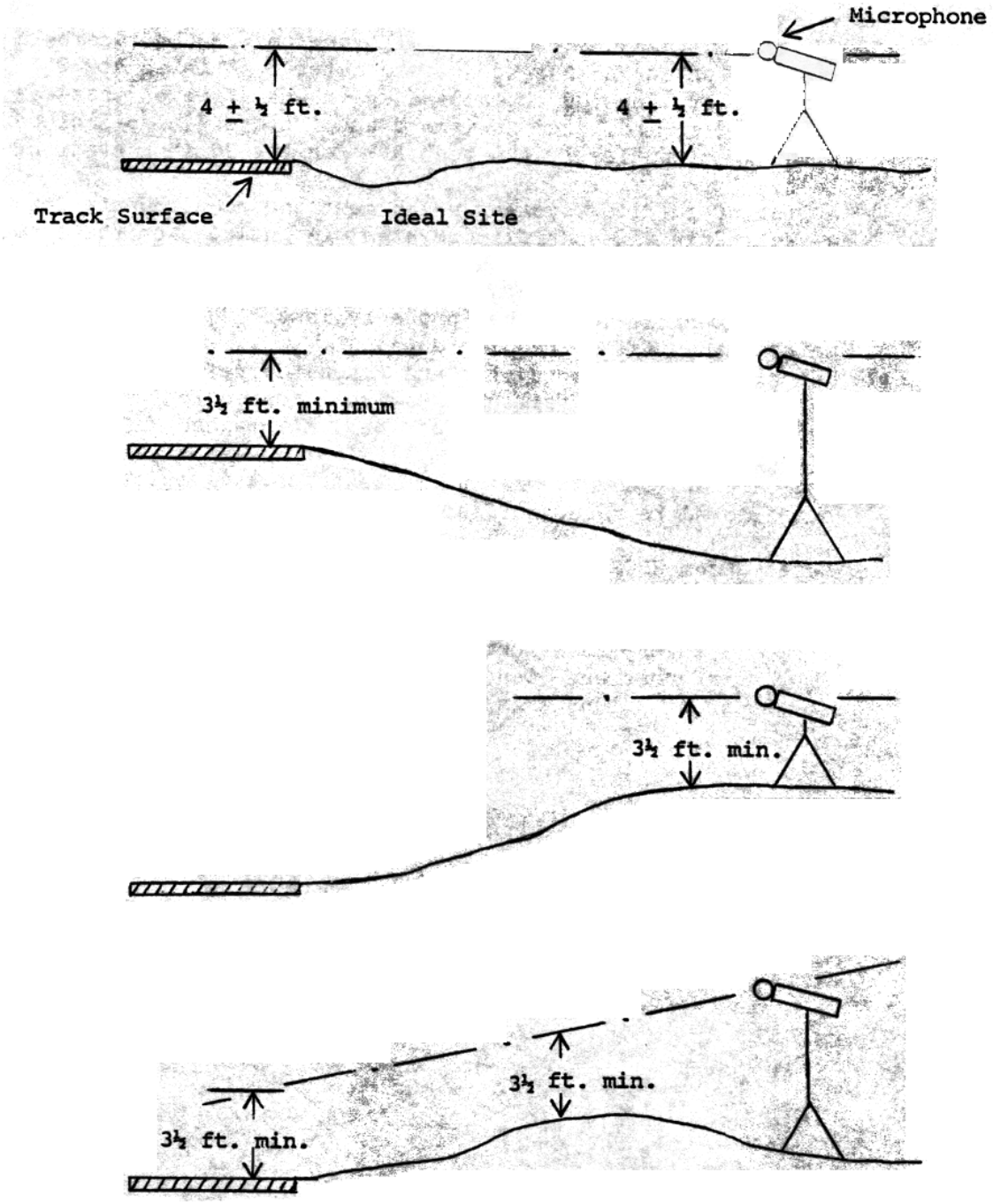


Fig. 5 - 1 Acceptable Microphone Heights

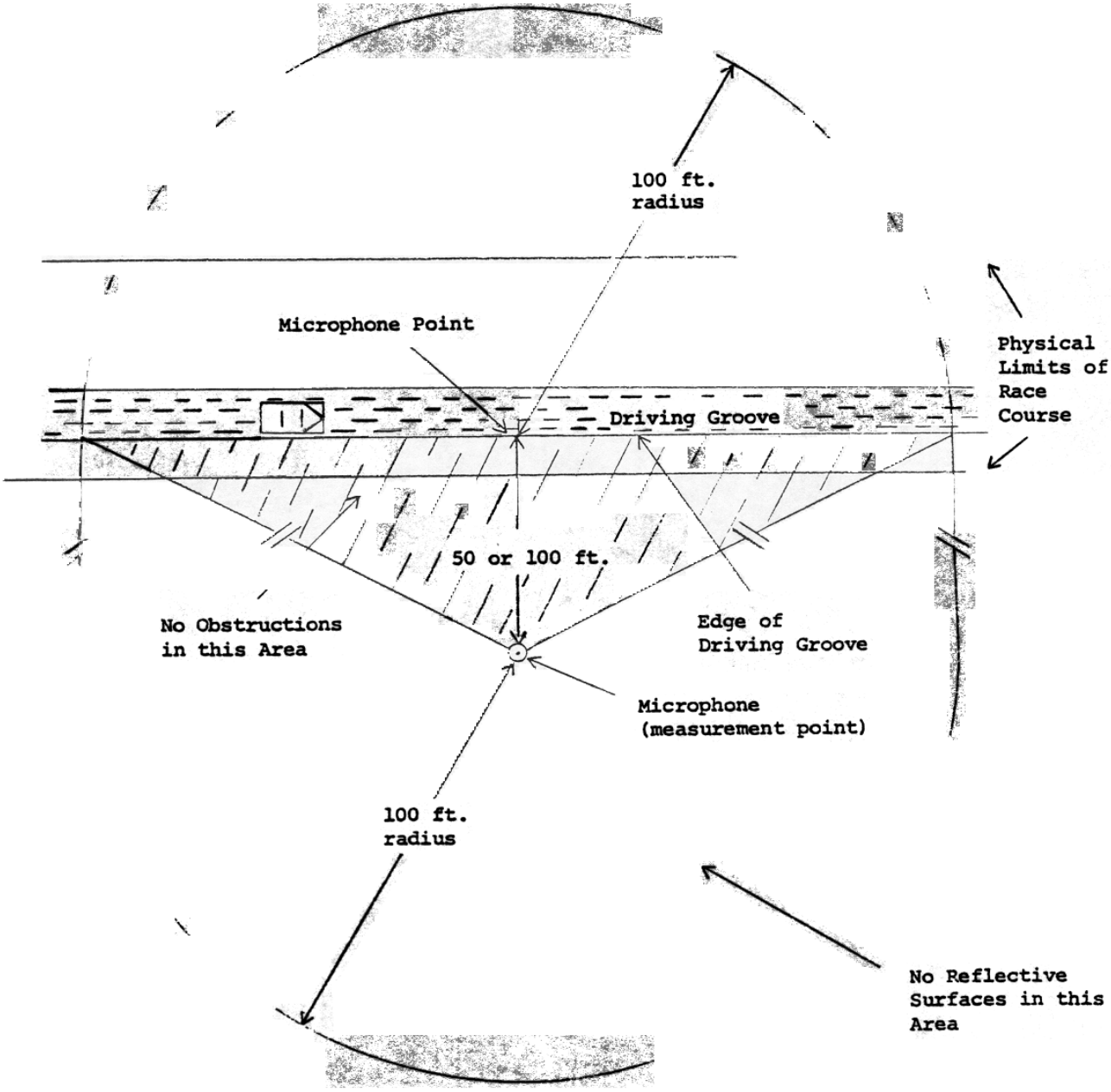
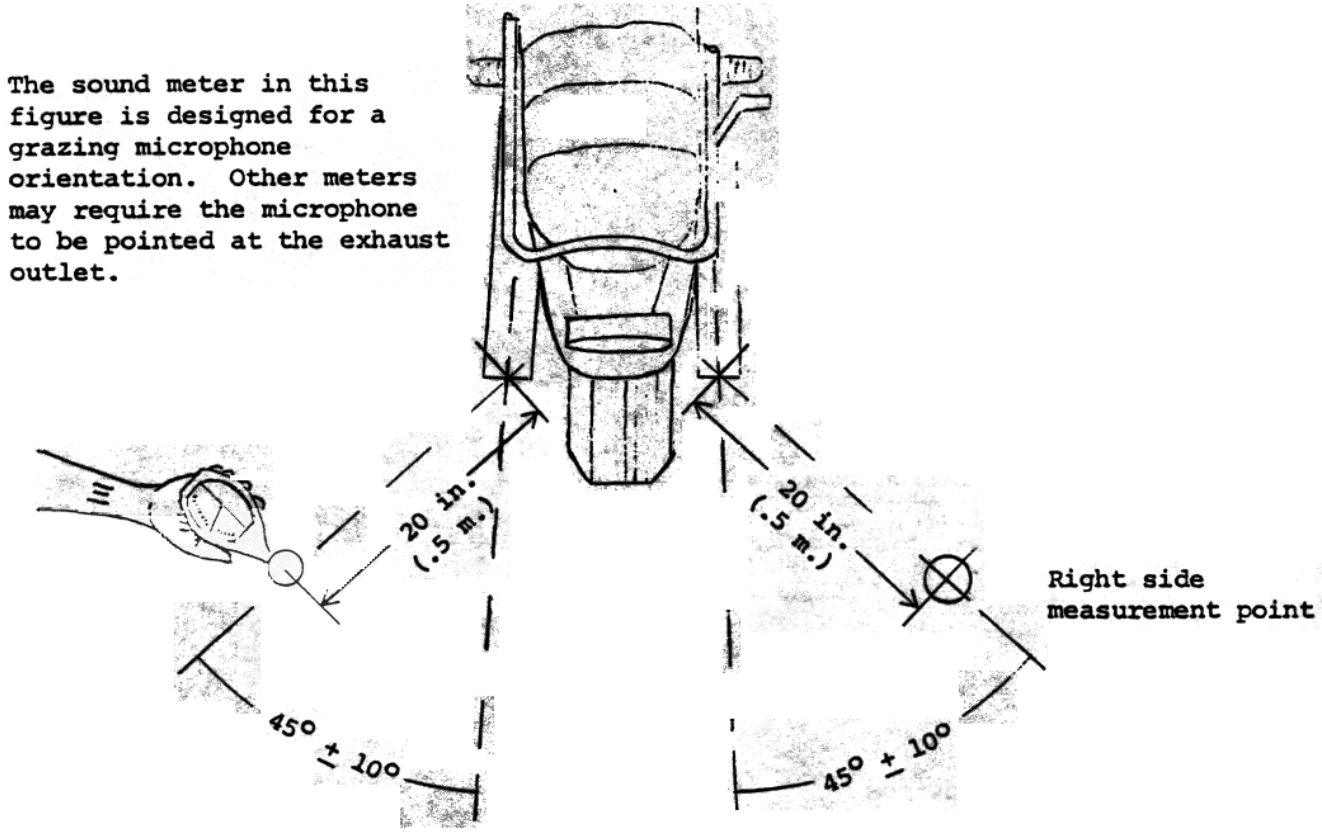
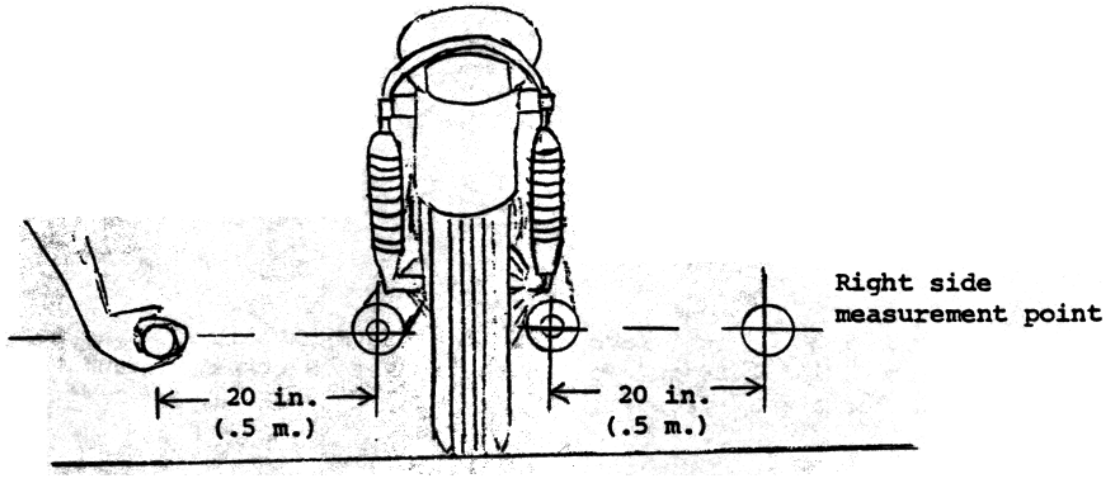


Fig. 5-2 General Layout of Ideal Moving Vehicle Sound Measurement Site (Flat Terrain, No Obstructions to Block the Sound Path, No Reflective Surfaces)

Fig. 5-3 Stationary Test Microphone Location



* Measure from rear most exhaust outlet on each side.
* For exhaust outlets on both sides, measure both.
* Report the highest reading at the test RPM.
* Do not allow exhaust to impinge on the microphone.



DEPARTMENT .VIRONMENTAL QUALITY
MOTOR SPORTS RACING RECORD FORM[1]

Racing Facility Name and Location:
Acme Race Track -- Smallville

Sponsoring Organization:
23rd St. Sports Car Club

Date: Nov. 4 1980

Inspected By: John Doe

Sound Meter Make and Model:
Gen Rad 1983

Sound Measurement Position: ☐ 20 in. ☒ 50 ft. ☐ 100 ft.
North Straight-away

Mark Type of Race and Max. Allowed Noise Emissions:

	-dBA- 20 in.	50 ft.	100 ft.
☐ Dray	-	-	-
☐ Oval	-	105	99
☒ Sports Car	-	105	99
☐ Closed Course Motorcycle	105	105	99
☐ Open Course Motorcycle	105	-	-
☐ 4-Wheel Drive	-	105	99
☐ Water Craft	-	105	99
☐ Autocross	-	90	84
☐ Go-Kart	-	105	99
☐ Other			

Sound Measurement Check List:
☒ Battery and Meter Calibration - OK
☒ "A" Weighting and Windscreen
☒ "Fast" - for Moving, "Slow" - for Stationary
☒ No Reflections or Blockage of Path
☒ Low Background Noise
— MOVING TEST —
☒ Find Loudest Site and Driving Groove
☒ 50 or 100 Ft. from Driving Groove
☒ Microphone Height and Orientation - OK
☒ Test Loud Side of Vehicle
— STATIONARY TEST —
☐ Microphone at 20 in. and 45° from Outlet
☐ Tachometer Working - OK
☐ Test at 50% of Red Line or...(see Manual)
☐ Test Both Sides at Steady State RPM

All non-Top Fuel Burning Drag[2] vehicles must have "Properly Installed and Well Maintained Muffling" system. If properly installed, the following systems meet this requirement. Also, all exhaust outlets must be muffled:

1. Reverse Flow, Baffle Muffler
2. Stacked Diffuser Disc Muffler
3. Exhaust Turbocharged System[3]
4. Muffler Approved for Go-Karts
5. Original Factory Muffler Installed on a Motorcycle
6. Underwater Exhausted Outboard Boat Motor
7. Auger Type Muffler
   a. Minimum 16" muffler for greater than 1600 cc engines, or
   b. Minimum 10" muffler for 1600 cc or less engines.
   } Drag Vehicles Only
8. Perforated Straight Core, Absorbent Lined Muffler; Not Installed on a Rotary Engine
   a. Minimum 20" muffler on any engine exceeding 1600 cc,
   b. Minimum 12" muffleron a non-motorcycle engine 1600 cc or less.
   c. Minimum 6" muffler on any 4-cycle motorcycle engine, or
   d. Minimum 0" muffler on any 2-cycle motorcycle engine.
   } Drag Vehicles Only
9. Any other DEQ approved muffling system.

(1600 cc = 96.7 cu. in)

VEHICLE DESCRIPTION	MEASURED NOISE LEVEL (dBA & RPM)	VISUAL INSPECTION OF THE MUFFLING SYSTEM: Muffler System	Describe Muffler System and Give Reason(s) for Pass/Fail (see list above)	RESULTS AND ACTIONS
J. Smith #19	109	☒ Pass ☐ Fail	Diffuser Disc Muffler	Took some discs out of Muffler; Passed at 102 dBA
Jones #3	—	☐ Pass ☒ Fail	No Muffler; Straight Pipes	Not allowed on track
Brown #12 (Rotary Engine)	—	☐ Pass ☒ Fail	Straight Core muffler on a Rotary Engine Car	Said he would fix it.
Wilson #5 (1400 cc Engine)	111	☒ Pass ☐ Fail	Dual exhaust, 14-inch glass packs on each side	Not allowed to race
Roberts #10 (1200 cc motorcycle engine)	115	☒ Pass ☐ Fail	Stock Motorcycle Mufflers	Not allowed to race
Brown #12 (See above)	97	☒ Pass ☐ Fail	Stock baffled mufflers	Allow
Mc Kay #2	101	☒ Pass ☐ Fail	[illegible]	Just interested when it passed.

(1) Only those race vehicles failing to comply with the "properly installed and well maintained muffler" requirements and/or the maximum allowable noise emission requirements, are required to be recorded on this form.

(2) Top Fuel Burning Drag vehicles are powered by greater than 50% alcohol or by nitromethane and are commonly known as top fuel or funny cars. These vehicles are not required to have a muffler.

(3) An Exhaust Turbocharged system is considered a "well maintained muffling" system.

Fig. 5 - 4

Example of Form NPCS-35-1

DEPARTMENT OF ENVIRONMENTAL QUALITY
MOTOR SPORTS RACING RECORD FORM[1]

Date: | Inspected By:

Racing Facility Name and Location:

Sound Meter Make and Model:

Sponsoring Organization:

Sound Measurement Position: ☐ 20 in. ☐ 50 ft. ☐ 100 ft.

Mark Type of Race and Max. Allowed Noise Emissions:

	-dBA- 20 in.	50 ft.	100 ft.
☐ Drag	-	-	-
☐ Oval	-	105	99
☐ Sports Car	-	105	99
☐ Closed Course Motorcycle	105	105	99
☐ Open Course Motorcycle	105	-	-
☐ 4-Wheel Drive	-	105	99
☐ Water Craft	-	105	99
☐ Autocross	-	90	84
☐ Go-Kart	-	105	99
☐ Other			

Sound Measurement Check List:
- ☐ Battery and Meter Calibration - OK
- ☐ "A" Weighting and Windscreen
- ☐ "Fast" - for Moving, "Slow" - for Stationary
- ☐ No Reflections or Blockage of Path
- ☐ Low Background Noise
- — MOVING TEST —
- ☐ Find Loudest Site and Driving Groove
- ☐ 50 or 100 Ft. from Driving Groove
- ☐ Microphone Height and Orientation - OK
- ☐ Test Loud Side of Vehicle
- — STATIONARY TEST —
- ☐ Microphone at 20 in. and 45° from Outlet
- ☐ Tachometer Working - OK
- ☐ Test at 50% of Red Line or...(see Manual)
- ☐ Test Both Sides at Steady State RPM

All non-Top Fuel Burning Drag[2] vehicles must have a "Properly Installed and Well Maintained Muffling" system. If properly installed, the following systems meet this requirement. Also, all exhaust outlets must be muffled:

1. Reverse Flow, Baffle Muffler
2. Stacked Diffuser Disc Muffler
3. Exhaust Turbocharged System[3]
4. Muffler Approved for Go-Karts
5. Original Factory Muffler Installed on a Motorcycle
6. Underwater Exhausted Outboard Boat Motor
7. Auger Type Muffler
   a. Minimum 16" muffler for greater than 1600 cc engines, or } Drag Vehicles Only
   b. Minimum 10" muffler for 1600 cc or less engines.
8. Perforated Straight Core, Absorbent Lined Muffler; Not Installed on a Rotary Engine
   a. Minimum 20" muffler on any engine exceeding 1600 cc, } Drag Vehicles Only
   b. Minimum 12" muffler on a non-motorcycle engine 1600 cc or less,
   c. Minimum 6" muffler on any 4-cycle motorcycle engine, or
   d. Minimum 8" muffler on any 2-cycle motorcycle engine.
9. Any other DEQ approved muffling system.

(1600 cc = 96.7 cu. in)

VEHICLE DESCRIPTION	MEASURED NOISE LEVEL (dBA & RPM)	VISUAL INSPECTION OF THE MUFFLING SYSTEM: Muffler System	Describe Muffler System and Give Reason(s) for Pass/Fail (see list above)	RESULTS AND ACTIONS
		☐ Pass ☐ Fail		
		☐ Pass ☐ Fail		
		☐ Pass ☐ Fail		
		☐ Pass ☐ Fail		
		☐ Pass ☐ Fail		
		☐ Pass ☐ Fail		
		☐ Pass ☐ Fail		

(1) Only those race vehicles failing to comply with the "properly installed and well maintained muffler" requirements and/or the maximum allowable noise emission requirements, are required to be recorded on this form.

(2) Top Fuel Burning Drag vehicles are powered by greater than 50% alcohol or by nitromethane and are commonly known as or funny cars. These vehicles are not required to have a muffler.

(3) considered a "well maintained muffling" system

CHAPTER 6

NOISE IMPACT BOUNDARIES

6.1 General. Prior to the construction or operation of any permanent new motor sports facility, the owner shall submit for Department approval the projected daily Noise Impact Boundaries for the facility representing an estimate of maximum projected use. The data and analysis used for determining the boundary shall also be submitted for Department evaluation. The Noise Impact Boundary is a map of the area around the facility with the maximum daily operation Ldn - 55 dBA noise contour drawn on it. The information needed by the Department to evaluate the project are such things as:

a) Maps giving the physical layout of the facility; the terrain of the land around the facility; the location and type of noise sensitive property nearby; and the local land use zoning.
b) Data about the type of events and vehicles using the facility including the days and hours of operation.
c) Information about practice sessions.
d) Information about recreation use at the facility.
e) Information on how the impact contours were predicted.
f) Information on the facility's public address system.

The facility owner should coordinate the development of the Noise Impact Boundaries for new facilities with the DEQ Noise Control Section.

NPCS35

AMEND: 340-035-0025

RULE TITLE: Noise Control Regulations for the Sale of New Motor Vehicles

NOTICE FILED DATE: 04/13/2016

RULE SUMMARY: Existing tables and publications included in rule.

RULE TEXT:

(1) Standards and Regulations:

(a) No person shall sell or offer for sale any new motor vehicle designated in this rule which produces a propulsion noise exceeding the noise limits specified in Table 1, except as otherwise provided in these rules. [Table not included. See ED. NOTE.]

(b) Subsequent to the adoption of a Federal Environmental Protection Agency procedure to determine sound levels of passenger cars and light trucks, or a nationally accepted procedure for these vehicles not similar to those specified and approved under subsection (2)(a) of this rule, the Department shall conduct an evaluation under such new procedure.

(c) After an appropriate evaluation of noise emission data measured under the procedure specified under subsection (1)(b) of this rule, the Department shall make recommendations to the Commission on the adequacy of the procedure and the necessity of amendments to this rule for incorporation of the procedure and associated standards.

(d) No person shall sell or offer to sell any new motorcycle, new motorcycle exhaust system or new motorcycle exhaust system component manufactured after January 1, 1983 unless the motorcycle, exhaust system, or exhaust component is properly labeled or marked in accordance with federal noise regulations specified in Part 205 Subpart E of Title 40 of the Code of Federal Regulations.

(2) Measurement:

(a) Sound measurements shall conform to test procedures adopted by the Commission in Motor Vehicle Sound Measurement Procedures Manual (NPCS-21), or to standard methods approved in writing by the Department. These measurements will generally be carried out by the motor vehicle manufacturer on a sample of either prototype or production vehicles. A certification program shall be devised by the manufacturer and submitted to the Department for approval within 60 days after the adoption of this rule;

(b) Nothing in this rule shall preclude the Department from conducting separate or additional noise level tests and measurements on new motor vehicles being offered for sale. Therefore, when requested by the Department a new motor vehicle dealer or manufacturer shall cooperate in reasonable noise testing of a specific class of motor vehicle being offered for sale.

(3) Manufacturer's Certification:

(a) Prior to the sale of or offer for sale of any new motor vehicle designated in Table 1, the manufacturer or a designated representative shall certify in writing to the Department that vehicles listed in Table 1 made by that manufacturer and offered for sale in the State of Oregon meet applicable noise limits. Such certification will include a statement by the manufacturer that: [Table not included. See ED. NOTE.]

(A) The manufacturer has tested sample or prototype vehicles;

(B) That such samples or prototypes met applicable noise limits when tested in accordance with the procedures specified;

(C) That vehicles offered for sale in Oregon are substantially identical in construction to such samples or prototypes.

(b) Nothing in this rule shall preclude the Department from obtaining specific noise measurement data gathered by the manufacturer on prototype or production vehicles for a class of vehicles for which the Department has reasonable grounds to believe is not in conformity with the applicable noise limits.

(4) Exceptions: Upon prior written request from the manufacturer or designated representative, the Department may authorize an exception to this noise rule for a class of motor vehicles, if it can be demonstrated to the Department that for that specific class a vehicle manufacturer has not had adequate lead-time or does not have the technical capability to either bring the motor vehicle noise into compliance or to conduct new motor vehicle noise tests.

(5) Exemptions:

(a) All racing vehicles, except racing motorcycles and racing motorboats, shall be exempt from the requirements of this rule provided that such vehicles are operated only at facilities used for sanctioned racing events;
(b) Racing motorcycles and racing motorboats shall be exempt from the requirements of this rule provided that racing motorcycles are operated only at facilities used for sanctioned racing events, racing motorboats are operated only at areas designated by the State Marine Board for testing or at an approved racing event, and the following conditions are complied with:
(A) Prior to the sale of a racing motorcycle or racing motorboat, the prospective purchaser shall file a notarized affidavit with the Department, on a Departmentally approved form, stating that it is the intention of such prospective purchaser to operate the vehicle only at facilities used for sanctioned racing events; and
(B) No racing vehicle shall be displayed for sale in the State of Oregon without notice prominently affixed thereto:
(i) That such vehicle will be exempt from the requirements of this rule only upon demonstration to the Department that the vehicle will be operated only at facilities used for sanctioned racing events, and
(ii) That a notarized affidavit will be required of the prospective purchaser stating that it is the intention of such prospective purchaser to operate the vehicle only at facilities used for sanctioned racing events; and
(C) No racing vehicle shall be locally advertised in the State of Oregon as being for sale without notice included:
(i) Which is substantially similar to that required in subparagraph (B)(i) and (ii) of this subsection; and
(ii) Which is unambiguous as to which vehicle such notice applies.
[ED. NOTE: A PDF of tables and publications can be viewed by clicking on this link.]

STATUTORY/OTHER AUTHORITY: ORS 467

STATUTES/OTHER IMPLEMENTED: ORS 467.030

OAR 340-035-0025
Table 1
New Motor Vehicle Standards
Moving test at 50 feet (15.2 meters)

Effective for	Maximum Noise Level (dBA)
Motorcycles	
1975 Model	86
1976 Model	83
1977-1982 Models	81
1983-1985 Models built after December 31, 1982	83
Moped Models built after December 31, 1982	70
Off-road models with engine displacements of 170cc and lower	
1983-1985 Models built after December 31, 1982	83
1983-1985 Models built after December 31, 1985	80
Off road models with engine displacement greater than 170cc	
1983-1985 Models built after December 31, 1982	86
1983-1985 Models built after December 31, 1985	82
Snowmobiles as defined in ORS 481.048	
1975 Models	82
Models after 1975	78
Trucks and Buses in excess of 10,000 lbs. (4536 kg) GVWR	
1975 Model	82
1976-1981 Models or Models manufactur4ed after Jan. 1, 1978 and before Jan. 1, 1986	83
Models manufactured after Jan.1, 1986, and before (Reserved)	---
Models manufactured after (Reserved)	
Automobiles, light trucks and all other road vehicles	
1975 Model	83
1976-1978 Models	83
Models after 1978	80
Motorboats	
Models offered for sale after June 30, 1980	82

Motor Vehicle Sound Measurement Procedures Manual

NPCS - 21

State of Oregon
Department of
Environmental
Quality

REVISION RECORD

INSTRUCTIONS FOR USE: All revisions of this manual will be numbered to assure each manual holder that he has received all revisions. The date and initials of the person inserting revisions to the manual should be entered on this revision record opposite the appropriate revision number. If the sequence is broken, copies of the missing revisions may be requested from the Noise Control Section.

Rev. No	Date Inserted	Initials	
1	7/8/74	JH	
2.	8/27/76	JH	EQC Amendments
3.	5/27/77	JH	EQC Amendments
4.	9/16/77	DO	pg. 42, corrected typographic error
5.	1/10/78	DO	pg. 12, corrected typographic error.
6.	5/21/80	JH	EQC Motorboat Amendements
7.	4/8/83	~~JH~~	EQC Amendments
8.			
9.			
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FOREWORD

The Motor Vehicle Sound Measurement Procedures Manual has been prepared to specify the equipment to be used, and the procedures established in the manual, when carefully followed, will ensure that the noise readings obtained are accurate, will support enforcement action, and aid in reducing motor vehicle noise.

The scope of this manual includes sound measurements for new motor vehicles, on-highway motor vehicles and stationary testing of off-highway and on-highway motor vehicles.

The objective of the manual is to establish procedures to implement the objectives of the Environmental Quality Commission. Further, if the practices and procedures herein are adhered to, the result will be a uniform enforcement program which will accomplish the intent of the Legislature and fulfill the Commission's responsibility under ORS Chapter 467.

Office of the Administrator
Air Quality Control Division
Department of Environmental Quality

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LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 Policy

1.1.1 The Department of Environmental Quality, through the Noise Pollution Control Section, shall establish a noise measurement program to implement the laws and regulations applying to motor vehicle noise.

1.1.2 The Noise Pollution Control Section and cooperating enforcement agencies shall be responsible for motor vehicle noise measurement.

1.3 This manual contains procedures for the Noise Pollution Control Section, Enforcement Division, and other persons taking motor vehicle sound measurements. Guidance is provided for in the comments.

1.2 Authority

2.1 Statutory and administrative law governing authority to the guidance and direction contained in this manual is found in the following sources:

a. Oregon Revised Statutes, Chapter 467, Sections 467.010 467.020, 467.030, 467.050, 467.990.

b. Oregon Administrative Rules, Chapter 340, Division 35, Department of Environmental Quality.

1.3 Instruments and Training

1.3.1 Specific requirements for instruments and personnel are defined under procedure manual, Noise Pollution Control Section - 2, Requirements for Sound Measuring Instruments and Personnel.

1.3.2 Allied departments, divisions or agencies who select sound measuring instruments for measuring noise emissions should secure the assistance of qualified engineers in the field of sound measurement in preparing specifications and making purchases of such instruments.

1.3.3 Personnel making noise measurements shall be carefully trained in the techniques of noise measurements, use of required instruments, instrument calibration and problems which may be encountered when performing such tasks.

CHAPTER 2

STATIONARY MOTOR VEHICLE SOUND LEVEL MEASUREMENT AT 25 FEET FOR TRUCKS AND BUSES

Scope. This Chapter establishes procedures for setting up and calibrating sound measuring equipment and conducting tests to determine the sound level output of a stationary vehicle, as measured 25 feet from the vehicle. The near field test procedure at 20 inches (.5 meter) is presented in Chapter 6.

Motor vehicles in excess of 10,000 pounds GVWR or GCWR engaged in interstate commerce shall conform to measurement procedures and methodologies specified in Compliance with Interstate Motor Carrier Noise Emission Standards of the Federal Highway Administration, Department of Transportation (49 CFR 325).

These procedures, the 25-foot stationary test, are used to conduct emission tests on trucks and buses rated in excess of 8,000 pounds. The standards for these vehicles are found in Table 2 of OAR 340-35-030.

2.2 Measurement Sites. Measurement sites shall be free of sound-reflecting objects within fifty feet of the microphone and fifty feet of the vehicle to be tested. (See Figure 2-1)

Comment: A "Sound-reflecting Surface" is any object or landscape surface in the immediate vicinity of a measurement site which reflects sufficient sound to require the application of a correction factor to the sound level meter reading. Surfaces which are not sound-reflecting surfaces are:

a. Any surface that measures less than eight feet in length in a direction parallel to the portion of the microphone line on which the microphone is positioned, regardless of height (such as a telephone booth or a tree trunk) or less than one foot in height, regardless of length (such as a curb or guard rail).

b. Any vertical surface, regardless of size (such as a billboard) with the lower edge more than fifteen feet above the roadway.

c. Any uniformly smooth slanting surface with less than a forty-five degree slope above horizontal.

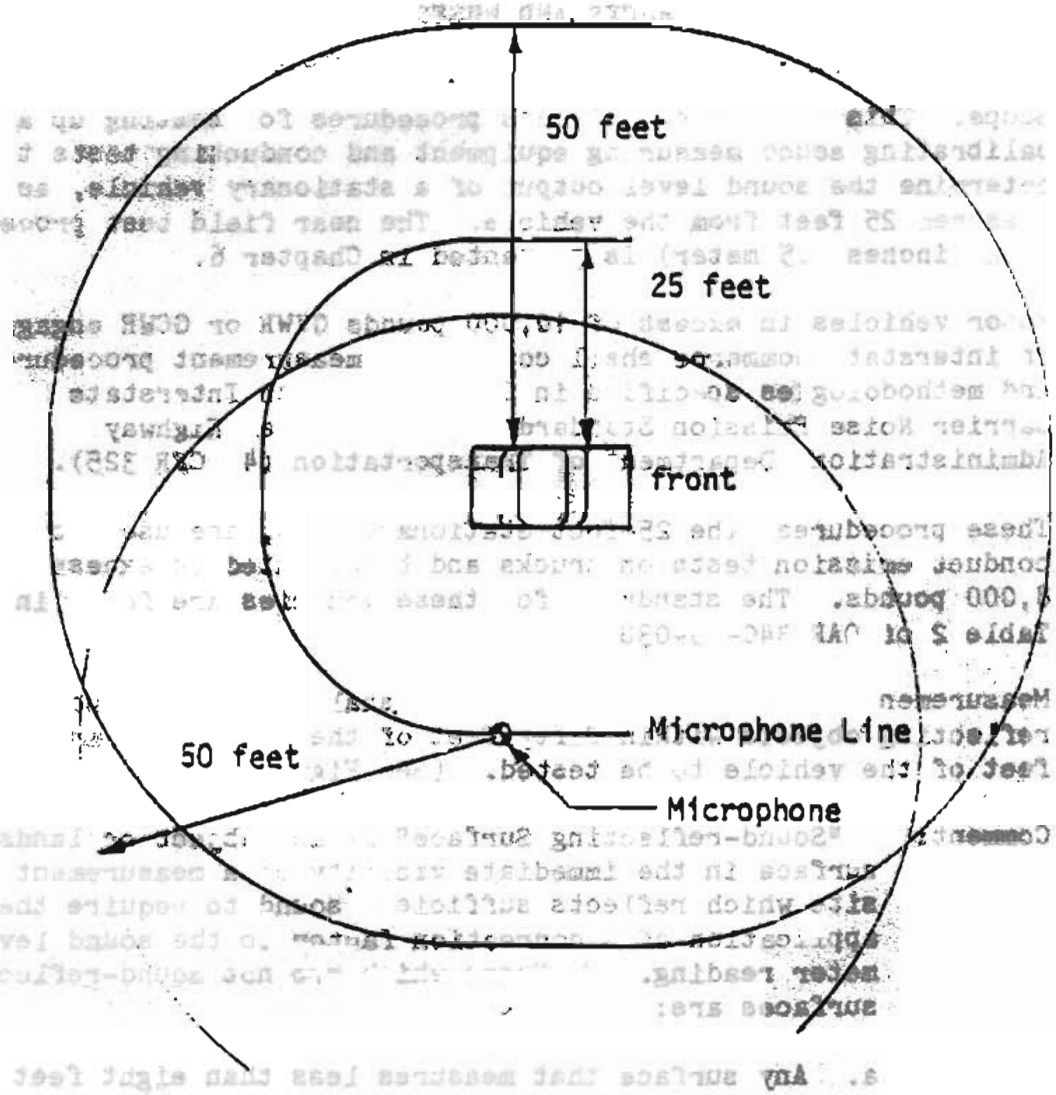


Fig. 2.1 Stationary Measurement Site

d. Any slanting surface with a forty-five to ninety degree slope above the horizontal where the line at which the slope begins to exceed forty-five degrees is more than fifteen feet above the roadway.

e. Any trees, bushes, shrubs, hedges, grass, or other vegetation.

All other surfaces are considered sound-reflecting surfaces.

2.2.1 Microphone Location. The microphone shall be located twenty-five feet ± six inches from the rear or from either side of the vehicle to be tested. The locus of points thus defined is the microphone line (See Figure 2-1). The microphone shall be located at the point on the microphone line at which the maximum sound level occurs.

Sound Level Measuring Precaution

2.3.1 Wind. Do not conduct measurements when wind velocity at the test location exceeds ten miles per hour.

2.3.2 Precipitation. Do not conduct measurements when falling precipitation affects results. However, measurements may be taken when streets are wet.

2.3.3 Ambient Noise. The ambient sound level shall be at least 10 dBA below the sound level of the vehicle being measured.

Recording. The sound level recorded shall be the highest level obtained during each test, disregarding unrelated peaks due to extraneous ambient noises.

Equipment Setup and Use.

2.4.1 General. All types of sound level meters shall be field calibrated immediately prior to use using the procedures described in the factory instruction manual.

2.4.2 Battery Check. Batteries in both the meter and calibrator shall be checked before calibration.

2.4.3 Instrument Calibration. The instrument shall be set to the correct level range, weighting scale and meter response. The calibrator shall be placed on the microphone of the meter. The output indicated on the meter shall then be adjusted to the correct calibration level.

2.4.4 Microphone Height. The sound level meter may be hand held or placed on a tripod. The microphone shall be positioned four and one-half feet above the ground.

2.4.5 Windscreens. Windscreens made of open cell polyurethane foam furnished by the instrument manufacturer shall be placed over the microphone after calibration.

COMMENT: The windscreen reduces the effect of wind noise and protects the microphone diaphragm from dust or other airborne matter.

2.4.6 Annual Calibration. Within one year prior to use, each set of sound measuring instruments, sound level meter including octave band filter, and calibrator, shall receive a laboratory calibration in accordance to the manufacturer's specifications. This calibration shall be traceable to the National Bureau of Standards.

COMMENT: An inspection label will be attached to each instrument set to determine when the calibration was performed.

2.5 Sound Level Measurement

2.5.1 Preliminary Steps. The following steps shall be followed before taking a measurement.

(a) Turn meter on.

(b) Switch meter to "A" weighting scale.

(c) Switch meter to "FAST" response.

(d) Set the meter to the appropriate range to measure the anticipated sound level.

2.5.2 Mounting. The sound level meter shall be hand held or placed on a tripod according to the manufacturer's instructions.

2.5.3 Orientation. The orientation of the sound level meter microphone shall be according to the manufacturer's instructions to obtain random incidence.

2.5.4 Variations. Allowances are necessary due to unavoidable variations in measurement sites and test equipment. Vehicles are not considered in violation unless they exceed the regulated limit by 2 dBA or more.

2.6 Vehicle Test Procedure.

2.6.1 Vehicle Sound Level. The sound levels for stationary motor vehicles shall be determined by tests performed according to the following procedures.

2.6.2 Location. The microphone shall be located on the microphone line at the position where the maximum sound level is expected to occupy. (See Figure 2-1).

2.6.3 Preliminary Tests. Sufficient preliminary tests shall be made to enable the driver to become thoroughly familiar with the test procedure.

2.6.4 Vehicle Operation. The vehicle shall be stationary, in a neutral gear, at its normal operating temperature.

a. Governed Engines. Engines with speed governors shall be run at low idle with the throttle closed. The throttle shall then be fully opened as fast as possible. As soon as the engine reaches and stabilizes at governed speed, the throttle shall be fully closed as quickly as possible.

b. Non-Governed Engines. Engines without speed governors shall be operated the same as governed engines except that the throttle shall be closed quickly enough to prevent excessive engine speed and possible damage to the engine. Drivers of vehicles supplied with tachometers should use the tachometer to monitor engine speed.

2.6.5 Visual Reading. The highest sound level observed, exclusive of peaks due to unrelated ambient noise, shall be reported for each test.

2.6.6 Reported Sound Level. The reported sound level for the vehicle shall be the highest reading which is no more than one dB higher than the next highest reading.

2.6.7 Stationary Motor Vehicle Test Form. A form to record all pertinent information and data is presented in Figure 2-2. This form, NPCS-24 or any other Department approved form for this use, shall be used for stationary tests.

STATIONARY VEHICLE NOISE TEST

NOISE POLLUTION DIVISION
DEPARTMENT OF ENVIRONMENTAL QUALITY

DATE

YEAR	VEHICLE MAKE	VEHICLE TYPE	LICENSE NO.	MODEL

REGISTERED OWNER

ADDRESS

DRIVER

D.L. NO.

ADDRESS

ENGINE TYPE	HP	ENGINE DISPLACEMENT	LOCATION	VEHICLE MILEAGE

EXHAUST OUTLET	CHECK POSITION AND SIZE OF OUTLET	RESONATORS	MUFFLER TYPE	TIRE SIZE	GEAR RATIOS
☐ Single ☐ L. Side ☐ Rear ☐ Dual ☐ R. Side ☐ Vertical	☐ Straight ☐ 45° to rear ☐ 45° to Side ☐ ___ dia	☐ Single ☐ Dual		___ x ___	Diff. ___ : ___ Spkt. ___ : ___ (No. of Teeth)

RECORDER MODEL AND DEQ NO.

METER MODEL AND DEQ NO.

CALIBRATOR AND DEQ NO.

TEST DRIVER

TEST ENGINEER

METER CHECK
☐ BAT. ☐ WINDSCREEN ☐ "A" SCALE ☐ FAST ☐ CALIB.

OPERATING CONDITIONS	Time	READINGS dBA	READINGS LOCATION NUMBER	MAX. RPM

TEST CONDITIONS

WEATHER CONDITION	TEMP.	R.H.	WIND SPEED

Sketch in this space the measurement site peculiarities, and using the proper symbols indicate the direction of wind, vehicle orientation and reading locations.

Key: WIND DIRECTION - - - →
VEHICLE ←→
MICROPHONE LOCATION NO. ⇨

INSTRUMENTATION SET UP AT 25 FT FROM EDGE OF VEHICLE

NPCS-24

Figure 2.2

Stationary Vehicle Noise Test

CHAPTER 3

IN-USE VEHICLE MOVING SOUND LEVEL MEASUREMENTS

Scope. This chapter describes the procedure for selecting sites and setting up equipment for measurement of noise from vehicles on the highway, off-road or on water.

This procedure is used to test and monitor moving vehicles at distances of 35 to 118 feet (typically 50 feet) from the vehicle path. The standards for road vehicles and off-road recreational vehicles are found in Tables 3 and 4 of OAR 340-35-030.

Measurement Sites.

3.2.1 Types of Sites. Two types are established for measuring vehicles in use on the highway. They are a standard measuring site requiring a large clear open area and a restricted measuring site in which sound-reflecting objects are permitted. When selecting measuring sites, care shall be taken to measure sites carefully and determine if a correction factor must be applied.

3.2.2 Standard Measuring Sites. Standard measuring sites are those where the microphone can be placed 50 feet from the center of the vehicle path and where there are no sound-reflecting objects within 100-foot radius of the microphone point (which is the point on the vehicle path that is closest to the microphone). (See Figure 3-1) When making measurements of vehicle sound levels in standard measuring sites, the instrument readings shall be recorded with no correction factor applied.

3.2.3 Restricted Measuring Sites. Restricted measuring sites are those where the distance from the center of the vehicle path to the microphone is other than 50 feet or where there are sound reflecting surfaces closer than 100 feet from the microphone or the microphone point. Vehicle noise measurements may be made in such areas when the proper correction factors described in this chapter are applied to the recorded sound levels. (See Figure 3-2)

3.2.4 Measuring Distance. The actual distance from the microphone to the microphone point at the center of the vehicle path may range from 35 to 118 feet when the factor obtained from Figure 3-3 is added to the sound level meter readings to correct the reading to what it would be at the standard measuring distance of 50 feet.

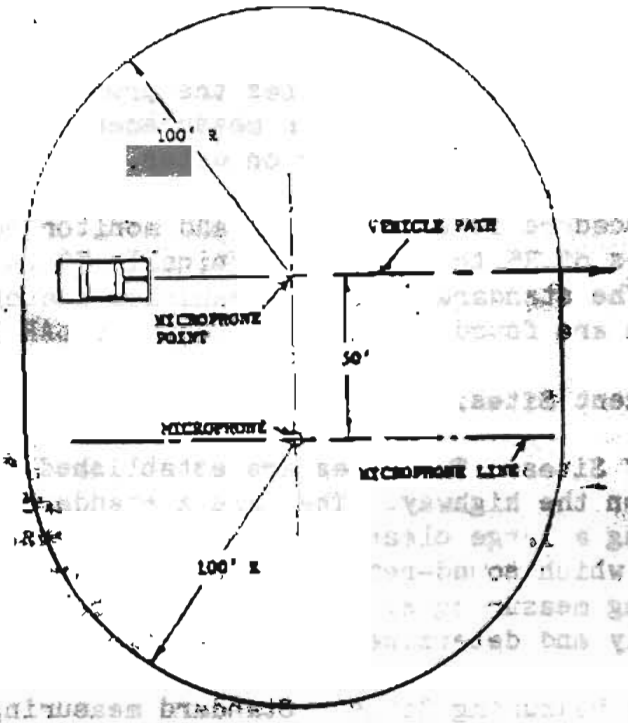


Fig. 3-1. Standard Measuring Site

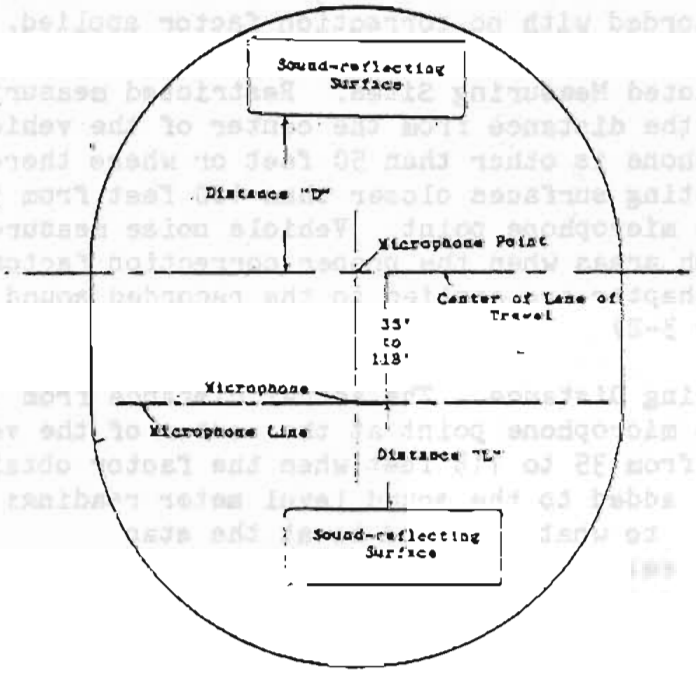


Fig. 3-2. Restricted Measuring Site

Distance from Microphone to Pathway Centerline	dBA Correction Factor
35 - 39 ft	-3
39 - 43 ft	-2
43 - 48 ft	-1
48 - 58 ft	0
58 - 70 ft	+1
70 - 83 ft	+2
83 - 99 ft	+3
99 - 118 ft	+4

Example: If the distance between the microphone and the pathway centerline is 36 feet instead of 50 feet and a vehicle is measured at 90 dBA, the recorded reading will be as follows:

90	dBA	Uncorrected reading
-3	dBA	Correction factor
87	dBA	Corrected reading

Fig 3-3 Measuring Distance Correction Factors

3.2.5 Sound-reflecting Surfaces. A "sound-reflecting surface" is any object or landscape surface in the immediate vicinity of a measurement site which reflects sufficient sound to require the application of a correction factor to the sound level meter reading.

a. Correction factors determined from paragraph 3.2.7 may be applied only when sound-reflecting surfaces are basically parallel to the lane of travel.

b. A basically parallel surface may have irregularities or projections of not more than two feet measured perpendicular to the lane of travel, with the distance to the microphone line or vehicle path measured from the closest point of the projection.

3.2.6 Surfaces Not Requiring Correction Factors. Correction factors shall not be applied to the sound level reading when the following surfaces are within the measuring area defined by paragraph 3.2.2:

a. Any surface that measures less than eight feet in length in a direction parallel to the vehicle path, regardless of height (such as telephone booth or tree trunk) or less than one foot in height, regardless of length (such as a curb or guard rail).

b. Any vertical surface, regardless of size (such as billboard) with the lower edge more than fifteen feet above the surface.

c. Any uniformly smooth slanting surface with less than a forty-five degree slope above horizontal.

d. Any slanting surface with a forty-five to ninety degree slope above horizontal where the line at which the slope begins to exceed forty-five degrees is more than fifteen feet above the surface.

e. Any trees, brushes, shrubs, hedges, grass or other vegetation.

3.2.7 Correction Factors for Sound-reflecting Surfaces. Correction factors to be applied to sound level meter readings when there are sound-reflecting surfaces within 100 feet of either the microphone or microphone point are determined as follows:

a. Reflecting Surfaces. Sites where there are sound-reflecting surfaces basically parallel to the vehicle path within the clear area of the standard site may be used by measuring the distances shown in Figure 3.4 and 3.5, and applying the correction factor obtained from the nomogram in Figure 3-6.

b. Smooth Embankments. The point of measurement from smooth embankments shall be the place on the embankment where the slope begins to exceed forty-five degrees above horizontal (See Figure 3-4). The point of measurement from irregular embankments shall be the place on the embankment where the irregularity begins. A smooth embankment is one with vegetation, concrete, asphalt, dirt or other relatively smooth cover.

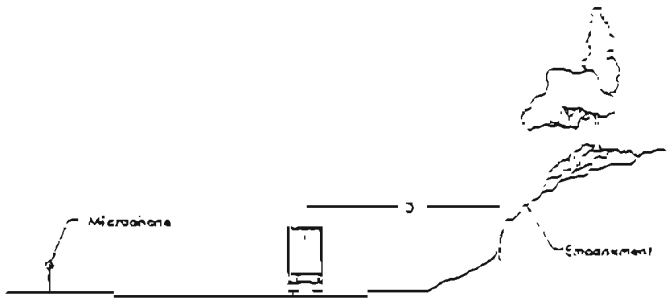


Fig. 3-4. Measurement of Distance to Embankment

c. Taking Measurements. To determine the correction factor for sound-reflecting surfaces within the measuring site, measure the distances shown in Figure 3-5. Measurement "D" is the shortest distance between the sound-reflecting surface and the centerline of the lane of travel. Measurement "L" is the shortest distance between the sound-reflecting surface and a line parallel to the lane of travel that passes through the microphone (microphone line).

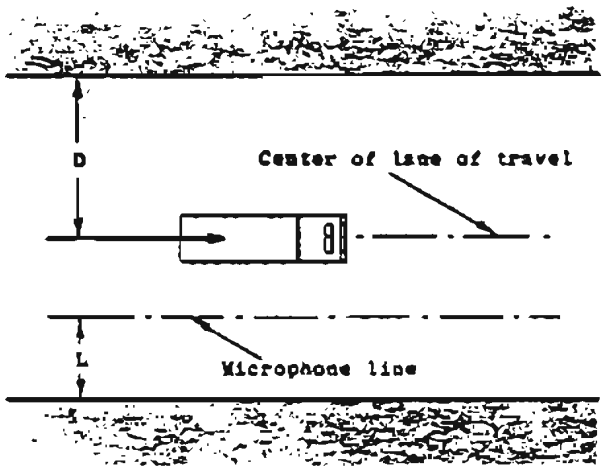
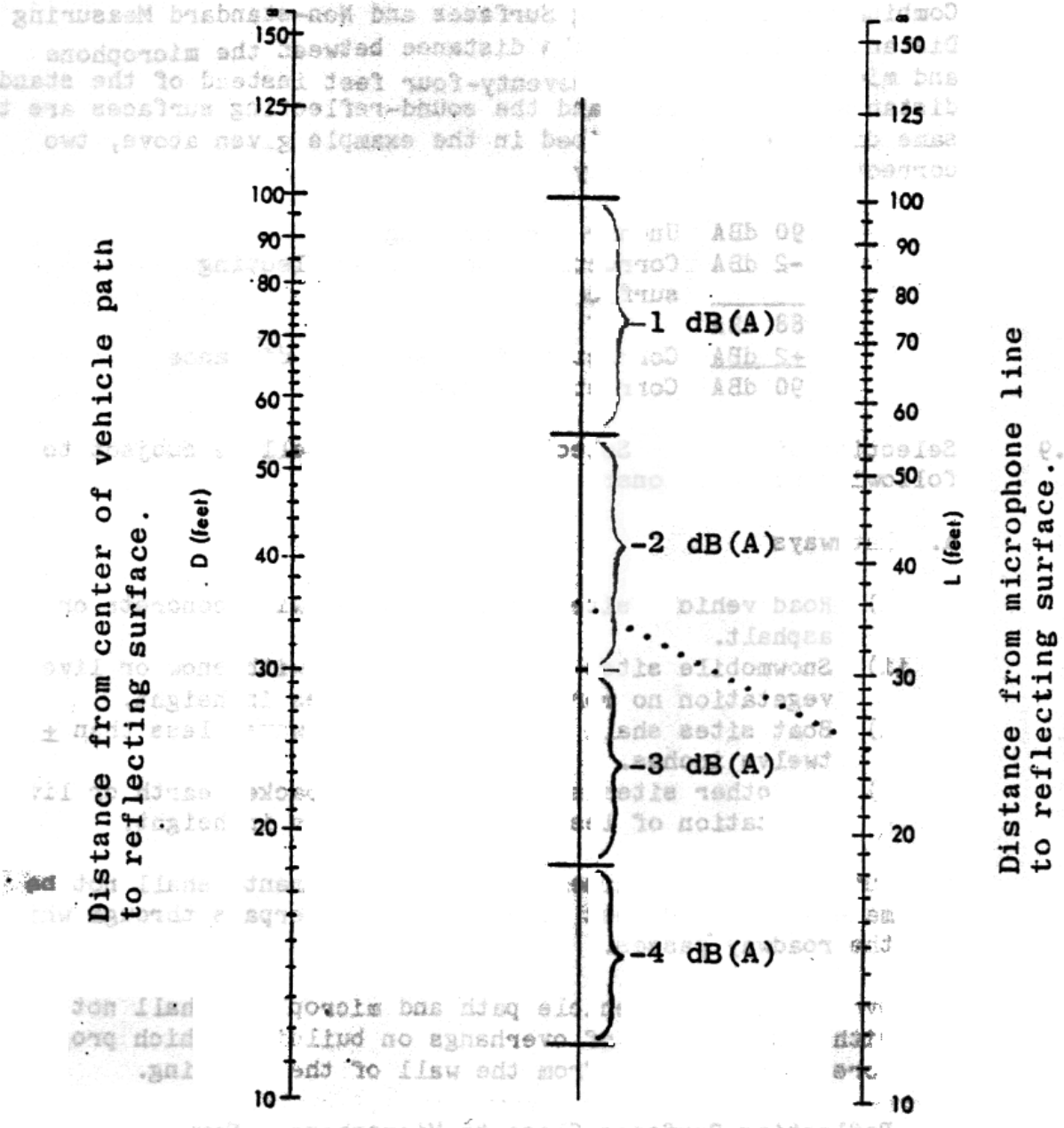


Fig. 3-5 Correction Factor Distances "D" and "L"

d. Determining Correction Factor. Locate the points on the left and right scales of the nomogram (Figure 3-6) corresponding to the distances "D" and "L." Place a straight edge across the nomogram so that it connects the two points. The point where the straight edge intersects the center axis indicates the correction factor to be applied to the sound level meter reading.

e. Example. The dotted line in Figure 3-6 illustrates the use of the nomogram for a reflecting surface fifty-two feet from the center of the lane of travel (distance "D") and one twenty-five feet from the microphone line (distance "L"). These measurements plotted on the nomogram result in a correction factor of -2 dBA. With the microphone at the standard measuring distance of fifty feet and a vehicle measured at ninety dBA, the corrected reading would be recorded as follows.

90 dBA	Uncorrected reading
-2 dBA	Correction from Figure 3-6
88 dBA	Corrected reading



On centerline read dB(A) correction to be subtracted from meter reading.

Fig. 3-6 Nomogram for Reflecting Surfaces

3.2.8 Combination of Reflecting Surfaces and Non-standard Measuring Distance. Example. If the distance between the microphone and microphone point is seventy-four feet instead of the standard distance of fifty feet and the sound-reflecting surfaces are the same distances as described in the example given above, two corrections are necessary.

90 dBA	Uncorrected reading
-2 dBA	Correction for sound-reflecting surfaces
88 dBA	
+2 dBA	Correction for measuring distance
90 dBA	Corrected reading

3.2.9 Selection of Sites. Selection of sites shall be subject to the following restrictions:

a. Pathways

i) Road vehicle sites shall be paved with concrete or asphalt.

ii) Snowmobile sites shall be covered with snow or live vegetation no more than four inches in height.

iii) Boat sites shall be on water with waves less than ± twelve inches.

iv) All other sites shall be on hard packed earth or live vegetation of less than four inches in height.

b. Tunnels and Overpasses. Sound measurements shall not be made within 100 feet of a tunnel or overpass through which the roadway passes.

c. Overhangs. The vehicle path and microphone shall not be within fifty feet of overhangs on buildings which project more than two feet from the wall of the building.

d. Reflecting Surfaces Close to Microphone. Sound reflecting surfaces, other than the ground or water, shall be no closer than ten feet from the microphone line.

e. Reflecting Surfaces Close to Lane of Travel. Sound reflecting surfaces shall be no closer than ten feet from the center of the lane of travel for a distance of 100 feet parallel to the vehicle path on either side of the microphone point.

f. Non-parallel Reflecting Surfaces. Large reflecting surfaces that are not basically parallel to the lane of travel shall be 100 feet or more from the microphone or microphone point. (see Figure 3-7).

g. Grades. The standards for road vehicles on "level roadways" contained in Table 3 of OAR 340-35-030 may be applied to vehicles traveling on any roadway that does not exceed a grade of plus two (2) percent.

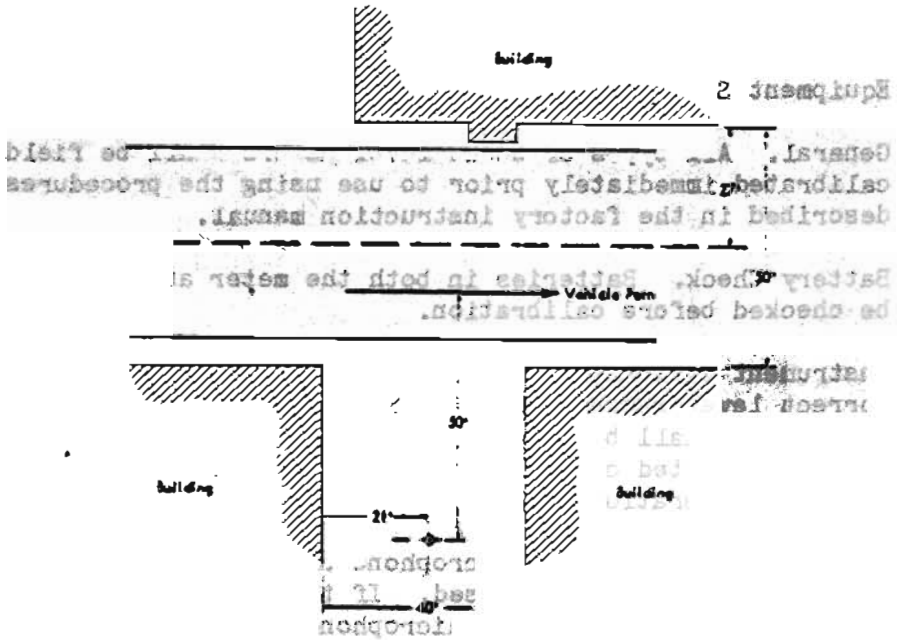


Fig. 3.7. Unacceptable Measuring Site

3.3 Sound Level Measuring Precautions

3.3.1 Identification. It is most important that the noise recorded is actually from the vehicle being measured. Care must be taken to ensure that noise from another vehicle does not add to that from the one being measured.

3.3.2 Intensity. The sound level of the vehicle under scrutiny must rise at least 6 dBA before and fall at least 6 dBA after the maximum sound level occurs.

3.3.3 Recording. The sound level recorded shall be the highest level obtained as the vehicle passes by, disregarding unrelated peaks due to extraneous ambient noises.

3.3.4 Wind. Always use the wind screen on the microphone when taking measurements. Do not conduct measurements when wind velocity at the test location exceeds ten miles per hour.

3.3.5 Precipitation. Do not conduct measurements when falling precipitation affects results. Streets shall be dry during road vehicle measurements.

Ambient Noise. The ambient sound level shall be at least 10 dBA below the sound level of the vehicle being measured.

3.4 Equipment Setup and Use

3.4.1 General. All types of sound level meters shall be field calibrated immediately prior to use using the procedures described in the factory instruction manual.

Battery Check. Batteries in both the meter and calibrator shall be checked before calibration.

3.4.3 Instrument Calibration. The instrument shall be set to the correct level range, weighting scale and meter response. The calibrator shall be placed on the microphone of the meter. The output indicated on the meter shall then be adjusted to the correct calibration level.

Microphone Height. The microphone shall be placed on a tripod if an extension cable is used. If the cable is not used, the sound level meter with the microphone attached may be hand held or placed on a tripod. The microphone shall be positioned at height of 4 $\pm$ 1/2 ft as shown in Figure 3.8.

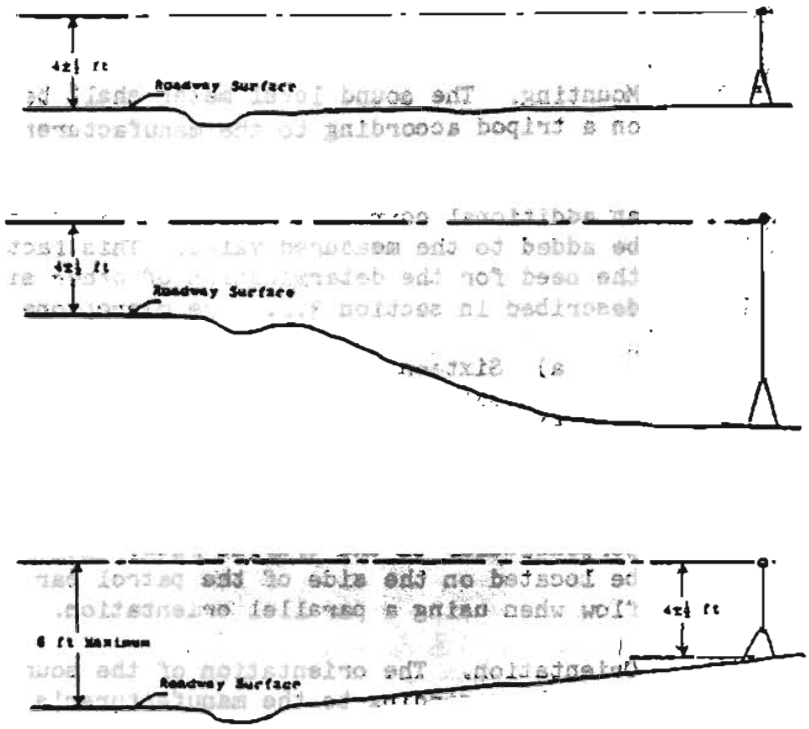


Fig. 3-8. Microphone Height

3.4.5 Windscreens. Windscreens made of open cell polyurethane foam furnished by the instrument manufacturer shall be placed over the microphone after calibration.

3.4.6 Annual Calibration. Within one year prior to use, each set of sound measuring instruments, sound level meter including octave band filter, and calibrator, shall receive a laboratory calibration in accordance to the manufacturer's specifications. This calibration shall be traceable to the National Bureau of Standards.

COMMENT: An inspection label will be attached to each instrument set to determine when the calibration was performed.

3.5 Sound Level Measurement

3.5.1 Preliminary Steps. The following steps shall be followed before taking a measurement.

a) Turn meter on.

b) Switch meter to "A" weighting scale.

c) Switch meter to "FAST" response.

d) Set the meter to the appropriate range to measure the anticipated sound level.

3.5.2 Mounting. The sound level meter shall be hand held or placed on a tripod according to the manufacturer's instructions.

The meter microphone may also be mounted above a patrol car with an additional correction factor of minus two decibels (-2 dBA) to be added to the measured value. This factor does not preclude the need for the determination of other site correction factors described in section 3.2. The microphone shall be mounted:

a) Sixteen (16) to twenty-four inches above the plane of the car roof, and
b) Not fore of the roof-windshield line nor aft of the roof-rear window line.

The patrol vehicle may be orientated either parallel or perpendicular to the traffic flow. However, the microphone shall be located on the side of the patrol car closest to the traffic flow when using a parallel orientation.

3.5.3 Orientation. The orientation of the sound level meter microphone shall be according to the manufacturer's instructions to obtain random incidence.

3.5.4 Variations. Allowances are necessary due to unavoidable variations in measurements sites and test equipment. Vehicles are not considered in violation unless they exceed the regulated limit by 2 dBA or more.

3.6 Vehicle Test Procedures

The moving vehicle test can be made after the following steps are accomplished.

a) The test site is selected and correction factors are determined as defined in Section 3.2.

b) The necessary measuring precautions are taken as described in Section 3.3.

c) The test equipment is setup as described in Section 3.4.

A form to record all pertinent information and data is presented in Figure 3-9. This form, NPCS-25, or any other Department approved form for this use shall be used for the moving vehicle noise tests.

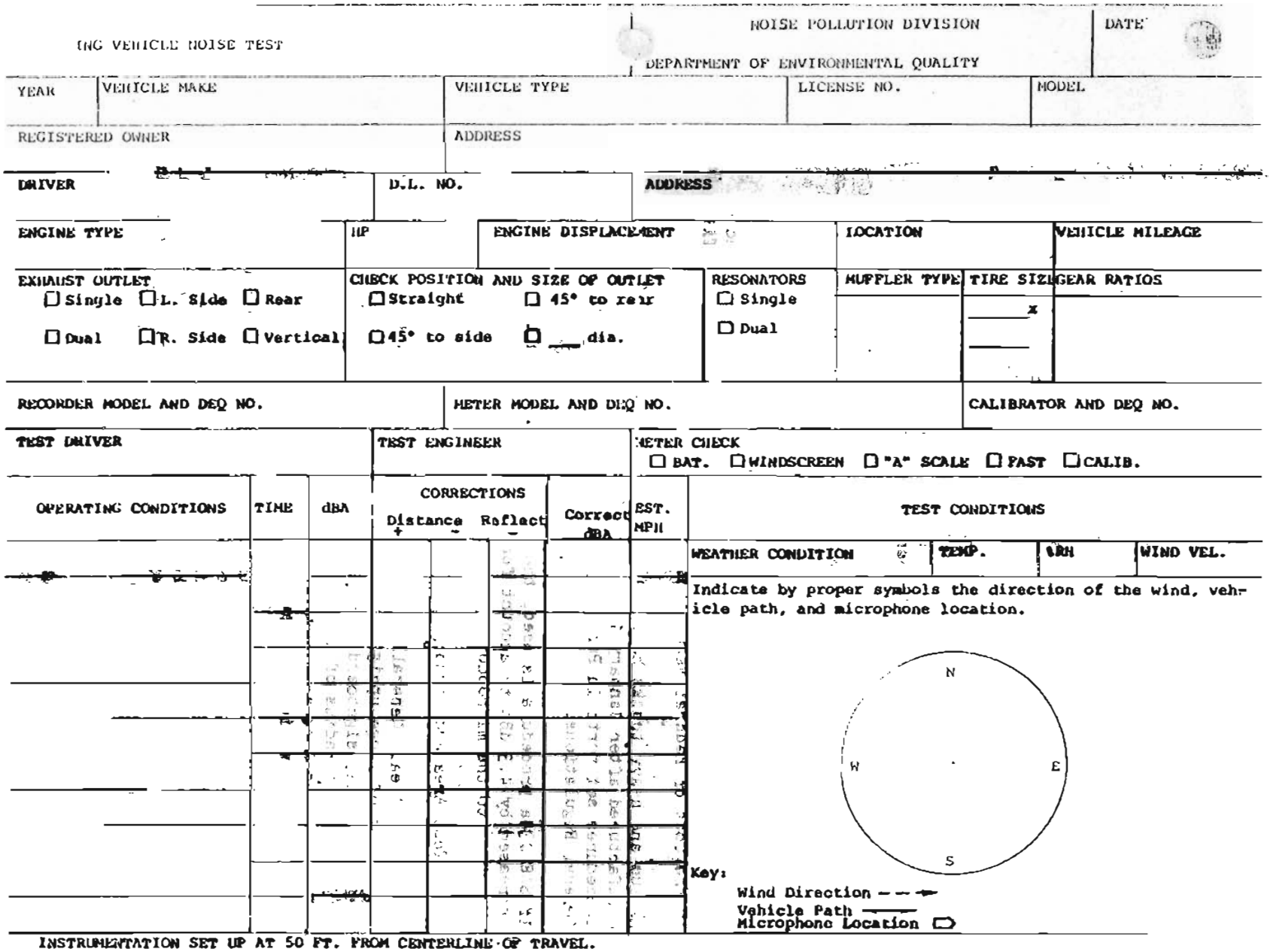


Figure 3-9

Moving Motor Vehicle Test

CHAPTER 4

NEW VEHICLE SOUND LEVEL MEASUREMENT

4.1 Scope. This Chapter establishes procedures for setting up and calibrating sound measuring equipment and conducting tests to determine vehicle sound level output.

OAR 340-35-025 requires all new motor vehicles offered for sale be certified as meeting noise emission limits specified in Table 1. Standards are established for new motorcycles, snowmobiles, automobiles, trucks, buses and motorboats. Emission test procedures for each of these categories are described in this chapter. In lieu of the procedures of this chapter, the following procedures adopted by the Society of Automotive Engineers (SAE) have also been approved:

Motorcycles	SAE J331a*
Snowmobiles	SAE J192a
Autos & Light Trucks	SAE J986NOV 81
Trucks and Buses	SAE J366b**
Motorboats	SAE J34***

Revised 4-1-88

* Motorcycles manufactured after December 31, 1982 shall be tested in accordance with procedures set forth in Part 205 Subpart D of Title 40 of the Code of Federal Regulations.

** Medium and heavy trucks having a GVWR in excess of 10,000 pounds and manufactured after January 1, 1978 shall be tested in accordance with procedures set forth in Part 205 Subpart B of Title 40 of the Code of Federal Regulations.

*** If SAE J34a procedure is used, the resulting emission levels shall be increased by 4.3 dBA to account for the increased distance from the motorboat to the microphone.

4.2 Test Area and Personnel.

4.2.1 Test Area. Generally, the test area shall be a flat open space free of large upright sound reflecting surfaces, such as parked vehicles, signboards, building, or hillsides, located within 100 feet radius of the microphone as shown in Figure 4-1. Detailed test area layouts are provided in Section 4.5 for specific vehicle categories.

4.2.2 Surface Condition. The surface of the ground within the measuring site for road vehicles shall be smooth asphalt or concrete free of snow, soil or ashes in at least the triangular area formed by the microphone location and points on the vehicle path 50 feet before and beyond the microphone point. The ground surface in the above area for snowmobiles shall be live

vegetation (grass) no more than four inches in height. Motorboats shall be tested on a calm water surface.

4.2.3 Roadway Surface. The surface of the vehicle path shall be dry, smooth asphalt or concrete pavement free of extraneous material, except that the pathway for snowmobiles shall be covered with live vegetation (grass) no more than four inches in height or a maximum of three inches of loose snow over a base of at least two inches of compacted snow.

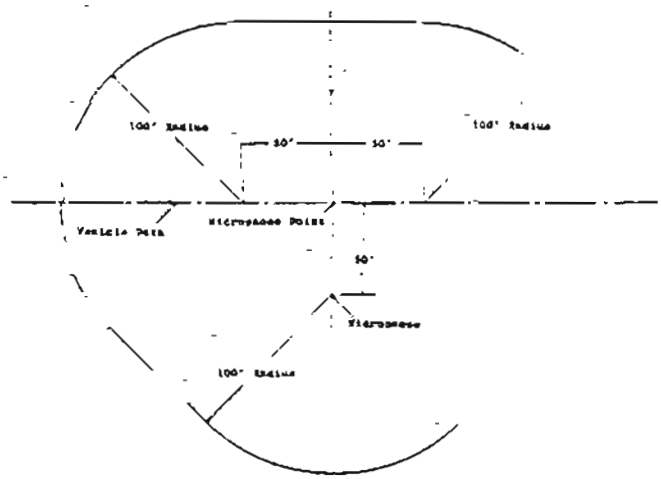


Fig. 4-1. New Vehicle Test Area Layout

4.2.4 Wind. Do not conduct sound measurements when wind velocity at the test area exceeds ten miles per hour.

4.2.5 Personnel Location. Excercise care to prevent interference with sound level measurements caused by personnel in the measuring area.

a. Bystander Location. Bystanders shall remain at least fifty feet from the microphone and the vehicle being measured during sound level measurements.

b. Technician Location. The technician making direct readings from the sound level meter with microphone attached shall stand with the instrument positioned in accordance with the manufacturer's instructions.

Equipment Setup and Use.

General. All types of sound level meters shall be field calibrated immediately prior to use using the procedures described in the factory instruction manual.

4.3.2 Battery Check. Batteries in both the meter and calibrator shall be checked before calibration.

Instrument Calibration. The instrument shall be set to the correct level range, weighting scale, and meter response. The calibrator shall be placed on the microphone of the meter. The output indicated on the meter shall then be adjusted to the correct calibration level.

4.3.4 Microphone Location. Attach the microphone or sound level meter to the tripod, extending the tripod legs so that the microphone, when aimed at the microphone point, will be at a height of 4 ± 1/2 ft. above the plane of the roadway or water surface. Position the tripod so the microphone is at a distance of 50 ± 1 ft. from the center of the lane of travel.

COMMENT: Connect extension cable between the instruments. Secure the cable to the foot of the tripod leg nearest the recorder location. This will help prevent the tripod from being pulled over by an accidental tug on the cable.

4.3.5 Windscreens. Windscreens made of open cell polyurethane foam furnished by the instrument manufacturer shall be placed over the microphone after calibration.

COMMENT: The windscreen reduces the effect of wind noise and protects the microphone diaphragm from dust or other airborne matter.

Annual Calibration. Within one year prior to use, each set of sound measuring instruments, sound level meter including octave band filter, and calibrator, shall receive a laboratory calibration in accordance to the manufacturer's specifications. This calibration shall be traceable to the National Bureau of Standards.

COMMENT: An inspection label will be attached to each instrument set to determine when the calibration was performed.

Sound Level Measurement

Preliminary Steps. The following steps shall be followed before taking a measurement.

a) Turn meter on.

b) Switch meter to "A" weighting scale.

c) Switch meter to "FAST" response.

d) Set the meter to the appropriate range to measure the anticipated sound level.

4.4.2 Mounting. The sound level meter shall be placed on a tripod according to the manufacturer's instructions.

4.4.3 Orientation. The orientation of the sound level meter microphone shall be according to the manufacturer's instructions !to obtain random incidence1.

4.4.4 Variations. Allowances are necessary due to unavoidable variations in measurement sites and test equipment. Vehicles are not considered in violation unless they exceed the regulated limit by 2 dBA or more.

4.4.5 Weather Measurement. Record wind velocity and direction with a wind gauge, and temperature and relative humidity with a sling psychrometer or other Department approved instruments.

4.4.6 Data Recording. Record all required vehicle data, type of test equipment, and weather information on the New Vehicle Test Form, (NPCS-26), as shown in Figure 4-2 or any other form approved in writing by the Department.

4.5 New Vehicle Test Procedure

4.5.1 Vehicle Sound Level. The sound levels for new motor vehicles shall be determined by tests performed according to procedures established for each particular class of vehicle.

4.5.2 Definitions. For the purpose of these procedures, the following terms have the meanings indicated:

a. Maximum RPM. "Maximum rpm" means the maximum governed engine speed, or if ungoverned, the rpm at maximum engine horsepower as determined by the engine manufacturer in accordance with the procedures in Society of Automotive Engineers Standard, Engine Power Test Code - Spark Ignition and Diesel - SAE J1349 DEC 80.

b. Microphone Point. "Microphone point" means the unmarked location on the center of the lane of travel that is closest to the microphone.

c. Vehicle Reference Point. "Vehicle reference point" means the location of the vehicle used to determine when the vehicle is at any of the points on the vehicle path. The primary vehicle reference point is the front of the vehicle.

NEW VEHICLE NOISE TEST

DEPARTMENT OF ENVIRONMENTAL QUALITY

DATE

YEAR	VEHICLE MAKE	VEHICLE TYPE	LICENSE NO.	MODEL
REGISTERED OWNER		ADDRESS		
DRIVER	D.L. NO.	ADDRESS		
ENGINE TYPE	HP	ENGINE DISPLACEMENT	LOCATION	VEHICLE MILEAGE

EXHAUST OUTLET
☐ Single ☐ L. Side ☐ Rear
☐ Dual ☐ R. Side ☐ Vertical

CHECK POSITION AND SIZE OF OUTLET
☐ Straight ☐ 45° to rear
☐ 45° to side ☐ dia.

RESONATORS
☐ Single
☐ Dual

MUFFLER TYPE

TIRE SIZE

Diff. ____ : ____
Sprkt. ____ : ____
(No. of Teeth)

RECORDER MODEL AND DEQ NO.	METER MODEL AND DEQ NO.	VEHICLE SUPPLIED BY	CALIBRATOR AND DEQ NO.

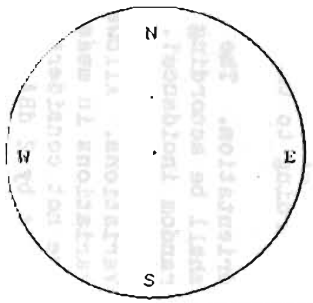
TEST DRIVER	TEST ENGINEER	METER CHECK
		☐ BAT. ☐ WINDSCREEN ☐ "A" SCALE ☐ FAST ☐ CALIB.

OPERATING CONDITIONS	TIME	dBA READINGS L.S.	dBA READINGS R.S.	MAXIMUM RPM	MAXIMUM MPH

TEST CONDITIONS

WEATHER CONDITION	TEMP.	%RH	WIND VEL.

Indicate by proper symbols the direction of the wind, vehicle path, and microphone location.



Key:
Wind Direction
Vehicle Path
Microphone Location

INSTRUMENTATION SET UP AT 50 FT. FROM CENTERLINE OF TRAVEL.

NPCS-26

Figure 4-2
New Vehicle Test

4.5.3 Operation

a. Preliminary Runs. Sufficient preliminary runs shall be made to enable the test driver to become familiar with the operation of the vehicle and to stabilize engine operating conditions.

b. Test Runs. At least four test runs shall be made for each side of the vehicle.

c. Reported Noise Level. The reported sound level for each side of the vehicle shall be on the average of the two highest readings on that side which are within 2 dBA of each other. The sound level reported for the vehicle shall be the sound level of the loudest side.

d. Visual Reading and Recording. Visual readings shall be taken from the sound level meter during preliminary test runs and recorded. The readings from the sound level meter shall be compared with those of the recorder and there shall be no more than $\pm$ 0.5 dBA variation between the readings. When the variation is greater, the equipment shall be checked and recalibrated. If the variation still exists, the test shall be conducted using only direct readings from the sound level meter.

4.5.4 Motorcycles. Motorcycles shall be tested as follows:

a. Vehicle Path. The test area shall include a vehicle path of sufficient length for safe acceleration, deceleration, and stopping of the vehicle.

b. Test Area Layout. The following points and zones shown in Figure 4-3 where only one directional approach is illustrated for purposes of clarity, shall be established on the vehicle path so that measurements can be made on both sides of the vehicle:

1. Microphone point.

2. Acceleration point - a location 25 feet before the microphone point.

3. End point - a location 100 feet beyond the microphone point.

4. End zone - the last 75-feet distance between the microphone point and the end point.

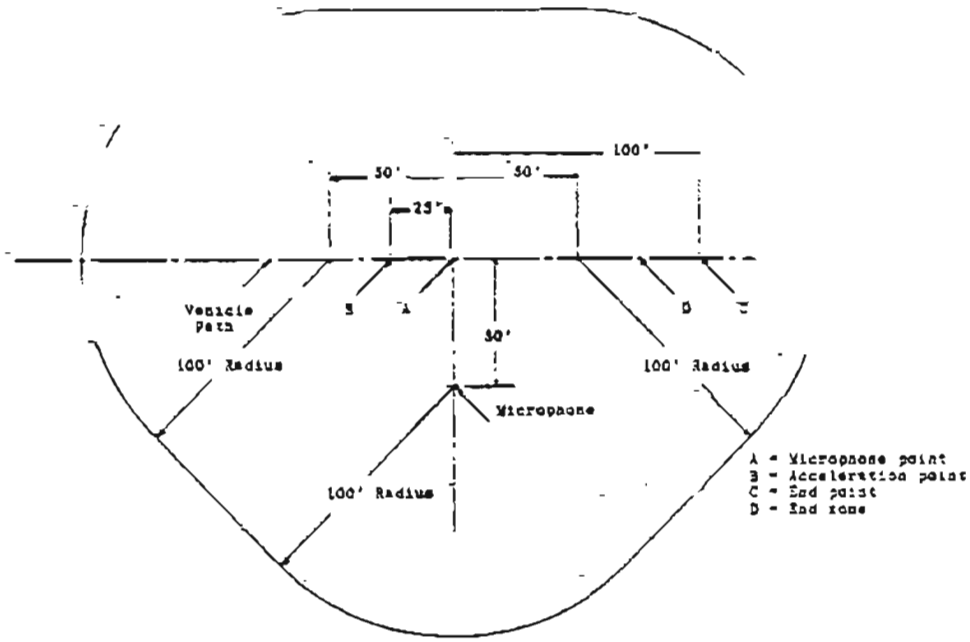


Fig. 4-3. Test Area Layout for Motorcycles

c. Test Procedures. Vehicles shall be tested according to the following procedures:

1. Gear Selection. Motorcycles shall be operated in second gear. Vehicles which reach maximum rpm at less than 30 mph or before a point of 25 feet beyond the microphone point shall be operated in the next higher gear.

If the motorcycle has an automatic transmission or torque converter, then gear selection shall follow the following procedure:

If the gear range is selectable, employ the lowest range. If the vehicle reaches maximum rpm at less than 30 mph or before a point 25 feet beyond the microphone point (see Figure 4-3), use the next higher range. If maximum rpm is reached before a point 25 feet beyond the microphone point when the vehicle is in the highest gear range, then the throttle shall be opened less rapidly, but in such a manner that full throttle and maximum rpm are attained while within the end zone.

If the gear range is not selectable, then the throttle shall be opened less rapidly, but in such a manner that full throttle and maximum rpm are attained while within the end zone.

2. Acceleration. The vehicle shall proceed along the test path at a constant approach speed which corresponds either to an engine speed of 60 percent of maximum rpm or to 30 mph, whichever is lower. When the vehicle reference point reaches the acceleration point, the throttle shall be rapidly and fully opened. The throttle shall be held open until the vehicle reference point reaches the end point or until the maximum rpm is reached within the end zone, at which point the throttle shall be closed. Wheel slip shall be avoided.

3. Deceleration. Tests during deceleration shall be conducted when deceleration noise appears excessive. The vehicle shall proceed along the vehicle path at maximum rpm in the same gear selected for the tests during acceleration. When the reference point on the vehicle reaches the acceleration point, the throttle shall be rapidly closed and the vehicle shall be allowed to decelerate to less than 1/2 of maximum rpm.

4. Engine Temperature. The engine temperature shall be within normal operating range before each test run.

5. Test Weight. The total weight of test driver and test instrumentation shall be 165 lbs. For small drivers, additional weights shall be used to bring the total to 165 lbs.

6. 1983 and Subsequent Models. These models shall be tested in accordance with U.S. EPA procedures. See paragraph 4.1 of this Chapter.

4.5.5 Snowmobiles. Snowmobiles shall be tested as follows:

a. Vehicle Path. The test area shall include a vehicle path of sufficient length for safe acceleration, deceleration, and stopping of the vehicle.

b. Test Area Layout. The following points and zones shown in Figure 4-3, where only one directional approach is illustrated for the purposes of clarity, shall be established on the vehicle path so that measurements can be made on both sides of the vehicle.

1 Microphone point.

2. End point - a location 50 feet beyond the microphone point.

3. Acceleration point - a location on the vehicle path established as follows: Position the vehicle headed

away from the microphone point with the vehicle reference point at 25 feet from the microphone point. From a standing start with transmission in low gear, rapidly apply wide-open throttle, accelerating until maximum rpm is attained. The location on the vehicle path where maximum rpm was attained is the acceleration point for test run in the opposite direction.

4. Maximum rpm zone.

c. Test Procedures. From a standing start, with transmission in low gear and the vehicle reference point positioned at the acceleration point, the throttle shall be rapidly and fully opened and held through the maximum rpm zone until the reference point on the vehicle reaches the end point after which the throttle shall be closed.

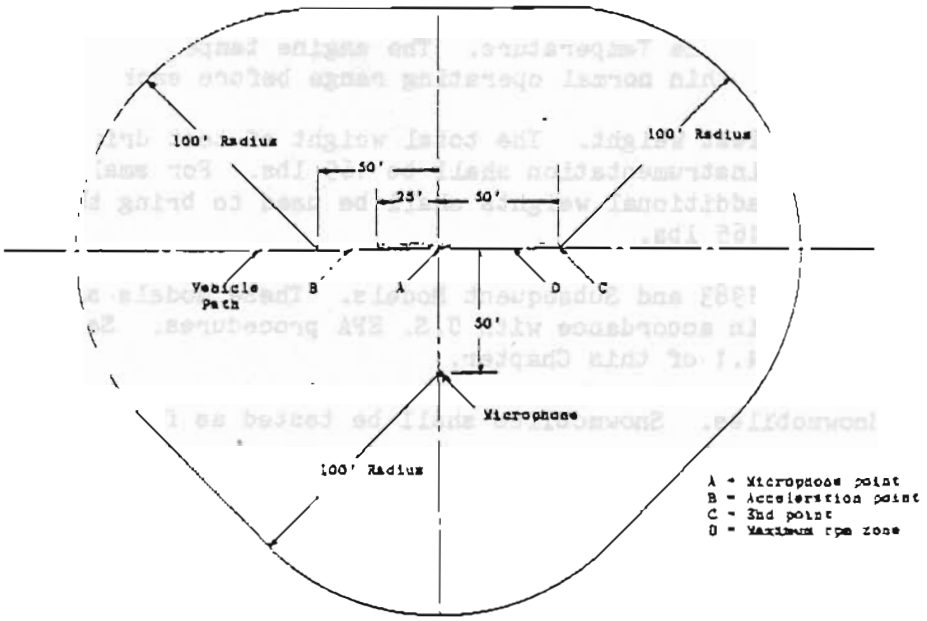


Fig 4-4. Test Area Layout for Snowmobiles

4.5.6 Heavy Trucks, Truck Tractors, and Buses. The test procedure for vehicles with a manufacturer's gross vehicle weight rating of 10,000 lbs or more shall be as follows:

(1) Test Area Layout. The test area shall include a vehicle path of sufficient length for safe acceleration, deceleration, and stopping of the vehicle. The following points and zones shall be established on the vehicle path

as shown in Figure 4-5, where only one directional approach is illustrated for purposes of clarity.

(A) Microphone point.

(B) Acceleration point - a location 50 ft before the microphone point.

(C) End point - a location 50 ft beyond the microphone point.

(D) End zone - the last 40-ft distance between the microphone point and the end point.

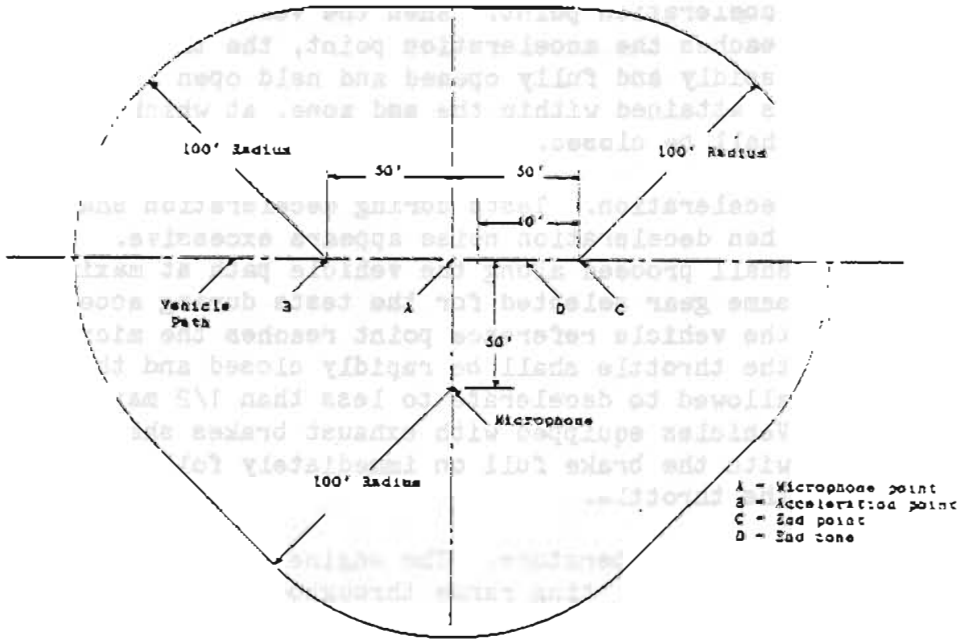


Figure 4-5. Test Area Layout for Trucks.

(2) Gear Selection. A gear shall be selected (manual or automatic transmission) which will result in the vehicle beginning at an approach rpm of no more than 2/3 maximum rpm at the acceleration point and reaching maximum rpm within the end zone without exceeding 35 mph.

(A) When maximum rpm is attained before reaching the end zone, the next higher gear shall be selected, up to the gear where maximum rpm produces over 35 mph.

(B) When maximum rpm still occurs before reaching the end zone, the approach rpm shall be decreased in 100 rpm

increments until maximum rpm is attained within the end zone.

(C) When maximum rpm is not attained until beyond the end zone, the next lower gear shall be selected until maximum rpm is attained within the end zone.

(D) When the lowest gear still results in reaching maximum rpm beyond the end zone, the approach rpm shall be increased in 100 rpm increments above 2/3 maximum rpm until the maximum rpm is reached within the end zone.

(3) Acceleration. The vehicle shall proceed along the vehicle path maintaining the approach engine rpm in the gear selected for at least 50 ft before reaching the acceleration point. When the vehicle reference point reaches the acceleration point, the throttle shall be rapidly and fully opened and held open until maximum rpm is attained within the end zone, at which point the throttle shall be closed.

(4) Deceleration. Tests during deceleration shall be conducted when deceleration noise appears excessive. The vehicle shall proceed along the vehicle path at maximum rpm in the same gear selected for the tests during acceleration. When the vehicle reference point reaches the microphone point, the throttle shall be rapidly closed and the vehicle allowed to decelerate to less than 1/2 maximum rpm. Vehicles equipped with exhaust brakes shall also be tested with the brake full on immediately following closing of the throttle.

(5) Engine Temperature. The engine temperature shall be within normal operating range throughout each test run.

(6) Demand-Activated Fans. If the test vehicle contains a demand-activated fan, the fan may be in the "off" position during the test.

(7) 1978 and Subsequent Model Trucks. These models shall be tested in accordance with U.S. EPA procedures. See paragraph 4.1 of this Chapter.

4.5.7 Automobiles, Light Trucks, Truck Tractors, Buses, and All Other Vehicles. The test procedure for trucks, truck tractors, and buses with a manufacturer's gross vehicle weight rating of less than 10,000 lbs and all passenger cars shall be as follows:

1) Test Area Layout. The test area shall include a vehicle path of sufficient length for safe acceleration, deceleration, and stopping of the vehicle. The following

points and zones shall be established on the vehicle path as shown in Figure 4-6, where only one directional approach is illustrated for purposes of clarity:

Microphone point.

(B) Acceleration point - a location 25 ft before the microphone point.

End point - a location 100 ft beyond the microphone point.

End zone - the last 75-ft distance between the microphone point and the end point.

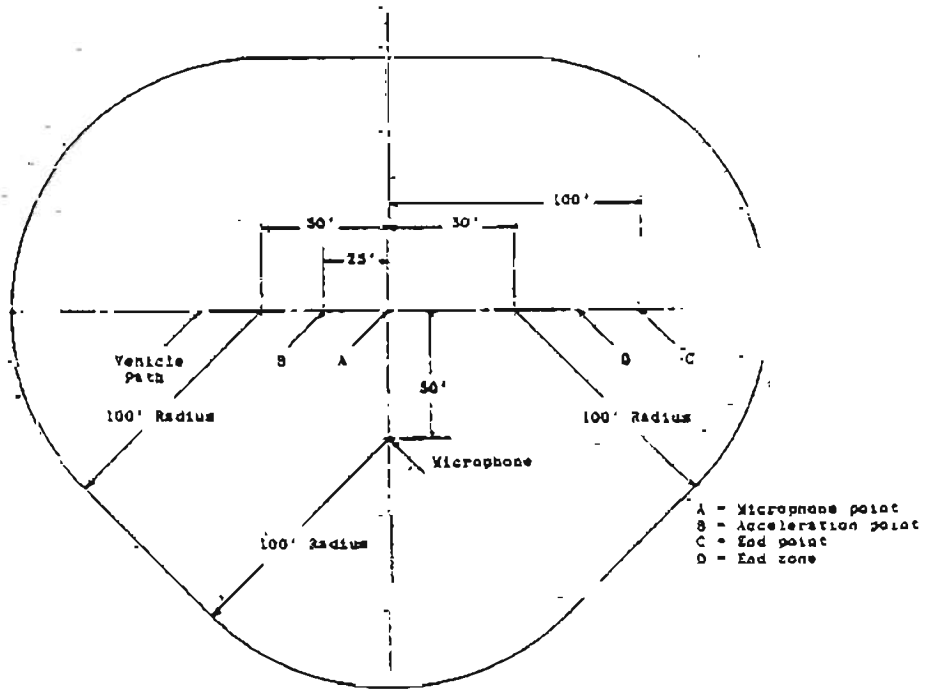


Figure 4-6. Test Area Layout for Passenger Cars

(2) Gear Selection. Motor vehicles equipped with three-speed manual transmissions and with automatic transmissions shall be operated in first gear. Vehicles equipped with manual transmissions of four or more speeds shall be operated in first gear and in second gear. Vehicles which reach maximum rpm at less than 30 mph or before reaching the end zone shall be operated in the next higher gear. Auxiliary step-up ratios (overdrive) shall not be engaged on vehicles so equipped.

Acceleration. The vehicle shall proceed along the vehicle path at a constant speed of 30 mph in the selected gear for at least 50 ft before reaching the acceleration point. When the vehicle reference point reaches the acceleration point, the throttle shall be rapidly and fully opened. The throttle shall be held open until the vehicle reference point reaches the end point or until maximum rpm is reached within the end zone. At maximum rpm, the throttle shall be closed sufficiently to keep the engine just under maximum rpm until the end point, at which time the throttle shall be closed.

(4) Deceleration. Tests during deceleration shall be conducted when deceleration noise appears excessive. The vehicle shall proceed along the vehicle path at a stabilized engine speed (rpm) the same as the maximum engine speed attained during the acceleration test and in the same gear. This approach speed is rated engine speed, if attained in the acceleration test mode, or the average of the terminal engine speed values at the end of the end zone as determined from the acceleration test. When the front of the vehicle reaches the acceleration point, the throttle shall rapidly be closed and the vehicle allowed to decelerate to one-half the approach speed or until the front of the vehicle reaches the end of the end zone.

(5) Engine Temperature. The engine temperature shall be within normal operating range throughout each test run. The engine shall be idled in neutral for at least one minute between runs.

4.5.8 Motorboats. The test procedure for motorized water craft (motorboats) shall be as follows:

Test Area Layout. A suitable test site is a calm body of water, large enough to allow full-speed pass-bys. The area around the microphone and boat shall be free of large obstructions, such as buildings, boats, hills, large piers, breakwater, etc., for a minimum distance of 100 ft. (30 m). Three markers (buoys or posts) will be placed in line, 50 ft. (15 m) apart, to mark the course the boat is to follow while being tested.

(2) Test Procedure. The boat shall pass all three markers on a straight course at wide-open throttle with the engine operating at the midpoint of the manufacturer's recommended full-throttle rpm range. The engine speed tolerance shall be $\pm$ 100 rpm if this falls in the recommended full-throttle

speed range. If a single top speed rpm is recommended, the tolerance shall be +0, -100 rpm.

(3) Measurements. The microphone shall be placed 50 ft (15 m) from the line determined by the three markers, normal to the line and opposite the center marker. It will also be placed 3 1/2 - 4 1/2 ft (1.1 - 1.4 m) above the water surface, and no closer than 2 ft (0.6 m) from the surface of the dock or platform on which the microphone stands, as near to the end of the dock as possible or overhanging the end of the dock. Measurements shall be taken while the boat is passing no more than three (3) feet (0.9 m) on the far side of all three markers.

CHAPTER 5

AUXILIARY EQUIPMENT SOUND LEVEL MEASUREMENT

5.1 Scope. This Chapter establishes procedures for setting up and calibrating sound measuring equipment and conducting tests to determine the sound level output of auxiliary motor vehicle equipment.

5.2 Measurement Sites. Measurement sites shall be free of sound-reflecting objects within one-hundred feet of the microphone and one-hundred feet of the vehicle to be tested.

5.2.1 Microphone Location. The microphone shall be located fifty feet ± six inches from the rear or from either side of the equipment to be tested. The locus of points thus defined is the microphone line. (See Figure 5-1) The microphone should be located at the point on the microphone line at which the maximum sound level occurs.

5.2.2 Sound-reflecting Surfaces. A "sound-reflecting surface" is any object or landscape surface in the immediate vicinity of a measurement site which reflects sufficient sound to require the application of a correction factor to the sound level meter reading. Surfaces which are not sound-reflecting surfaces are defined in paragraph 5.2.3, and all other surfaces are considered sound-reflecting surfaces.

5.2.3 Surfaces Which are not Sound-reflecting. The following surfaces may be present in the test area:

a. Any surface that measures less than eight feet in length in a direction parallel to the portion of the microphone line on which the microphone is positioned, regardless of height (such as a telephone booth or a tree trunk) or less than one foot in height, regardless of length (such as a curb or guard rail).

b. Any vertical surface, regardless of size (such as a billboard with the lower edge more than fifteen feet above the roadway).

c. Any uniformly smooth slanting surface with less than a forty-five degree slope above horizontal.

d. Any slanting surface with a forty-five to ninety degree slope above the horizontal where the line at which the slope begins to exceed forty-five degrees is more than fifteen feet above the roadway.

e. Any trees, bushes, shrubs, hedges, grass or other vegetation.

5.3 Sound Level Measuring Precaution

5.3.1 Wind. Do not conduct measurements when wind velocity at the test location exceeds ten miles per hour.

5.3.2 Precipitation. Do not conduct measurements when falling precipitation affects results. However, measurements may be taken when streets are wet.

5.3.3 Ambient Noise. The ambient sound level shall be at least 10 dBA below the sound level of the equipment being measured.

5.3.4 Recording. The sound level recorded shall be the highest level obtained during each test, disregarding unrelated peaks due to extraneous ambient noises.

Equipment Setup and Use

5.4.1 Microphone Height. The sound level meter may be hand held or placed on a tripod. The microphone shall be positioned four and one-half feet above the ground.

5.4.2 Windscreens. Windscreens made of open cell polyurethane foam furnished by the instrument manufacturer may be placed over the microphone after calibration. The windscreen reduces the effect of wind noise and protects the microphone diaphragm from dust or other airborne matter.

5.4.3 Sound Level Meter Setup and Use. Procedures for setup, calibration and use of the sound level meter is contained in this section.

a) General. All types of sound level meters shall be calibrated using the procedures described in the factory instruction manual. All instruments shall be calibrated prior to use. A general discussion of calibration procedures follows.

b) Battery Check. The state of the battery shall be checked before the calibration of the instrument. Batteries in both the meter and the calibrator shall be checked.

c) Instrument Calibration. The instrument shall be set to the correct level range, weighting scale and meter response. The calibrator shall be placed on the microphone of the meter. The output indicated on the meter is then adjusted to the correct calibration level using a screwdriver on the adjustment screw.

d) Annual Calibration. Annually, or when determined to be necessary, each set of sound measuring instruments, sound level meter and calibrator, shall be returned for calibration to the manufacturer's specifications. An inspection label will be attached to each instrument set to determine when the calibration was performed.

e) Sound Level Measurement

1 The following steps should be followed before taking a measurement

(a) Turn the meter on.
(b) Switch on the "A" weighting scale.
(c) Switch on the "FAST" meter response.
(d) Set the meter to the appropriate number to measure the anticipated sound level.

2. The sound level meter should be hand-held or placed on a tripod according to the manufacturer's instructions.

3. The orientation of the microphone should be according to the manufacturer's instructions.

4. Allowances are necessary due to unavoidable variations in measurement sites and test equipment. Equipment is not considered in violation unless it exceeds the regulated limit by 2 dBA or more.

5.5 Equipment Test Procedure

5.5.1 Vehicle Sound Level. The sound levels for auxiliary equipment shall be determined by tests performed according to the following procedures.

5.5.2 Location. The microphone shall be located on the microphone line at the position where the maximum sound level is expected to occur (See Figure 5-1).

5.5.3 Preliminary Tests. Sufficient preliminary tests shall be made to enable the operator to become thoroughly familiar with the equipment.

5.5.4 Equipment Operation. The equipment shall be operated at the combination of load and speed which produces the maximum sound level without violating the manufacturer's operation specifications.

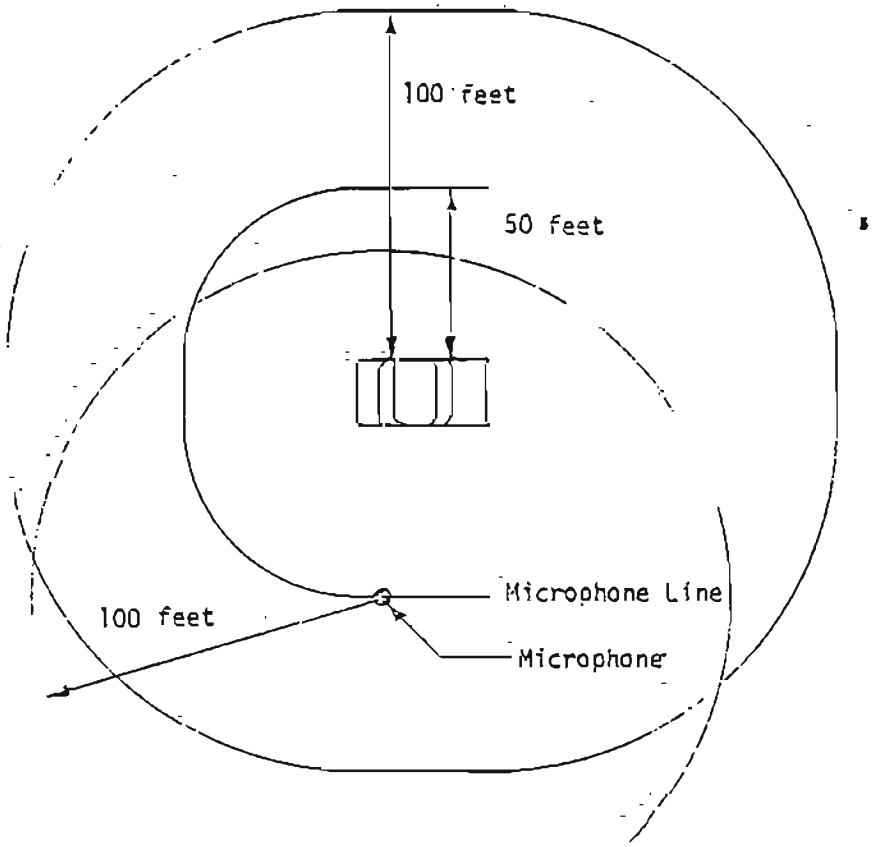


Figure 5-1. Auxiliary Equipment Measurement Site

5.5.5 Visual Reading. The highest sound level observed, exclusive of and peaks due to unrelated ambient noise, shall be reported for each test.

5.5.6 Reported Sound Level. The reported sound level for the vehicle shall be the highest reading which is no more than one dB higher than the next highest reading.

5.5.7 Auxiliary Equipment Test Form. A form to record all pertinent information and data is presented in Figure 5-2. This form, or any other Department approved form for this use, shall be used for auxiliary equipment tests.

AUXILIARY EQUIPMENT NOISE TEST

NOISE POLLUTION DIVISION
DEPARTMENT OF ENVIRONMENTAL QUALITY

DATE

YEAR | EQUIPMENT MAKE | EQUIPMENT TYPE | LICENSE NO. | MODEL

REGISTERED OWNER | ADDRESS

DRIVER | D.L. NO. | ADDRESS

ENGINE TYPE | Primary / Secondary | HP | ENGINE DISPLACEMENT | LOCATION | EQUIP. MILEAGE/HRS.

EXHAUST OUTLET
☐ Single ☐ L. Side ☐ Rear
☐ Dual ☐ R. Side ☐ Vertical

CHECK POSITION AND SIZE OF OUTLET
☐ Straight ☐ 45° to rear
☐ 45° to Side ☐ ___ dia

RESONATORS
☐ Single
☐ Dual

MUFFLER TYPE

RECORDER MODEL AND DEQ NO. | METER MODEL AND DEQ NO. | CALIBRATOR AND DEQ NO.

TEST DRIVER | TEST ENGINEER

METER CHECK
☐ BAT. ☐ WINDSCREEN ☐ "A" SCALE ☐ FAST ☐ CALIB.

OPERATING CONDITIONS	Time	READINGS dBA	READINGS LOCATION NUMBER	MAX. NPN

TEST CONDITIONS

WEATHER CONDITION	TEMP.	R.H.	WIND SPEED

Sketch in this space the measurement site peculiarities, and using the proper symbols indicate the direction of wind, vehicle orientation and reading locations.

Key: WIND DIRECTION - - - ←
VEHICLE . . . —
MICROPHONE LOCATION NO. ⇨

INSTRUMENTATION SET UP AT 50 FT FROM EDGE OF VEHICLE

NPCS-27

Figure 5-2

Auxiliary Equipment Noise Test

CHAPTER 6

NEAR FIELD STATIONARY MOTOR VEHICLE

SOUND LEVEL MEASUREMENTS

20 Inches 1/2 Meter)

6.1 Scope. This chapter establishes procedures for setting up and calibrating sound measuring equipment and conducting tests to determine the sound level output of a stationary vehicle as measured 20 inches (.5 meter) from the exhaust exit. This procedure allows testing indoors and at sites limited in open space.

These procedures are used to conduct emission tests on automobiles, light trucks under 8,000 pounds GVWR, motorcycles and motorboats containing atmosphere terminating exhaust systems. Standards for these vehicles are found in Tables 2 and 4 of OAR 340-35-030.

6.2 Initial Inspection.

6.2.1 Subjective Evaluation. Before a vehicle is tested according to the near field procedures, a subjective evaluation of the vehicle noise shall be made by experienced personnel to determine if an objective test is necessary. The subjective test, using the human ear as a sensing device, shall be conducted at engine idle and during rapid partial throttle opening in neutral gear. The inspector shall stand on the exhaust exit side and near the rear of the vehicle during this evaluation. The exhaust noise shall not be discernably louder than the engine noise and they shall blend together to be acceptable.

6.2.2 Visual Inspection. If a vehicle is found to be subjectively loud, a visual inspection of the exhaust system shall be conducted. This inspection should include the entire system from the engine to the outlet pipe.

COMMENT: Under Oregon Administrative Rules Chapter 340 Section 35-030 the following defects are a violation:

a) No muffler

b) Leaks in the exhaust system

c) A pinched outlet pipe

6.2.3 Near Field Test. If the subjective evaluation warrants further inspection and the visual check does not disclose a violation, then the vehicle shall be subjected to the near field noise test as described in Section 6.5. This test uses a sound level meter to measure the noise level of the vehicle under controlled test conditions.

Measurement Sites.

6.3.1 Vehicle Location. The vehicle must rest on the open water, ground or pavement, the shop floor, or on a dynamometer. It should not be on a hoist, rack, or over a pit. Shop doors should be open to avoid excessively high readings and reflective surfaces should be as far as possible from the sound level meter.

6.3.2 Bystanders. Bystanders should not stand within 10 feet (3 meters) of the microphone or vehicle during noise tests, except for operating personnel.

6.3.3 Wind. Do not conduct noise measurements when wind velocity at the test location exceeds 20 miles per hour (32 km/hr).

6.3.4 Precipitation. Do not conduct noise measurements if precipitation is falling, unless the microphone and instruments are protected from moisture and results are not affected.

Warning: Do not let any moisture on microphone. This will cause damage. Do not attempt to clean microphone.

6.3.5 Ambient Noise. The ambient noise levels shall be at least 10 dBA below the sound level of the vehicle being tested.

Equipment Setup and Use.

6.4.1 Meter Specifications. The specifications for sound level meters are defined in Noise Pollution Control Section manual NPCS-2 Requirements for Sound Measuring Instruments and Personnel. The minimum meter required is a Type II as defined by American National Standards Institute number S1.4-1971.

6.4.2 Battery. A battery check shall be conducted on the Meter and Calibrator before each calibration.

6.4.3 Calibration. The sound level meter shall be field calibrated immediately prior to use following procedures described by the manufacturer's instruction manual. Meters should be calibrated at least at the beginning and end of each business day and at intervals not exceeding 2 hours when the instrument is used for more than a 2-hour period.

COMMENT: If the instrument is damaged or in need of service, contact the Noise Pollution Control office or Motor Vehicles office.

6.4.4 Annual Calibration. Within one year prior to use, each set of sound level meters shall receive a laboratory calibration in accordance with the manufacturer's specifications. This calibration shall be traceable to the National Bureau of Standards.

6.4.5 Windscreens. Windscreens of open cell polyurethane foam furnished by the manufacturer shall be placed over the microphone after calibration. This will protect it from dust or other airborne matter.

Warning: Do not let exhaust gases impinge on microphone.

6.4.6 Meter Setting. The meter shall be set on the "A" scale and used in the slow response mode.

6.4.7 Tachometer. A calibrated engine tachometer shall be used to determine when the test RPM is attained. Tachometers shall have the following characteristic:

Steady state accuracy of ± 2% of full scale.

The tachometer shall be calibrated at least once a year in accordance with manufacturer's calibration procedures.

6.5 Sound Level Measurements.

6.5.1 Preliminary Steps:

a) Field calibration.
b) Windscreen on.
c) Set meter to the appropriate range to measure the anticipated sound level.
d) Switch to "A" weighting scale and slow response mode.
e) Turn meter on.

6.5.2 Mounting. The sound level meter shall be hand-held or placed on a tripod according to the manufacturer's instructions.

6.5.3 Orientation. The orientation of the sound level meter microphone shall be according to the manufacturer's instructions.

COMMENT: Generally, the operating personnel will be to one side. The "General Radio" 1565B Sound Level Meter shall be oriented such that the microphone points aft and the sound path will "graze" the surface of the microphone (See Figure 6.1 and 6.2).

6.5.4 Microphone Position. The microphone for the sound level meter shall be at the same height as the center of the exhaust outlet but no closer to the surface than 8 in. (203 mm). The microphone shall be positioned with its longitudinal axis parallel to the ground, 20 in. (508 mm) from the edge of the exhaust outlet, and 45 ± 10 deg. from the axis of the outlet (Figure 6.1 & 6.2). For exhaust outlets located inboard from the vehicle body, the microphone shall be located at the specified angle and at least 8 in. (203 mm) from the nearest part of the vehicle.

For motorcycles with more than one outlet per side, the measurement shall be made at the rearmost outlet.

Note: If a measuring device is attached to the exhaust outlet and the meter to maintain proper distance, ensure no vibrations from the vehicle are transmitted to the instrument.

6.5.5 Vehicle Operation. Vehicles tested to determine exhaust system sound levels shall be operated as follows:

a) Automobiles and Light Trucks and other Automotive Powered Vehicles. The engine shall be operated at normal operating temperatures with transmission in park or neutral. Sound level measurements shall be made at 3/4 (75%) of the RPM for rated horsepower ± 100 RPM of meter reading.

COMMENT: Tables of the 75% RPM (test RPM) versus the engines are given in the Near Field Motor Vehicle Test RPM Tables, NPCS-31.

b) Motorcycles. The rider shall sit astride the motorcycle in a normal riding position with both feet on the ground. The engine shall be operated at normal operating temperatures with the transmission in neutral. If no neutral is provided, the motorcycle shall be operated either with the rear wheel 5-10 cm (2-4 in) clear of the ground, or with the drive chain or belt removed. The sound level measurement shall be made with the engine speed stabilized at one of the following values:

(A) If the motorcycle engine data is available, test the motorcycle at 1/2 (50%) of the RPM for maximum rated horsepower ± 100 RPM.

(B) If the engine data is not available and if the motorcycle has a tachometer indicating the manufacturer's recommended maximum engine speed ("Red Line"), test the motorcycle at 45% of the "Red Line" RPM ± 100 RPM.

Motorcycle tachometers generally show a red area at the upper part of the scale. The "Red Line RPM" is the lowest value within the red area.

If the engine data and red line RPM are not available, test the motorcycle at:

(i) 3500 RPM ± 100 RPM for motorcycles with total cylinder dispacement between 0-950 cc (0-58 in^3)

(ii) 2800 RPM ± 100 RPM for motorcycles with total cylinder displacement greater than 950 cc (58 in^3)

c) Trucks and Buses. To be determined.

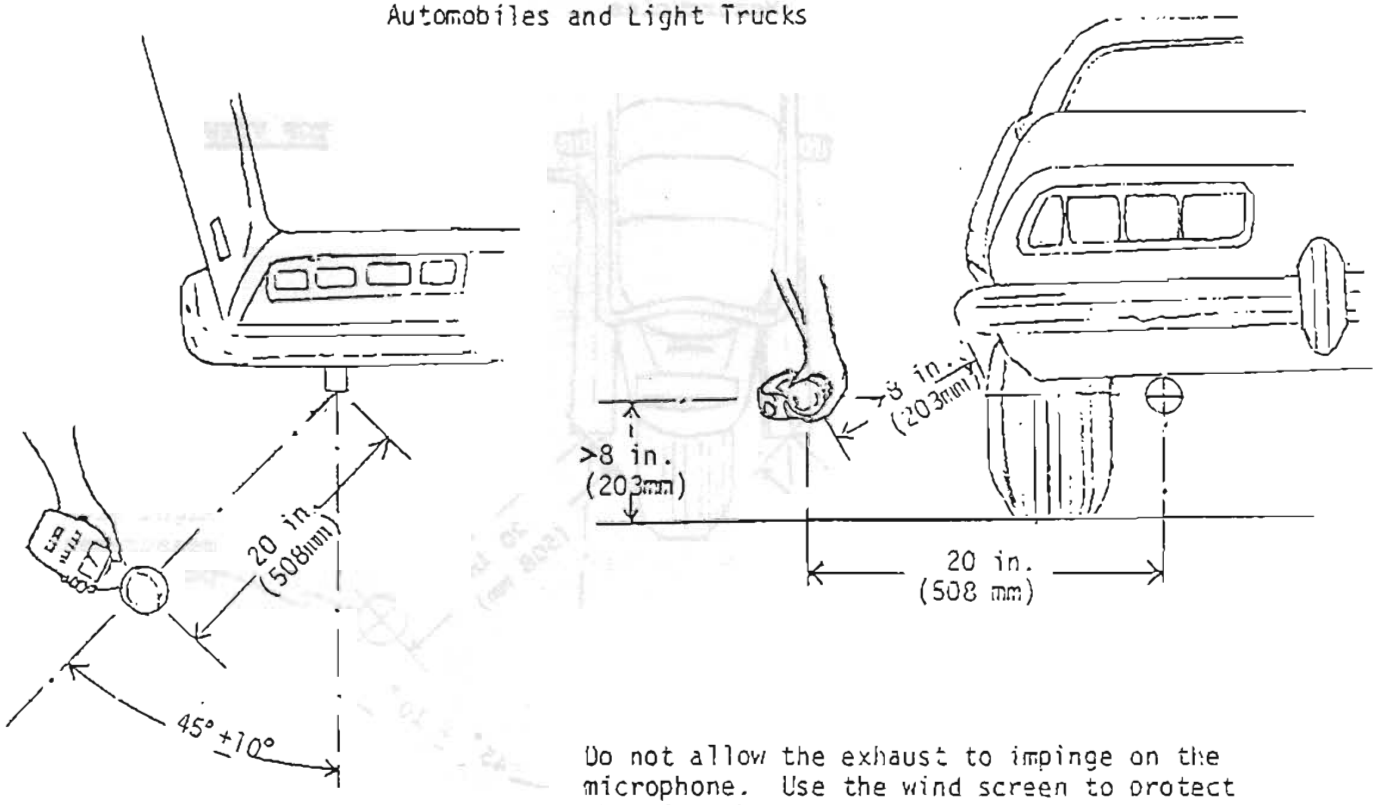
6.5.6 Reported Sound Levels. The reported exhaust system sound level reading shall be the highest reading obtained during the test, exclusive of peaks due to unrelated ambient noise or extraneous impulsive type noise obtained during the acceleration or deceleration portion of the test. When there is more than one exhaust outlet, the reported sound level shall be for the loudest outlet.

COMMENT: The purpose of this test is to measure exhaust noise, so there should not be any other noises within 10 dBA below the exhaust noise (See Ambient Noise).

6.5.7 Variations. Allowances are necessary due to unavoidable variations in measurement sites and test equipment. Vehicles are not considered in violation unless they exceed the regulated limit by the value shown in the following table or more.

Sound Level Meter Type	Allowable Exceedance
ANSI Type I	1 dBA
ANSI Type II	2 dBA

Figure 6.1
Microphone Placement for
Automobiles and Light Trucks



Do not allow the exhaust to impinge on the microphone. Use the wind screen to protect the microphone.

For dual exhausts, measure both and record the higher of the two readings.

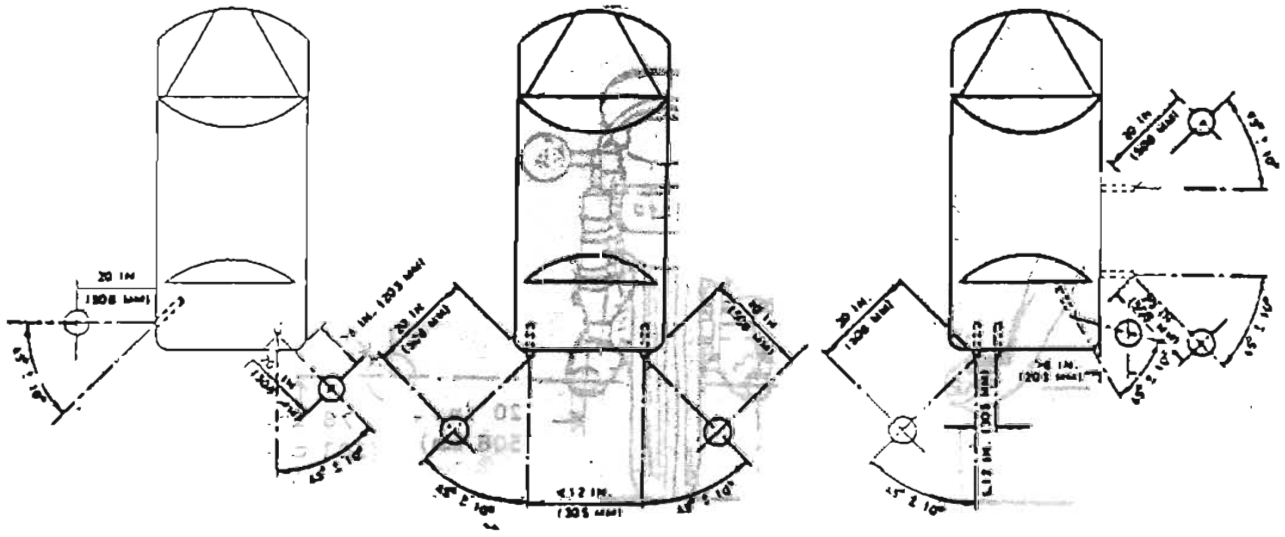
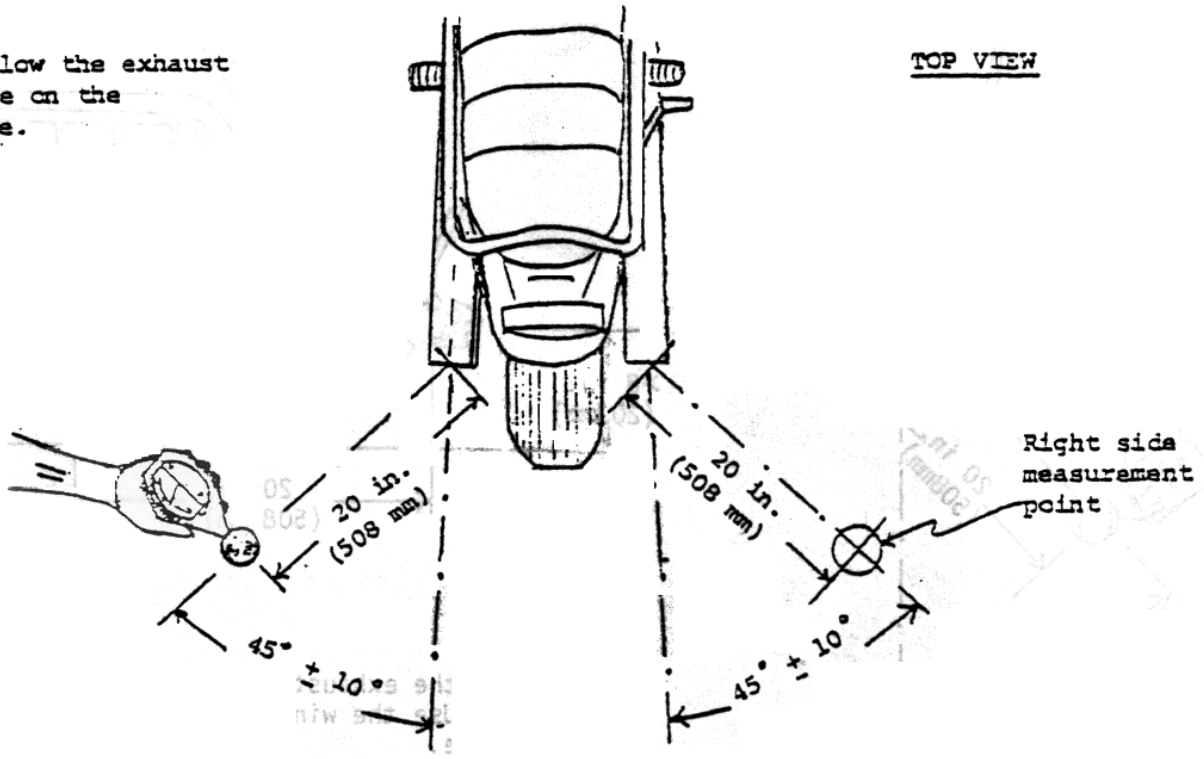


Figure 6.2
Microphone Placement for
Motorcycles

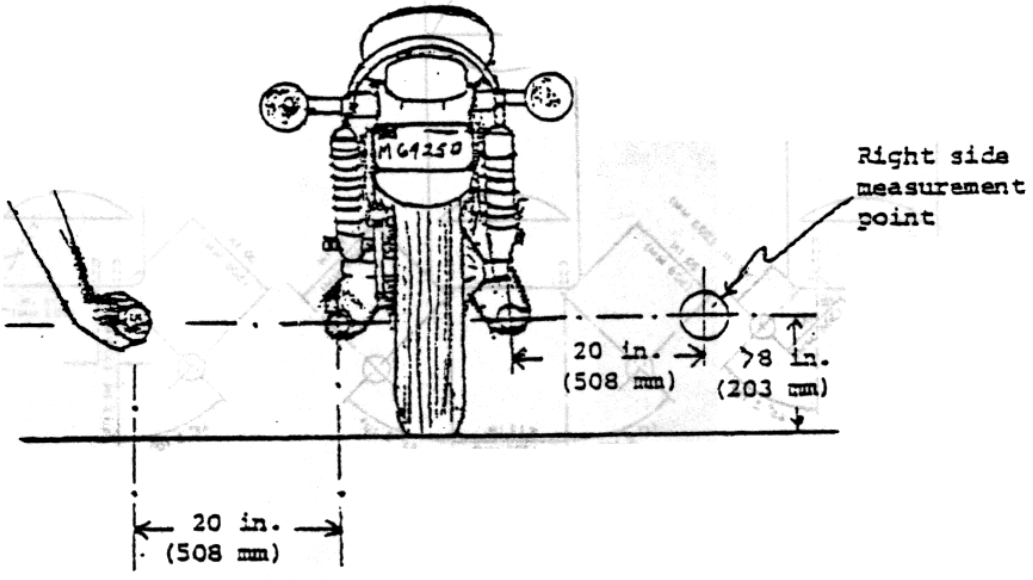
Do not allow the exhaust to impinge on the microphone.

TOP VIEW



For exhaust outlets on both sides, measure both and report the highest of the two readings.

Rear View



AMEND: 340-035-0030

RULE TITLE: Noise Control Regulations for In-Use Motor Vehicles

NOTICE FILED DATE: 04/13/2016

RULE SUMMARY: Existing tables and publications included in the rule.

RULE TEXT:

(1) Standards and Regulations:

(a) Road Vehicles:

(A) No person shall operate any road vehicle which exceeds the noise level limits specified in Table 2 or in such a manner to exceed the noise level limits specified in Table 3, except as otherwise provided in these rules.

(B) No person shall operate a road vehicle with any of the following defects:

(i) No muffler;

(ii) Leaks in the exhaust system;

(iii) Pinched outlet pipe.

(C) Non-conforming “classic” and other “special interest” vehicles may be granted an exception to this rule, pursuant to OAR 340-035-0010, for the purpose of maintaining authentic equipment.

(b) Off-Road Recreational Vehicles:

(A) No person shall operate any off-road recreational vehicle which exceeds the stationary noise level limits specified in Table 4 or in such a manner as to exceed the moving vehicle noise level limits specified in Table 4; [Table not included. See ED. NOTE.]

(B) No person shall operate an off-road recreational vehicle with any of the following defects:

(i) No muffler;

(ii) Leaks in the exhaust system;

(iii) Pinched outlet pipe.

(c) Trucks Engaged in Interstate Commerce. Motor vehicles with a GVWR or GCWR in excess of 10,000 pounds which are engaged in interstate commerce by trucking and are regulated by Part 202 of Title 40 of the Code of Federal Regulations, promulgated pursuant to Section 17 of the Noise Control Act of 1972, 86 Stat. 1248, Public Law 92-574, shall be:

(A) Free from defects which adversely affect sound reduction;

(B) Equipped with a muffler or other noise dissipative device;

(C) Not equipped with any “cut-out” devices, “by-pass” devices, or any other similar devices; and

(D) Not equipped with any tire which as originally manufactured or newly retreaded has a tread pattern composed primarily of cavities in the tread, excluding sipes and local chunking, not vented by grooves to the tire shoulder or vented circumferentially to each other around the tire.

(d) Ambient Noise Limits:

(A) No person shall cause, allow, permit, or fail to control the operation of motor vehicles, including motorcycles, on property which he owns or controls, nor shall any person operate any such motor vehicle if the operation thereof increases the ambient noise level such that the appropriate noise level specified in Table 5 is exceeded as measured from either of the following points, if located within 1,000 feet (305 meters) of the motor vehicle:

(i) Noise sensitive property; or

(ii) A quiet area.

(B) Exempt from the requirements of this section shall be:

(i) Motor vehicles operating in racing events;

(ii) Motor vehicles initially entering or leaving property which is more than 1,000 feet (305 meters) from the nearest noise sensitive property or quiet area;

(iii) Motor vehicles operating on public roads; and

(iv) Motor vehicles operating off-road for non-recreational purposes.

(e) Auxiliary Equipment Noise Limits:
(A) No person shall operate any road vehicle auxiliary equipment which exceeds the noise limits specified in Table 6, except as otherwise provided in these rules;
(B) No person shall cause, allow, permit, or fail to control the operation of any road vehicle auxiliary equipment that exceeds 50 dBA for more than 30 minutes between 10 p.m. and 7 a.m. at any appropriate noise sensitive property measurement point as specified in OAR 340-035-0035(3)(b).
(f) Motorcycles manufactured after December 31, 1982 to Federal Noise Regulations (40 CFR Part 205):
(A) No person shall remove or render inoperative, or cause to be removed or rendered inoperative, other than for the purposes of maintenance, repair, or replacement of any device or element of design incorporated in the motorcycle for the purpose of noise control;
(B) No person shall remove or deface any noise label or mark required by federal law which is affixed to any motorcycle or motorcycle part for purposes of identifying the motorcycle or motorcycle part as a federally regulated product;
(C) No person shall operate any road or off-road motorcycle manufactured to federal noise law that does not bear a label or mark on the exhaust system that matches the model specific code of the motorcycle on which the system is installed;
(D) No person shall operate, nor shall any person cause, allow, permit or fail to control the operation of any competition motorcycle identified for “competition use only” by the noise label or mark required by federal law on any property other than a motor sports facility in a practice session or a racing event;
(E) No person shall operate, nor shall any person cause, allow, permit or fail to control the operation of any motorcycle fitted with an exhaust system or exhaust system component identified for “competition motorcycles only” by the noise label or mark required by federal law on any property other than a motor sports facility in a practice session or a racing event.
(2) Measurement. Sound measurement shall conform to test procedures adopted by the Commission in Sound Measurement Procedures Manual (NPCS-1) and Motor Vehicle Sound Measurement Procedures Manual (NPCS-21) or to standard methods approved in writing by the Department.
(3) Exemptions:
(a) Motor vehicles registered as antique or historical motor vehicles licensed in accordance with ORS 481.205(4) are exempt from these regulations;
(b) Motor vehicle warning devices are exempt from these regulations;
(c) Vehicles equipped with at least two snowtread tires are exempt from the noise limits of Table 3; [Table not included. See ED. NOTE.]
(d) Motor vehicles described in subsection (1)(c) of this rule, which are demonstrated by the operator to be in compliance with the noise levels in Table 3, for operation greater than 35 mph, are exempt from these regulations;
(e) Auxiliary equipment operated on construction sites or in the maintenance of capital equipment or to avoid or reduce the severity of accidents or operated on a farm for agricultural purposes or operated on forest land as defined in subsection (1) of ORS 526.324 for activities related to the growing or harvesting of forest tree species are exempt from these regulations.
(4) Equivalency:
(a) The in-use motor vehicle standards specified in Table 2 and 3 have been determined by the Department to be substantially equivalent to the 25 foot stationary test standards set forth in 1977 Oregon, Laws, Chapter 273; [Table not included. See ED. NOTE.]
(b) Tests shall be conducted according to the procedures in Motor Vehicle Sound Measurement Procedures Manual (NPCS-21) or to standard methods approved in writing by the Department.
[ED. NOTE: You can view a PDF of publications and tables by clicking here.]

STATUTORY/OTHER AUTHORITY: ORS 467

STATUTES/OTHER IMPLEMENTED: ORS 467.030

OAR 340-035-0030
Table 2
In-Use Road Vehicle Standards
Stationary Test

Model Year	Maximum Noise Level (dBA)	Minimum Distance from Vehicle to Measurement Point
All Vehicles Described in ORS 481.205(2)		
Before 1976	94	25 feet (7.6 meters)
1976 and after	91	25 feet (7.6 meters)
All Other Trucks in Excess of 8,000 pounds (3629 kg.) GVRW		
Before 1976	94	25 feet (7.6 meters)
1976-1981	91	25 feet (7.6 meters)
After 1981	88	25 feet (7.6 meters)
Motorcycles		
1975 and Before	102	20 inches (1/2 meter)
After 1975	99	20 inches (1/2 meter)
Front-engine Automobiles, Light Trucks, All Other Front-engine Road Vehicles		
All	95	20 inches (1/2 meter)
Rear-engine Automobiles, Light Trucks and All Other Front-engine Road Vehicles		
All	95	20 inches (1/2 meter)
Buses as Defined Under ORS 481.030		
Before 1976	94	25 feet (7.6 meters)
1976 and After	91	25 feet (7.6 meters)

OAR 340-035-0030
Table 3
In-Use Road Vehicle Standards
Moving Test at 50 feet (15.2 meters) or Greater at Vehicle Speed

Operating Conditions	Trucks and Buses Exceeding 10,000 pounds GVWR	Automobiles and Light Trucks	Motorcycles
Posted 45 mph or less Under any Grade, Load, Acceleration or Deceleration	86	72	78
Posted Greater Than 45 mpg Under any Grade, Load, Acceleration or Deceleration	90	78	62
Moving at 35 mph or Less on Level Roadway Under Constant Speed More than 200 Feet From Stop	84	70	74

OAR 340-035-0030
Table 4
Off-Road Recreational Vehicle Standards

Allowable Noise Limits

Model Year	Maximum Noise Level (dBA and distance from vehicle to measuring point)	
	Stationary Test 20 inches (.5 meters)	Moving Test at 50 feet (15.2 meters)
Motorcycles		
1975 and before	102	85
After 1975	99	82
Snowmobiles		
1971 and before	---	86
1972-1975	---	84
After 1975	---	80
Boats		
Underwater exhaust - all	100	84
Atmosphere exhaust - all	100	84
All Others		
Front engine - all	95	78
Mid and Rear Engines - all	97	78

OAR 340-035-0030
Table 5
Ambient Standards for Vehicles Operated Near Noise Sensitive Property

Allowable Noise Limits

Time	Maximum Noise Level
7:00 a.m. – 10:00 p.m.	60
10:00 p.m. – 7:00 a.m.	55

OAR 340-035-0030
Table 6
Auxiliary Equipment Driven by Primary Engine Noise Standards

Stationary Test at 50 feet (15.2 meters) or Greater

Model Year	Maximum Noise Level dBA
Before 1976	88
1976-1978	85
After 1978	82

Sound Measurement Procedures Manual

NPCS - 1

DEQ

State of Oregon
Department of Environmental Quality

REVISION RECORD

INSTRUCTIONS FOR USE: All revisions of this manual will be numbered to assure each manual holder that he has received all revisions. The date and initials of the person inserting revisions to the manual should be entered on this revision record opposite the appropriate revision number. If the sequence is broken, copies of the missing revisions may be requested from the Noise Control Section.

Rev. No.	Date Inserted	Initials	
1.	4-30-74	JH	[illegible]
2.	8-16-74	JH	[illegible]
3.	11-25-74	NT	[illegible]
4.	8-27-76	JH	EQC Amendments
5.	5-6-83	JH	EQC Amendments
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FOREWORD

The Sound Measurement Procedures Manual has been prepared to specify the equipment to be used and the procedures to be followed when measuring environmental noise. The procedures established in the manual, when carefully followed, will ensure that the noise readings obtained are accurate, will support enforcement action, and aid in reducing environmental noise.

The scope of this manual includes industrial noise, commercial noise, noise from races and racetracks, noise from public roads and ambient noise measurements. Individual motor vehicle noise measurements are covered in a separate manual.

The objective of the manual is to establish procedures to implement the provisions of the Environmental Quality Commission. Further, if the practices and procedures herein are adhered to, the result will be a uniform enforcement program which will accomplish the intent of the Legislature and fulfill the Commission's responsibility under ORS Chapter 467.

Office of the Administrator
Air Quality Control Division
Department of Environmental Quality

TABLE OF CONTENTS

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Policy

1.1.1 The Department of Environmental Quality, through the Noise Pollution Control Section shall establish a noise measurement program to implement the laws and regulations applying to environmental noise.

1.1.2 The Noise Pollution Control Section shall be responsible for the conformity of environmental noise measurement.

1.1.3 This manual contains procedures for the Noise Pollution Control Section, and all other persons taking environmental noise measurements. Guidance is provided in the "Comments".

1.2 Authority

Statutory and administrative law governing authority to the guidance and direction contained in the following sources:

a. Oregon Revised Statutes, Chapter 467, Sections 467.010, 467.020, 467.030, 467.040, 467.050, 467.990.

b. Oregon Administrative Rules, Chapter 340, Division 35, Department of Environmental Quality.

Instruments and Training

1.3.1 Specific requirements for instruments and personnel are defined under procedure manual, Noise Pollution Control Section - 2, Requirements for Sound Measuring Instruments and Personnel.

CHAPTER 2

INSTRUMENTATION

Sound Level Meters

The specifications for sound level meters (SLM) are defined in manual Noise Pollution Control Section (NPCS-2) Requirements for Sound Measuring Instruments and Personnel. The minimum meter required is a Type II as defined by American National Standard Institute Number S1.4-1971.

2.2 Accessories

The minimum accessories shall be a windscreen and an acoustically coupled calibrator.

Comment: Additional accessories that have been found to be valuable in gathering data are tabulated below:

(1) Noise data forms
(2) Clipboard
(3) Tripod
(4) Wind meter
(5) Sling psychrometer
(6) Screwdriver
(7) Spare batteries
(8) Watch with sweep second hand or digital equivalent

Tape Recorders and Level Recorders

Recording systems shall conform to NPCS-2.

Comment: The recording system should be able to duplicate the measurements as taken in the field. For tape recorders, a table of frequency response tolerances is given in SAE standards. Graphic level recorder systems standards are also described in the manual.

Octave Band Filter Sets

The octave band filter sets shall be those defined in NPCS-2.

Comment: These sets may either be integral to a sound level meter or they may be a separate piece of equipment.

Special Study Instruments

Comment: In some instances, special types of equipment may be found to be useful in studying a noise problem. The Department has several specialized noise instruments to be used in study situations. These instruments include a random noise generator, a loud speaker system, and a one-third octave band filter set.

One-Third Octave Band Filter Sets

The one-third octave band filter sets shall be those defined in NPCS-2.

Comment: These sets may be integral to a sound level meter or they may be a separate piece of equipment. Sets shall contain the preferred one-third octave band filters.

Impulse Meters

Impulse meters shall be those defined in NPCS-2.

Comment: These meters are integral to some Type I precision sound level meters set for a peak unweighted response. Blasting impulse noise is measured on a standard Type I or Type II meter set to the "C" weighting scale and the "SLOW" dumping response.

CHAPTER 3

INSTRUMENT CALIBRATION

General

All types of sound level meters shall be field calibrated immediately prior to use, using the procedures described in the factory instruction manual.

Battery Check

Batteries in both the meter and the calibrator shall be checked before calibration.

Instrument Calibration

The instrument shall be set to the correct level range, weighting scale and meter response. The calibrator shall be placed on the microphone of the meter. The output indicated on the meter shall then be adjusted to the correct calibration level.

Annual Calibration

Within a year prior to use, each sound level meter, including octave band filter and calibrator, shall receive a laboratory calibration in accordance with the manufacturer's specifications. This calibration shall be traceable to the National Bureau of Standards.

Comment: An inspection label may be attached to each instrument set to determine when the calibration was performed.

CHAPTER 4

ENVIRONMENTAL NOISE MEASUREMENT

4.1 Application

This chapter applies to ambient measurements, noise emissions from industrial facilities, and commercial facilities, and to ambient noise limits from motor vehicles. Individual motor vehicle noise measurements, airports and racetracks are covered in separate manuals.

4.1.2 Persons selected to measure environmental noise shall meet the requirements of NPCS-2 Requirements for Sound Measuring Instruments and Personnel.

Site Selection

4.2.1 The measurement location shall be at any point, no more than 25 feet from the noise sensitive building where the noise level is generally greatest, as illustrated in Figure 4-1.

If the noise sensitive building is closer than 25 feet from the property line, the measurement location shall be at any point on the property line, providing it is no more than 25 feet from the building, or at any other point within the noise sensitive property no more than 25 feet from the noise sensitive building, wherever the noise level is generally greatest, as illustrated in Figure 4-2. For any measurement, sound reflective surfaces shall not be closer than 10 feet from the measurement point.

Comment: Sound reflective surfaces do not include trees, shrubs, hedges or other vegetation.

Comment: Measurements for noise sensitive property on which the noise sensitive building lies within 10 feet of the noise sensitive property line may require sound level projection techniques described in 4.8 of the manual.

Equipment Set-Up

4.3.1 The sound level meter or microphone, either hand held or placed on a tripod, shall be 4 feet or more above the ground or floor surface.

4.3.2 Comment: A microphone extension cable may be used in areas where accessibility is difficult. Example: Changes in ground elevation, reflective surfaces, height or source or receiver.

Figure 4-1 Measurement Point 25 Feet From Building

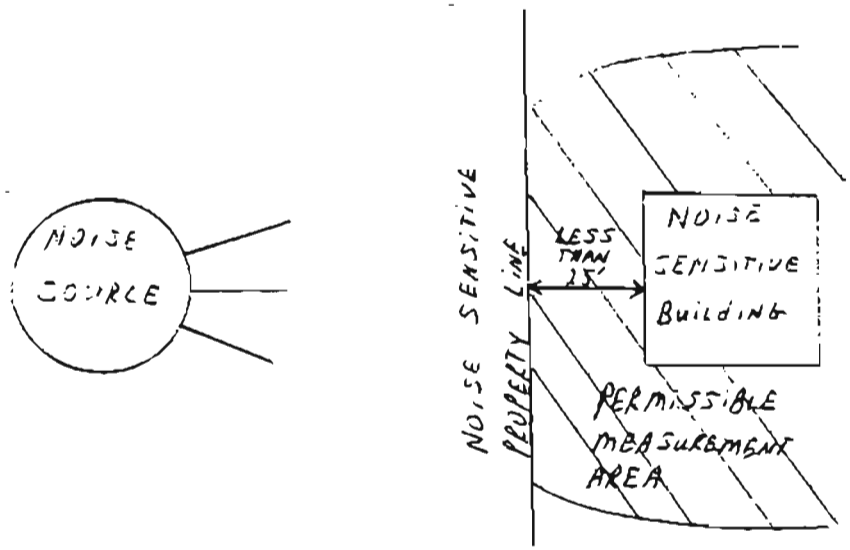


Figure 4-2 Measurement Point on Property Line

Instrument Calibration and Battery Check

4.4.1 Refer to Chapter 3 of NPCS-1 for instructions.

Noise Level Measurements

4.5.1 Comment: That information and data submitted to the Department should be recorded on Forms NPCS-4 and NPCS-5 as shown in Figure 4-3 and Figure 4-5, or on forms approved in writing by the Department.

4.5.2 Weather Conditions

a. The wind speed and direction shall be determined before measurements are taken and recorded on a form. Measurements shall not be taken when the wind speed exceeds 10 mph. The sound level meter windscreen shall always be installed on the microphone while taking measurements.

b. The relative humidity may be determined for the time measurements are taken. Measurements shall not be taken when precipitation affects results.

Comment: Measurements may be taken when the ground is wet if the readings are not influenced by motor vehicle tire noise on wet pavement.

c. Comment: The barometric pressure has an effect on the calibration level of most calibrators. This effect is usually small but can introduce some error under very low atmospheric pressure conditions or at high elevations. Typically no correction is needed at elevations below 2,000 feet. Above 2,000 feet elevation, the manufacturers correction factor must be applied to the instrument during calibration.

4.5.3 Determination of Meter Speed

a. Comment: The "FAST" meter speed is used for sounds of an essentially continuous nature. This speed is such that the indication instrument attains its final reading in approximately 0.2 seconds. In general, the "FAST" meter is used where meter fluctuations do not exceed 3 dB, or where the meter is required to follow fast changes in level such as an automobile or aircraft pass-by measurements.

b. Comment: The "SLOW" meter speed is used for sounds where the noise level fluctuates by + or - 3 dB and meter variations make the instrument display unreadable. The slower action of the meter provides an averaging effect that is helpful in measuring sounds of a rapidly varying nature or of low frequencies. However, for a noise pulse of 0.5 second duration, such a meter will typically read 2 to 6 dB low. It is not satisfactory for measuring intermittent sounds.

4.5.4 "A" Weighting Scale Measurements

Comment: Maximum noise level measurements with the "A" network weighting scale are taken with the sound level meter switched to the "A" network per the manufacturer's instructions. The meter must be properly positioned with respect to the noise source per the manufacturer's instructions. Information and data taken during the measurements should be recorded on Form NPCS-4 or equivalent as shown in Figure 4-3.

4.5.5 Statistical Noise

Comment: The statistical noise level is that noise level exceeded a stated percentage of the time. An $L_{10} = 65$ dBA means that in any consecutive 60 minute period of the day 65 dBA is equalled or exceeded only 10% of the time, or for a total of 6 minutes. Several procedures are in use by the Department to determine statistical noise levels and other methods may be approved in writing from the Department. Three acceptable procedures to determine the statistical noise level are presented in Section 6 of this Chapter. Information and data taken during the measurements should be recorded on Form NPCS-10-1 or equivalent as shown in Figure 4-9. Statistical calculations can be carried out on Forms NPCS-10-2 and NPCS-10-3 and should be summarized in "L" terminology on Form NPCS-4. An example of a completed Form NPCS-4 is presented in Figure 4.4.

4.5.6 Ambient Noise Determination

Comment: The ambient noise level is a composite of sounds from many sources near and afar. As the ambient noise level will be compared to the noise level with the source included in any consecutive 60 minute period, it is important that data is obtained in time periods of interest during the day and also both the week and

the weekend to obtain data which are representative. It is also important to note that the data must be taken without emphasis on either noise peaks or unusual quiet.

Measurements should not be taken in weather conditions which may create a bias in the data. Wet streets or snow accumulations could bias the data unless these conditions are typical for the community.

Measurements should be made at least at several appropriate locations within the sampling area under consideration. Measurements should be made randomly in the sense that each location and each sampling time has the same chance of being sampled and that the selection of any one factor in no way influences the choice of another. Measurements should be made on at least three separate days.

The ambient statistical noise levels obtained or predicted with the noise source in question operating, should include all noises generated by that source. This may include such sources as increased motor vehicle traffic noise, safety warning device noise, and other sounds that may be exempted from the rules due to other considerations.

Procedures to determine the L_{10} and L_{50}, statistical noise levels are presented in Section 6 of this Chapter. Information and data taken during the measurements should be recorded on Form NPCS-4 or equivalent as shown in Figure 4-4.

4.5.7 Octave Band Noise Measurement

Octave band noise measurements shall be made on an octave band frequency analyzer per document NPCS-2, Requirements for Sound Measuring Instruments and Personnel.

Comment: Octave band sound pressure levels may be measured in the same manner as the "A" weighting scale measurements, except that the octave band filters shall be used in place of the "A" weighting network. Information and data taken during the measurements should be recorded on Form NPCS-5 or equivalent as shown in Figure 4.5. An example of a completed form NPCS-5 is presented in Fig. 4-6.

4.5.8 Tape Recording

Comment: Tape recording of the noise and a calibration signal is optional. The tape recorder system must conform to the specifications defined in document NPCS-2 Requirements for Sound Measuring Instruments and Personnel.

4.5.9 One-Third Octave Band Noise Measurement

One-third octave band noise measurements shall be made on a one-third octave band frequency analyzer per document NPCS-2, Requirements for Sound Measuring Instruments and Personnel.

Comment: One-third octave band sound pressure levels may be measured in the same manner as the "A" weighting scale measurements, except that the one-third octave band filter shall be used in place of the "A" weighting network. Information and data taken during the measurements should be recorded on form NPCS-29 or equivalent as shown in Figure 4-7. An example is shown in Figure 4-8.

4.5.10 Impulse Measurements

Impulse measurements shall be made on meters per document NPCS-2, Requirements for Sound Measuring Instruments and Personnel. Impulse sound pressure levels are to be taken with the meter set to the linear unweighted scale with the peak detector circuit engaged for unweighted (dB) impulse measurements. For "C" weighted (dBC) impulse measurements the meter is set to the "C" weighting scale and the meter speed is set to the "SLOW" damping response.

Comment: Information and data should be recorded on Form NPCS-4 or equivalent as shown in Figure 4-3. An example of a completed form is presented in Figure 4-4.

DEPARTMENT OF ENVIRONMENTAL QUALITY

File _____

SOUND PRESSURE LEVEL DATA SHEETS

County

SOURCE _____ BY

DATE

SHEET

COMPLAINANT _____

COMPLAINT DATE _____

INSTRUMENTATION		
EQT	TYPE	SERIAL
SLM		
MIC		
FLTR		
CAL		
Windscreen ON OFF		

Time	Bat. Ck.	Cal. dB	°F dry bulb	°F wet bulb	% RH	Press. mm Hg	Wind mph	Wind Direct

Measurement Position	Meter Fast/Slow	A Scale	C Scale	Linear Scale	L_1	L_{10}	L_{50}	Peak Impulse

Comments _____

Form NPCS-4

INSTRUMENT SET-UP
CHECK-OFF LIST

- ☐ Site Selection
- ☐ SLM Position
- ☐ Battery Check
- ☐ Calibration Adjustment
- ☐ Wind Below 10 MPH
- ☐ Humidity Below 95%
- ☐ Windscreen

1. Days of Operation
   - A. Mon. - Fri.
   - B. Mon. - Sat.
   - C. Mon. - Sun.
2. Time of Operation
   - A. 8 a.m. - 5 p.m.
   - B. _ a.m. - _ p.m.
3. Number of Shifts
   - A. One
   - B. Two
   - C. Three
4. Distance from Receiver to source _____ feet.
5. Visibility to Source
   - A. Direct _____
   - B. Hill or Berm
   - C. Trees _____
   - D. Other _____
6. Zoning
   - A. Residence _____
   - B. Plant or Facility _____
7. Who came first?
   - A. Residence...Date _____
   - B. Plant or Facility _____
8. Petition Submitted
   - A. Yes... Number _____
   - B. No

SKETCH OF MEASUREMENT SITE AND SOURCE

REVERSE SIDE FORM NPCS-4
FIGURE 4-3

NPCS-4

DEPARTMENT OF ENVIRONMENTAL QUALITY

SOUND PRESSURE LEVEL DATA SHEETS

File Industry

County Multnomah

SOURCE Oregon Paving Co.
1000 SE 101st, Portland
Rock crusher

BY C. M. Sroka

DATE 6/6/74

SHEET 1/2

COMPLAINANT Mr. Eastland
155 SE Millman Dr, Portland

COMPLAINT DATE 5/10/74

INSTRUMENTATION		
EQT	TYPE	SERIAL
SLM	GR 1565B	
MIC	GR	
FLTR		
CAL	GR 1567	Del [illegible]
Windscreen (ON) OFF		

Time	Bat. Ck.	Cal. dB	°F dry bulb	°F wet bulb	% RH	Press. mm Hg	Wind mph	Wind Direct
1:45p	✓	114	67	51	29	—	0.5	W

Measurement Position	Meter Fast/Slow	A Scale	C Scale	Linear Scale	L_1	L_{10}	L_{50}	Peak Impulse
1	fast	78		85				106
2	fast				79	75	70	

Comments An occasional bus or truck; ambient noise without crusher operating is 51-57 dBA.

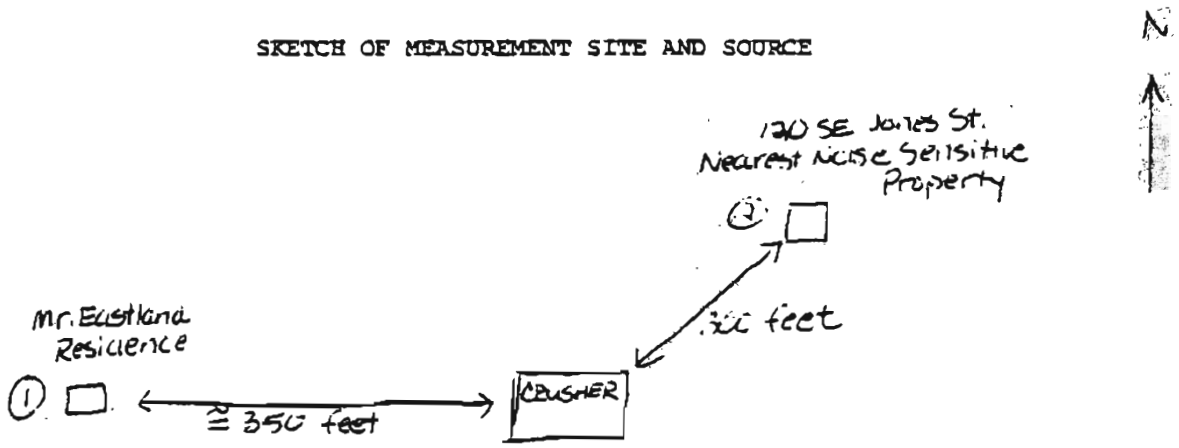
Example Form NPCS-4

INSTRUMENT SET-UP
CHECK-OFF LIST

- ☑ Site Selection
- ☑ SLM Position
- ☑ Battery Check
- ☑ Calibration Adjustment
- ☑ Wind Below 10 MPH
- ☑ Humidity Below 95%
- ☑ Windscreen

1. Days of Operation
   - (A) Mon. - Fri.
   - B. Mon. - Sat.
   - C. Mon. - Sun.
2. Time of Operation
   - A. 8 a.m. - 5 p.m.
   - (B) 6 a.m. - 9 p.m.
3. Number of Shifts
   - A. One
   - (B) Two
   - C. Three
4. Distance from Receiver to source 300-350 feet.
5. Visibility to Source
   - (A) Direct _____
   - B. Hill or Berm _____
   - C. Trees _____
   - D. Other _____
6. Zoning
   - (A) Residence _____
   - B. Plant or Facility _____
7. Who came first?
   - (A) Residence...Date _____
   - B. Plant or Facility
8. Petition Submitted
   - (A) Yes... Number 300 Sig?
   - B. No

SKETCH OF MEASUREMENT SITE AND SOURCE



Example Form NPCS-4
Figure 4-4 REVERSE SIDE FORM

DEPARTMENT OF ENVIRONMENTAL QUALITY

SOUND PRESSURE LEVEL DATA SHEETS

File _____

County _____

SOURCE _____

BY

DATE _____

SHEET 1

COMPLAINANT _____

COMPLAINT DATE _____

INSTRUMENTATION		
EQT	TYPE	SERIAL
SLM		
MIC		
FLTR		
CAL		

Windscreen ON OFF

Time	Bat. Ck.	Cal. dB	°F dry bulb	°F wet bulb	% RH	Press. mm Hg	Wind mph	Wind Direct

Position	Fast/ Slow	A Scale	Lin. Scale	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz

Comments _____

Form NPCS-5
Figure 4-5

NPCS-5

INSTRUMENT SET-UP
CHECK-OFF LIST

- ☐ Site Selection
- ☐ SLM Position
- ☐ Battery Check
- ☐ Calibration Adjustment
- ☐ Wind Below 10 MPH
- ☐ Humidity Below 95%
- ☐ Windscreen

1. Days of Operation
   - A. Mon. - Fri.
   - B. Mon. - Sat.
   - C. Mon. - Sun.
2. Time of Operation
   - A. 8 a.m. - 5 p.m.
   - B. _ a.m. - _ p.m.
3. Number of Shifts
   - A. One
   - B. Two
   - C. Three
4. Distance from Receiver to source _____feet.
5. Visibility to Source
   - A. Direct _____
   - B. Hill or Berm _____
   - C. Trees _____
   - D. Other _____
6. Zoning
   - A. Residence _____
   - B. Plant or Facility _____
7. Who came first?
   - A. Residence...Date _____
   - B. Plant or Facility _____
8. Petition Submitted
   - A. Yes... Number _____
   - B. No

SKETCH OF MEASUREMENT SITE AND SOURCE

FIGURE 4-5
REVERSE SIDE FORM NPCS-5

DEPARTMENT OF ENVIRONMENTAL QUALITY

SOUND PRESSURE LEVEL DATA SHEETS

File Industry

County Lane

SOURCE Sam's Sawmill
1200 East Road
Eugene

BY LCVR - GCS

DATE 4/27/74

SHEET 1 / 1

COMPLAINANT Mr. Ed Jones
100 Martin St., Eugene

COMPLAINT DATE April 19, 1974

INSTRUMENTATION		
EQT	TYPE	SERIAL
SLM	G.R. 1933	2250 1591
MIC	G.R.	[illegible]
FLTR	G.R.	1250
CAL	G.R. [illegible]	[illegible]
Windscreen ON OFF		

Time	Bat. Ck.	Cal. dB	°F dry bulb	°F wet bulb	% RH	Press. mm Hg	Wind mph	Wind Direct
3:40 pm	OK	114	67	51	47	—	4	W
4:07 pm	OK	114.0						

Position	Fast/ Slow	A Scale	Lin. Scale	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
1	S	47	63	55	55	54	54	50	44	38	30	[illegible]

Comments Measurements taken during "blower" operation. Readings taken from 3:51 through 4:02 pm.

Example Form NPCS-5
Figure 4-6

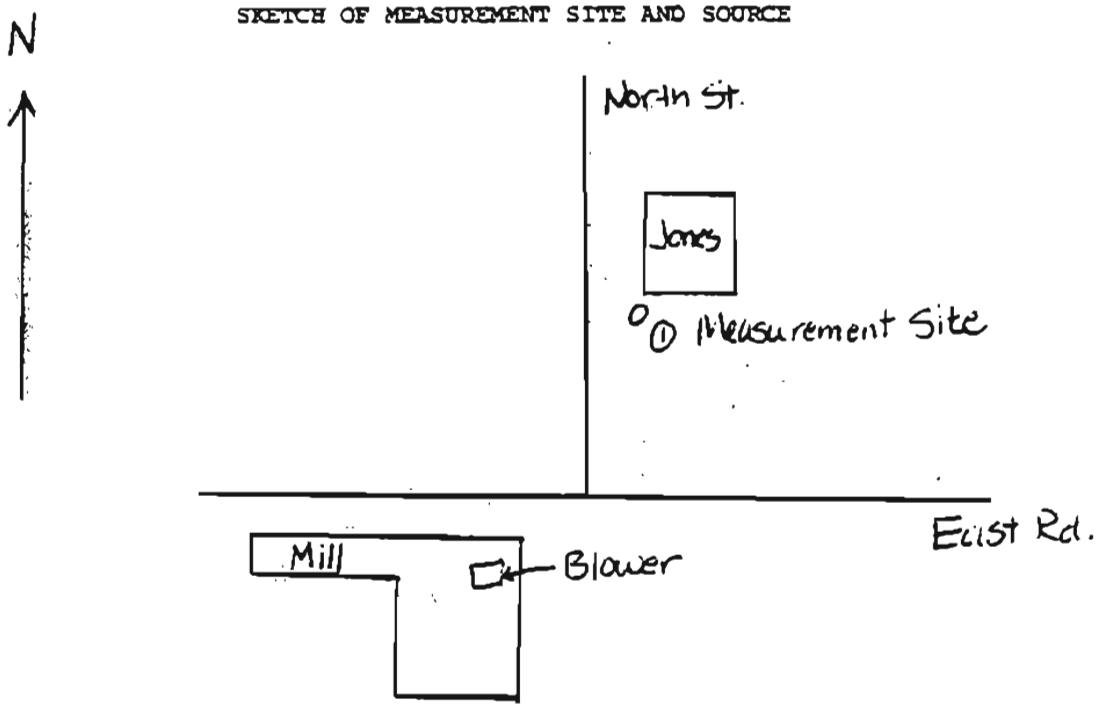
NPCS-5

INSTRUMENT SET-UP
CHECK-OFF LIST

- [x] Site Selection
- [x] SLM Position
- [x] Battery Check
- [x] Calibration Adjustment
- [x] Wind Below 10 MPH
- [x] Humidity Below 95%
- [x] Windscreen

1. Days of Operation
   - A. Mon. - Fri.
   - (B) Mon. - Sat.
   - C. Mon. - Sun.
2. Time of Operation
   - A. 8 a.m. - 5 p.m.
   - (B) 8 a.m. - 4 p.m.
3. Number of Shifts
   - A. One
   - (B) Two
   - C. Three
4. Distance from Receiver to source ≈300 feet.
5. Visibility to Source
   - A. Direct X
   - B. Hill or Berm
   - C. Trees
   - D. Other
6. Zoning
   - A. Residence X
   - B. Plant or Facility
7. Who came first?
   - (A) Residence...Date 1952
   - B. Plant or Facility
8. Petition Submitted
   - A. Yes... Number
   - (B) No

SKETCH OF MEASUREMENT SITE AND SOURCE



Example Form NPCS-5
Figure 4-6
REVERSE SIDE OF FORM

DEPARTMENT OF ENVIRONMENTAL QUALITY

1/3 OCTAVE BAND DATA SHEET

File

County _____

SOURCE _____ BY _____

_____ DATE

_____ SHEET

_____

COMPLAINANT _____

_____

COMPLAINT DATE _____

INSTRUMENTATION		
EQT	TYPE	SERIAL
SLM		
MIC		
FLTR		
CAL		

Windscreen ON OFF

Time	Bat. Ck.	Cal. dB	°F dry bulb	°F wet bulb	% RH	Press. mm Hg	Wind mph	Wind Direct

PREFERRED CENTER FREQUENCIES FOR 1/3 OCTAVE BANDS

osition	Lin. Scale	20 Hz	25 Hz	30 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz
osition	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10,000	12,500

omments _____

_____

_____

_____

Figure 4-7 Form NPCS-29

NPCS-29

DEPARTMENT OF ENVIRONMENTAL QUALITY

1/3 OCTAVE BAND DATA SHEET

I+C

File NP-ABC Lumber

County Coos

SOURCE ABC Lumber Co.
1000 "F" St.
Coos Bay, OR

BY B. Hammon

DATE 9-18-81

COMPLAINANT Mr. Joe Smith
1245 "D" St., Coos Bay

COMPLAINT DATE 9-16-81

INSTRUMENTATION		
EQT	TYPE	SERIAL
SLM	B+K 2209	396 472
MIC	B+K 4145	311 347
FLTR	B+K 1618	923111
CAL	B+K 4220	376042
MAG TAPE	B+K 7003	704619
Windscreen	(ON)	OFF

Time	Bat. Ck.	Cal. dB	°F dry bulb	°F wet bulb	% RH	Press. mm Hg	Wind mph	Wind Direct
2:00 PM	✓	124.0	66°	PARTLY CLOUDY			4-6	SW
3:10 PM	✓	124.0	69°	"			2-4	"

PREFERRED CENTER FREQUENCIES FOR /3 OCTAVE BANDS

Position	Lin. Scale	20 Hz	25 Hz	30 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz
1	70	58	60	59	58	59	60	59	59	58	57	56	54	52	51

Position	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000		
1	50	48	46	45	53	43	41	40	40	37	38	36	37	32	28

Comments SAMPLE TAKEN 2:13 TO 2:35 PM PDT. PRIMARY IS A LARGE SAW. PRODUCES WHINE IN 1250 Hz. BAND

4.6 Statistical Noise Level Calculations

4.6.1 Hand Sample Method (Comment)

a. For this method use forms NPCS-10-1, NPCS-10-2, and NPCS-10-3 as shown in Figures 4-9 through 4-11 or equivalent.

b. Perform a short noise survey to determine the approximate range of sound levels produced by the noise source being investigated. Enter the approximate high and low noise levels as well as the central tendency on form NPCS-10-1. Use the minimum and maximum sound levels and the table at the back-bottom of form NPCS-10-1 to estimate the minimum number of good sound samples needed to be taken from the source in question. For example, in Figure 4-12 the noise varied from a high of approximately 67 dBA to a low of 61 dBA. This is a 6 dBA variation. The table on NPCS-10-1 indicates that a minimum of 132 good readings needs to be taken.

The table on NPCS-10-1 is designed to give an acceptable statistical confidence in the L_{10} and L_{50} noise level. For determining the L_1 noise level with confidence or for more complex noise sources, more noise samples than indicated in the table may be necessary.

c. Record the noise levels in dBA on Form NPCS-10-1 at five second intervals, at ten second intervals, or at fifteen second intervals. An example of such a measurement is presented in Figure 4-12. Note any unusual activity from the noise source in question. Also indicate all external or extraneous noise sources which may contaminate the noise reading. Examples include sounds from passing vehicle traffic and aircraft. The sound readings associated with these external sources will not be included in the statistical noise level calculations. If external sounds contaminate the measurements for a significant amount of time, it may be necessary to conduct the survey during a period of the day in which these other sources are absent or quieter.

d. Using Form NPCS-10-2, tally the recorded noise levels in 1 dBA increments as the example shows in Figure 4-13. Record on NPCS-2 only those sound levels which are legitimately associated with the source in question, ignoring all other contaminating sound levels.

In the "Number of Readings" column, sum the total readings at each dBA level. Using the "Number Greater Than" column, calculate the number of readings taken that are greater than each particular level. For example, in Figure 4-13 there are no readings greater than 74 dBA, hence the "Number Greater Than " is zero. There is one reading taken at a level greater than 73 dBA, and three (1 plus 2) readings greater than 72 dBA.

The percent greater than (% Greater Than) column contains the statistical percent for each dBA level. The percent is calculated by dividing the numbers in the "Number Greater Than" column by the total number of readings times 100. For example, the percent of 73 dBA is calculated as (1/194) x 100 = 0.5%, and the percent at 72 dBA is (3/194) x 100 = 1.5%.

e. Using Form NPCS-10-3, the dBA levels versus the "percent greater than" numbers are plotted. An example of this is shown in Figure 4-14.

From the resulting graph, the statistical noise level at any required percentage may be found. For example, the L_{50} and L_{10} are found to be 63 dBA and 66 dBA, respectively. Note that a normalized or randomly varying noise source will result in a straight line when plotted on form NPCS-10-3.

f. The results from the statistical survey are then summarized on form NPCS-4 (see Figure 4-4). On the back of NPCS-4 a sketch of the measurement site should be drawn.

g. A typical noise survey will require approximately 20 minutes of measuring to record the required number of samples at a 5-second sample interval. However, the noise standards for industrial and commercial noise sources (OAR 340-35-035) are specified for a one-hour (60 minute) period. Therefore, the noise investigator must ensure that the noise survey represents sounds that are typical of a full 60-minute operation of the noise source. If the source significantly changes its operation for the remainder of the hour, it is recommended that a full 60 minutes of samples are measured and recorded for the statistical analysis.

h. The documentation of the L_1 statistical noise level is often better accomplished by the "time above" method. For noise sources that operate for a short period of time at a constant sound level, an accurate determination of the L_1 noise level can be determined by measuring the total amount of time the noise source operates in a one-hour period. If

the source operates for a period of 36 seconds or greater within the hour (but less than 6 minutes), then the L_1 is equal to the measured noise level. If the source operates for 6 minutes or more during the hour, then the measured level is the L_{10} statistical noise level.

4.6.2 Noise Exposure Counter or Monitor Method

Comment: Statistical noise levels may be obtained through the use of several commercially designed devices that sample and classify the data.

4.6.3 Programmable Calculator Method

Comment: The noise staff of the Department has developed a program to calculate statistical noise levels on a Wang 600 series programmable calculator. This method will digitally make the necessary calculations after the analog noise data has been converted to digital data. As this method is specialized to the Department's facilities, it will not be presented here. A complete explanation of the method and program listing is on file at the Department in Manual NPCS-22, Analysis of Ambient Noise with the Wang 600 Series Programmable Calculator.

DEPARTMENT OF ENVIRONMENTAL QUALITY

STATISTICAL NOISE SURVEY

SOURCE: _____ DATE:

_____ BY:

MEASUREMENT SITE: _____ COUNTY: _____

_____ SHEET: /

Time	Bat.	Calibration dB	F dry bulb	F wet bulb	%RH	Press. mm Hg.	Wind MPH	Wind direct.

INSTRUMENTATION		
EQUT	TYPE	SERIAL
SLM		
MIC		
CAL		

WINDSCREEN: ON OFF

~ Range of Noise: Hi _____ dBA Low _____ dBA Central Tend. _____ dBA

Start Time: _____ Sample Interval: 5 10 15 seconds

DATA POINTS	SOUND PRESSURE LEVEL dBA					
1 - 6						
7 - 12						
13 - 18						
19 - 24						
25 - 30						
31 - 36						
37 - 42						
43 - 48						
47 - 54						
55 - 60						
61 - 66						
67 - 72						
73 - 78						
79 - 84						
85 - 90						
91 - 96						
97 - 102						
103 - 108						
109 - 114						
115 - 120						
121 - 126						
127 - 132						

Figure 4-9
Form NPCS-10-1

Note: See back for the minimum number of samples.
Indicate all missing data points and give an explanation.

NPCS-10-1

6/76

133 - 138						
139 - 144						
145 - 150						
151 - 156						
157 - 162						
163 - 168						
169 - 174						
175 - 180						
181 - 186						
187 - 192						
193 - 198						
199 - 204						
205 - 210						
211 - 216						
217 - 222						
223 - 228						
229 - 234						
235 - 240						
241 - 246						
247 - 252						
253 - 258						
259 - 264						
265 - 270						
271 - 276						
277 - 282						
283 - 288						
289 - 294						
295 - 300						
301 - 306						
307 - 312						
313 - 318						
319 - 324						
325 - 330						
331 - 336						

Figure 4-9
Reverse Side Form NPCS-10-1

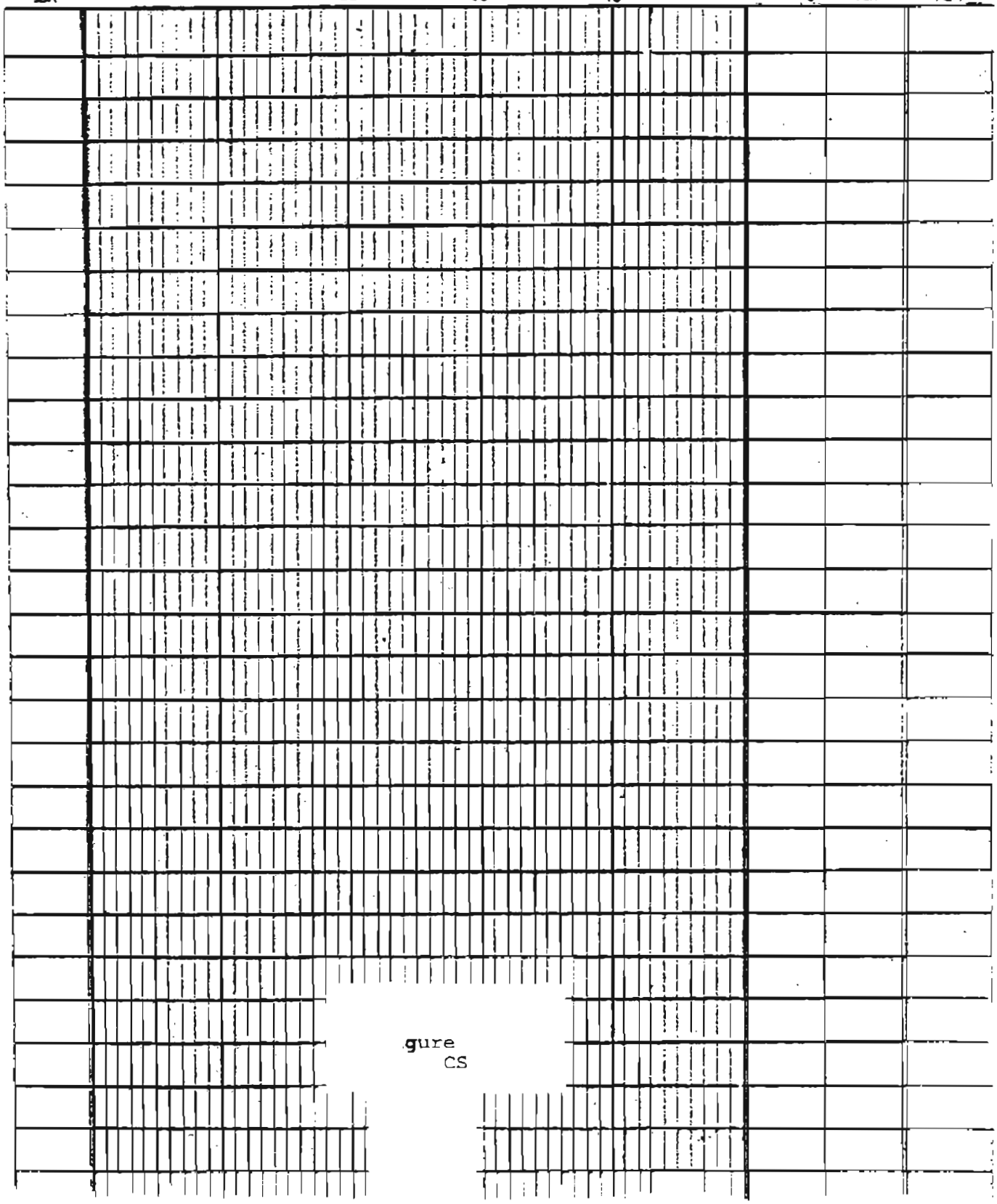
Maximum - Minimum Levels (difference in range)													
0-8	9	10	11	12	13	14	15	16	17	18	19	20	21
132	138	174	210	246	288	336	384	438	498	558	618	684	756
Minimum Number "Good" Samples													

Note: Indicate all missing data points and give an explanation. Additional data points may be needed to document an L_1 violation.

NPCS-10-1

DEPARTMEN OF ENVIRONMENTAL QUALITY
STATISTICAL COMPUTATION SHEE

te. _____ rce: _____ /



gure
CS

NPCS 2 6/76

Figure 4-11
Form NPCS-10-3

SOURCE: ACME WOOD PRODUCTS INC. DATE: 9-16-81

1581 S.W. 76TH (DEBARKER, SAW, CHIPPER) BY: GTW

MEASUREMENT SITE: SITE 1, MR & MRS. JONES' NSP COUNTY: MULT.

1576 S.W. 76TH, PORTLAND SHEET: 2/4

Time	Bat.	Calibration dB	F dry bulb	F		Press. mm Hg.	Wind MPH	Wind direct.
1410	✓	114.0					0-5	NW
1515	✓	114.0					2-6	NW

~ Range of Noise: Hi 67 dBA Low 61 dBA Central Tend. 63 dBA

Start Time: 1420 PDT Sample Interval: (5) 10 15 seconds

INSTRUMENTATION		
EQUT	TYPE	SERIAL
SLM	GR 1565	12345
MIC	1"	
CAL	GR 1987	1790

WINDSCREEN (ON) OFF

DATA POINTS	SOUND PRESSURE LEVEL dBA					
1 - 6	65	63	62	61	64	65
7 - 12	63	61	65	CAR	CAR	64
13 - 18	63	62	70	65	63	62
19 - 24	70	62	DOG	64	63	61
25 - 30	62	63	63	61	67	67
31 - 36	TRUCK →	T	T	64	66	65
37 - 42	62	63	64	63	62	64
43 - 48	63	63	64	63	73 R	62
47 - 54	63	63	65	62	64	63
55 - 60	61	64	65	63	63	65
61 - 66	65	66	64	61	62	66
67 - 72	60	61	63	63	64	70
73 - 78	72	61	73 R	74 R	64	64
79 - 84	63	62	60	65	62	64
85 - 90	61	62	67	63	JET	JET →
91 - 96	JET	JET	65	64	64	64
97 - 102	70 R	63	64	63	62	65
103 - 108	66	65	66	62	64	63
109 - 114	64	64	62	63	65	64
115 - 120	64	67	63	64	DOG	DOG
121 - 126	65	66	67	64	66	69
127 - 132	69	CAR	CAR	63	66	64

Note: See back for the minimum number of samples. NPCS-10-1
Indicate all missing data points and give an explanation.

6/76

133 - 138	63	66	65	64	63	66
139 - 144	62	63	65	64	63	64
145 - 150	64	64	65	66	62	64
151 - 156	66	63	68	63	63	63
157 - 162	62	63	64	63	63	62
163 - 168	63	65	64	62	63	68
169 - 174	← COMPLAINANT		TALKING →		64	61
175 - 180	63	63	63	64	63	65
181 - 186	64	61	61	BIRDS →	B	63
187 - 192	64	63	64	62	65	64
193 - 198	62	64	63	62	64	62
199 - 204	CAR	CAR	63	64	60	63
205 - 210	64	62	62	TRUCK →	T	T
211 - 216	T	T	T	63	64	64
217 - 222	69	63	65	63	65	63
223 - 228						
229 - 234						
235 - 240						
241 - 246						
247 - 252						
253 - 258						
259 - 264						
265 - 270						
271 - 276						
277 - 282						
283 - 288						
289 - 294						
295 - 300						
301 - 306						
307 - 312						
313 - 318						
319 - 324						
325 - 330						
331 - 336						

Maximum - Minimum Levels (difference in range)

0-8	9	10	11	12	13	14	15	16	17	18	19	20	21
132	138	174	210	246	288	336	384	438	498	558	618	684	756

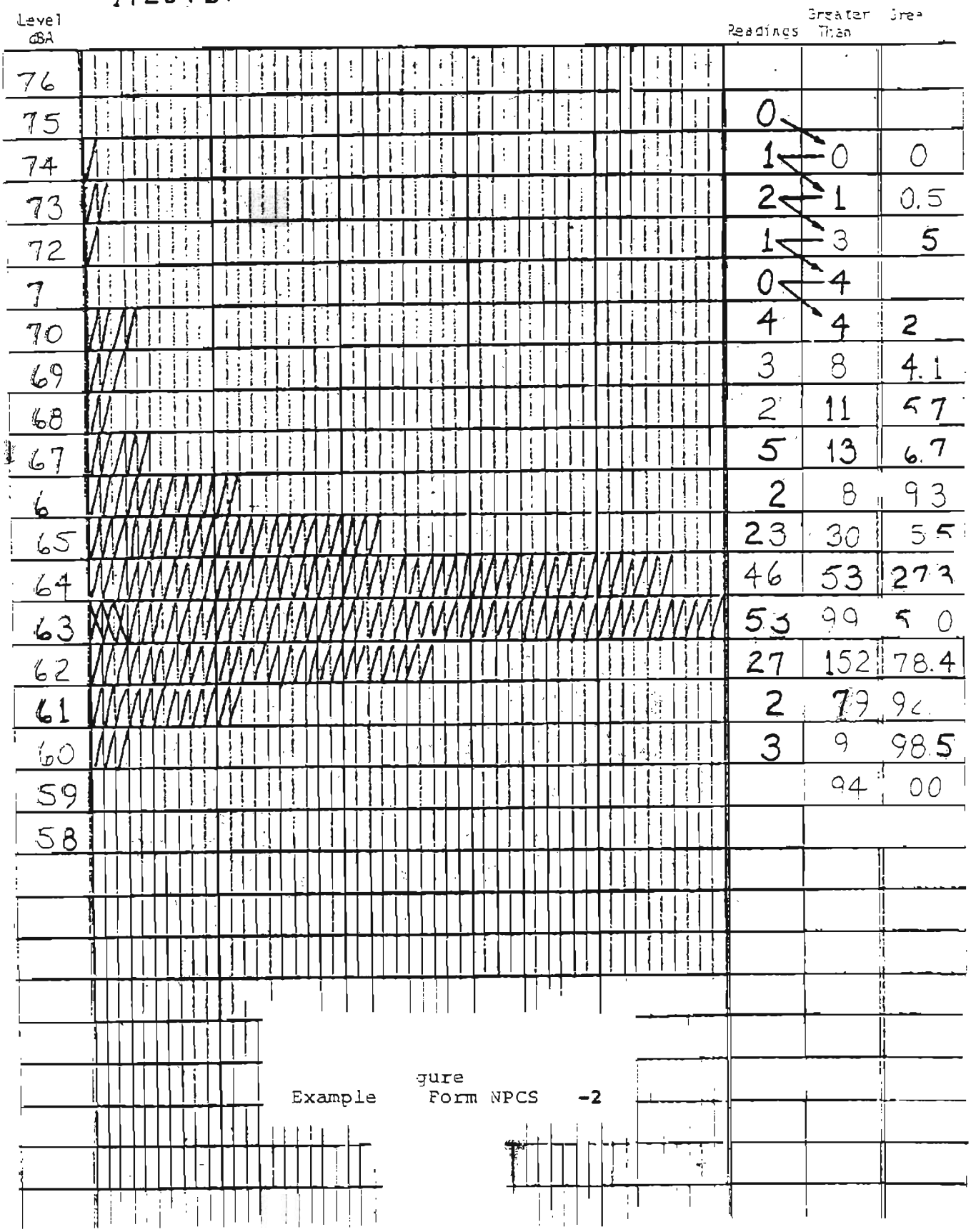
Minimum Number "Good" Samples

Additional data

NPCS-10-1

ICAL COMPI

Date 9-16-81 1420 PDT Source: ACME WOOD PRODUCTS INC. Sheet 3/4



Level dBA	Readings	Greater Than	Grea
76			
75	0		
74	1	0	0
73	2	1	0.5
72	1	3	5
7	0	4	
70	4	4	2
69	3	8	4.1
68	2	11	57
67	5	13	6.7
6	2	8	93
65	23	30	55
64	46	53	273
63	53	99	50
62	27	152	78.4
61	2	79	9[illegible]
60	3	9	98.5
59		94	00
58			

Example gure Form NPCS -2

NPCS 2

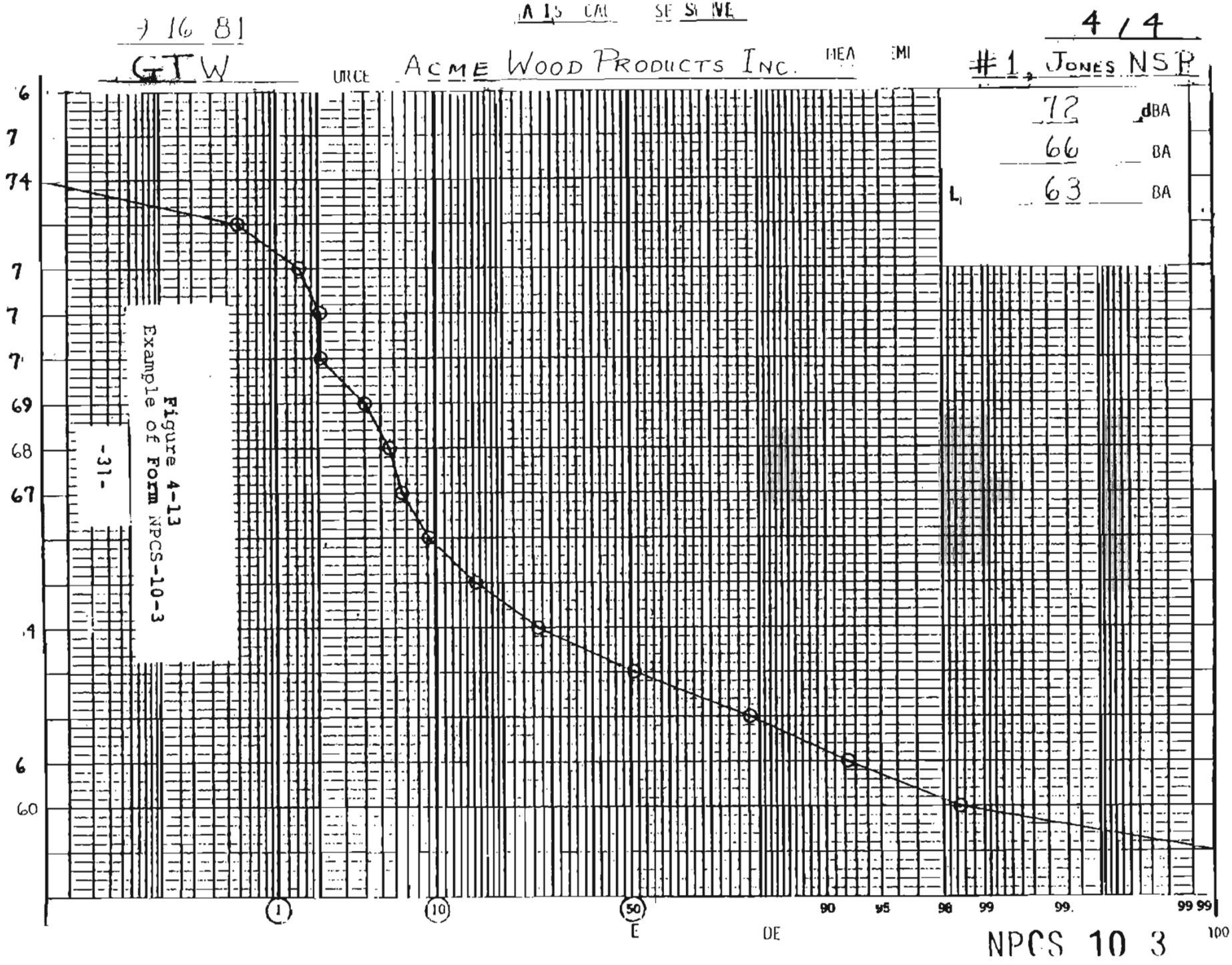


Figure 4-13
Example of Form NPCS-10-3

4.8.1 Point Source

Comment: The sound pressure level at a point r feet from a point source can be calculated from a sound pressure level measurement at a point r_o feet from the point source using the following equation:

$$SPL = SPL_o - 20 \log (r/r_o)$$

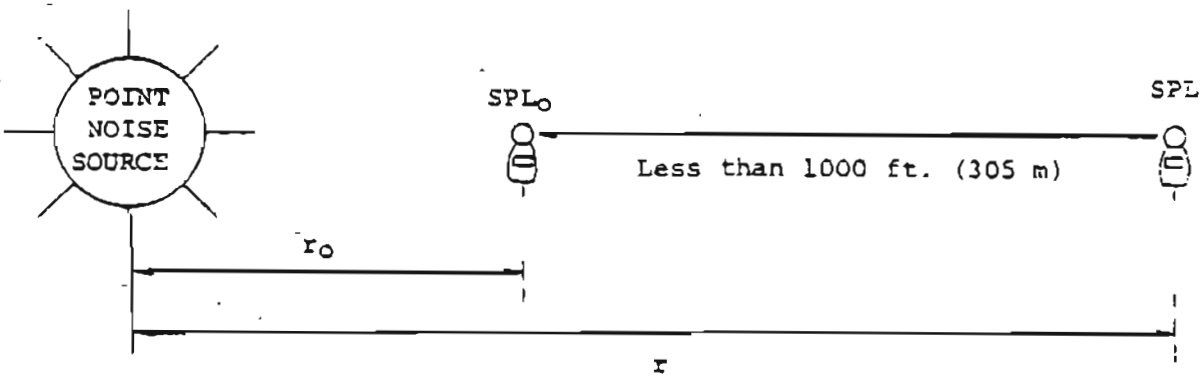
where:

SPL = sound pressure level at r feet from the source.

SPL_o = sound pressure level at r_o feet from the source. Note that r_o is a reference distance and that the distance r is always greater than r_o. The point r_o must be in the far field of the source.

Figure 4-15 illustrates a point source, such as an industrial site, and the distance at which the measurement SPL_o is taken and the distance where the required level, SPL is needed.

This projection technique is applicable only if the distance between r and r_o is less than 1000 feet. This projection technique should be used only when it is not practical to make a sound pressure level reading at r.



SOUND LEVEL ADJUSTMENT WITH DISTANCE

FIGURE 4-15

4.8.2 Line Source

Comment: The sound pressure level at a point r feet from a line source can be calculated from a sound pressure level measurement at a point r_o feet from the line source using the following equation:

$$SPL = SPL_o - 10 \log (r/r_o)$$

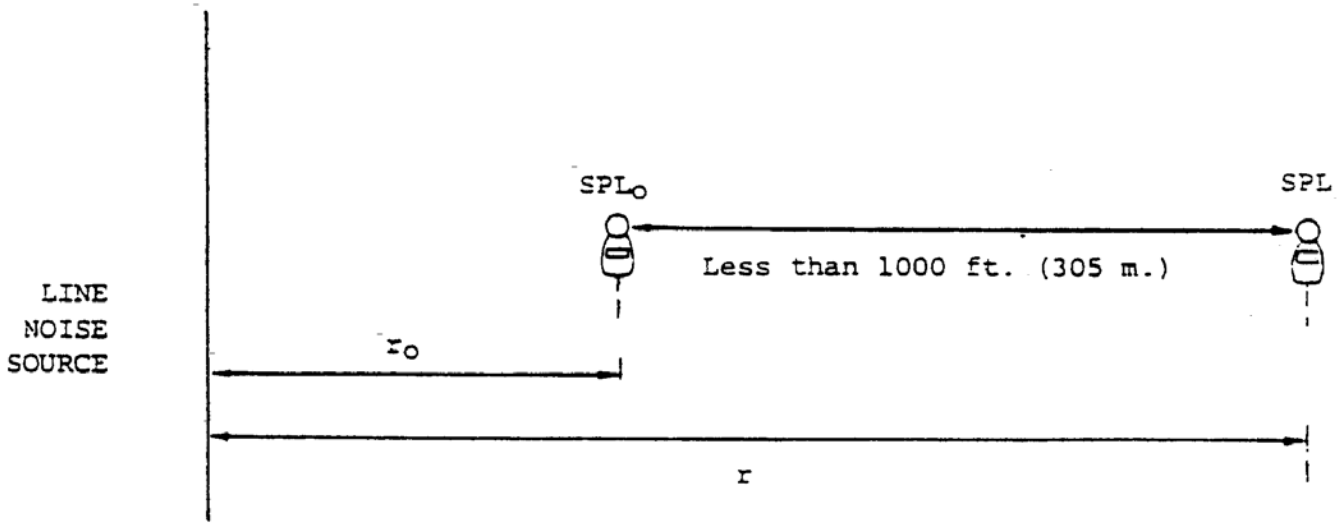
where:

SPL = sound pressure level at r feet from the source.

SPL_o = sound pressure level at r_o feet from the source. Note that r_o is a reference distance and that the distance r is always greater than r_o. The point r_o must be in the far field of the source.

Figure 4-16 illustrates a line source, such as a highway with closely spaced moving vehicles, and the distance at which the measurement, SPL_o is taken and the distance where the required level SPL is needed.

This projection technique is applicable only if the distance between r and r is less than 1000 feet. This projection technique should be used only when it is not practical to make a sound pressure level reading at point r.



LINE NOISE SOURCE DISTANCE ADJUSTMENT

FIGURE 4-16

Motor Vehicle Sound Measurement Procedures Manual

NPCS - 21

State of Oregon
Department of
Environmental
Quality

REVISION RECORD

INSTRUCTIONS FOR USE: All revisions of this manual will be numbered to assure each manual holder that he has received all revisions. The date and initials of the person inserting revisions to the manual should be entered on this revision record opposite the appropriate revision number. If the sequence is broken, copies of the missing revisions may be requested from the Noise Control Section.

Rev. No	Date Inserted	Initials	
1	7/8/74	JH	
2.	8/27/76	JH	EQC Amendments
3.	5/27/77	JH	EQC Amendments
4.	9/16/77	DO	pg. 42, corrected typographic error
5.	1/10/78	DO	pg. 12, corrected typographic error.
6.	5/21/80	JH	EQC Motorboat Amendements
7.	4/8/83	~~JH~~	EQC Amendments
8.			
9.			
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18.			

FOREWORD

The Motor Vehicle Sound Measurement Procedures Manual has been prepared to specify the equipment to be used, and the procedures established in the manual, when carefully followed, will ensure that the noise readings obtained are accurate, will support enforcement action, and aid in reducing motor vehicle noise.

The scope of this manual includes sound measurements for new motor vehicles, on-highway motor vehicles and stationary testing of off-highway and on-highway motor vehicles.

The objective of the manual is to establish procedures to implement the objectives of the Environmental Quality Commission. Further, if the practices and procedures herein are adhered to, the result will be a uniform enforcement program which will accomplish the intent of the Legislature and fulfill the Commission's responsibility under ORS Chapter 467.

Office of the Administrator
Air Quality Control Division
Department of Environmental Quality

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Chapter 6 - NEAR

LIST OF FIGURES

CHAPTER 1

INTRODUCTION

1.1 Policy

1.1.1 The Department of Environmental Quality, through the Noise Pollution Control Section, shall establish a noise measurement program to implement the laws and regulations applying to motor vehicle noise.

1.1.2 The Noise Pollution Control Section and cooperating enforcement agencies shall be responsible for motor vehicle noise measurement.

1.3 This manual contains procedures for the Noise Pollution Control Section, Enforcement Division, and other persons taking motor vehicle sound measurements. Guidance is provided for in the comments.

1.2 Authority

2.1 Statutory and administrative law governing authority to the guidance and direction contained in this manual is found in the following sources:

a. Oregon Revised Statutes, Chapter 467, Sections 467.010 467.020, 467.030, 467.050, 467.990.

b. Oregon Administrative Rules, Chapter 340, Division 35, Department of Environmental Quality.

1.3 Instruments and Training

1.3.1 Specific requirements for instruments and personnel are defined under procedure manual, Noise Pollution Control Section - 2, Requirements for Sound Measuring Instruments and Personnel.

1.3.2 Allied departments, divisions or agencies who select sound measuring instruments for measuring noise emissions should secure the assistance of qualified engineers in the field of sound measurement in preparing specifications and making purchases of such instruments.

1.3.3 Personnel making noise measurements shall be carefully trained in the techniques of noise measurements, use of required instruments, instrument calibration and problems which may be encountered when performing such tasks.

CHAPTER 2

STATIONARY MOTOR VEHICLE SOUND LEVEL MEASUREMENT AT 25 FEET FOR TRUCKS AND BUSES

Scope. This Chapter establishes procedures for setting up and calibrating sound measuring equipment and conducting tests to determine the sound level output of a stationary vehicle, as measured 25 feet from the vehicle. The near field test procedure at 20 inches (.5 meter) is presented in Chapter 6.

Motor vehicles in excess of 10,000 pounds GVWR or GCWR engaged in interstate commerce shall conform to measurement procedures and methodologies specified in Compliance with Interstate Motor Carrier Noise Emission Standards of the Federal Highway Administration, Department of Transportation (49 CFR 325).

These procedures, the 25-foot stationary test, are used to conduct emission tests on trucks and buses rated in excess of 8,000 pounds. The standards for these vehicles are found in Table 2 of OAR 340-35-030.

2.2 Measurement Sites. Measurement sites shall be free of sound-reflecting objects within fifty feet of the microphone and fifty feet of the vehicle to be tested. (See Figure 2-1)

Comment: A "Sound-reflecting Surface" is any object or landscape surface in the immediate vicinity of a measurement site which reflects sufficient sound to require the application of a correction factor to the sound level meter reading. Surfaces which are not sound-reflecting surfaces are:

a. Any surface that measures less than eight feet in length in a direction parallel to the portion of the microphone line on which the microphone is positioned, regardless of height (such as a telephone booth or a tree trunk) or less than one foot in height, regardless of length (such as a curb or guard rail).

b. Any vertical surface, regardless of size (such as a billboard) with the lower edge more than fifteen feet above the roadway.

c. Any uniformly smooth slanting surface with less than a forty-five degree slope above horizontal.

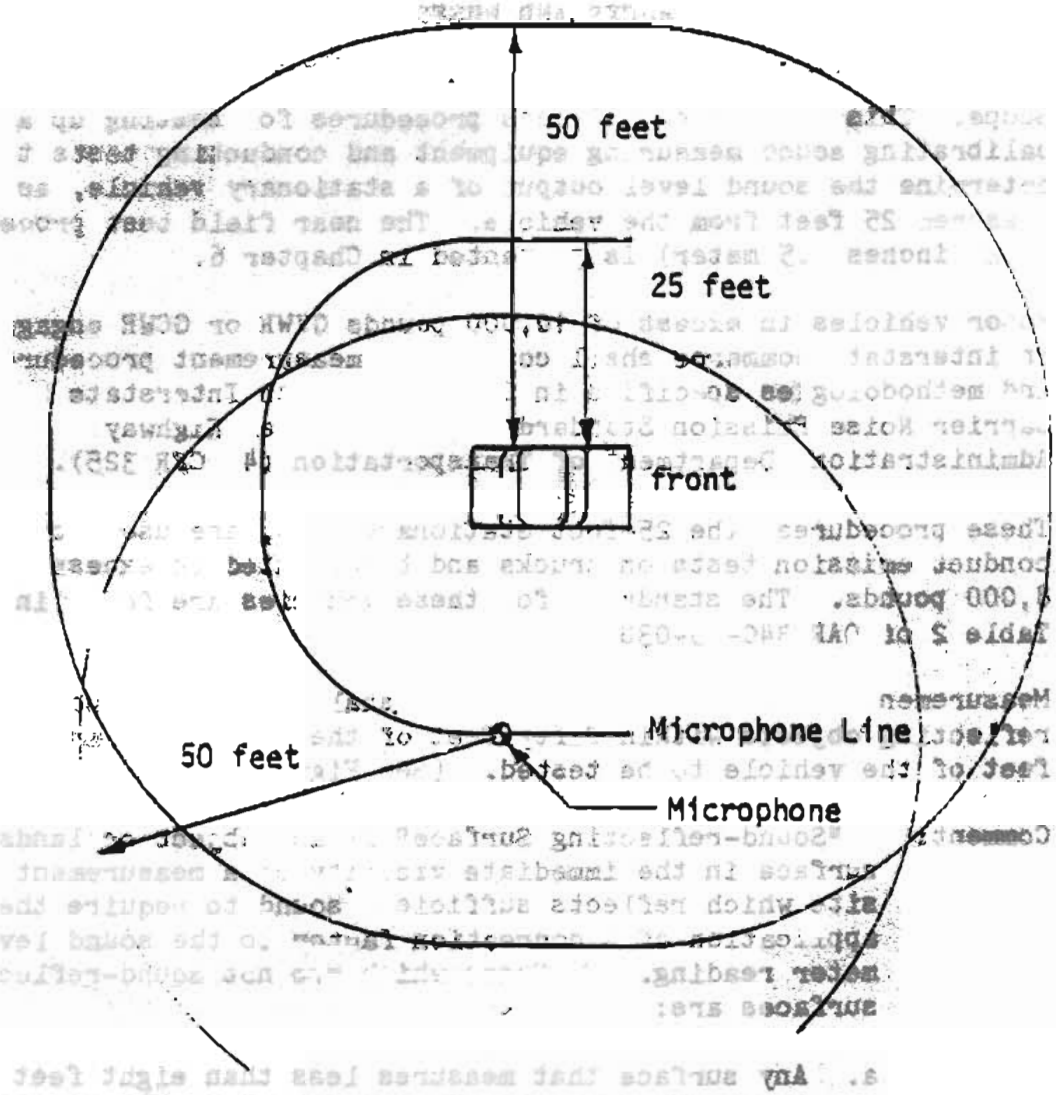


Fig. 2.1 Stationary Measurement Site

d. Any slanting surface with a forty-five to ninety degree slope above the horizontal where the line at which the slope begins to exceed forty-five degrees is more than fifteen feet above the roadway.

e. Any trees, bushes, shrubs, hedges, grass, or other vegetation.

All other surfaces are considered sound-reflecting surfaces.

2.2.1 Microphone Location. The microphone shall be located twenty-five feet ± six inches from the rear or from either side of the vehicle to be tested. The locus of points thus defined is the microphone line (See Figure 2-1). The microphone shall be located at the point on the microphone line at which the maximum sound level occurs.

Sound Level Measuring Precaution

2.3.1 Wind. Do not conduct measurements when wind velocity at the test location exceeds ten miles per hour.

2.3.2 Precipitation. Do not conduct measurements when falling precipitation affects results. However, measurements may be taken when streets are wet.

2.3.3 Ambient Noise. The ambient sound level shall be at least 10 dBA below the sound level of the vehicle being measured.

Recording. The sound level recorded shall be the highest level obtained during each test, disregarding unrelated peaks due to extraneous ambient noises.

Equipment Setup and Use.

2.4.1 General. All types of sound level meters shall be field calibrated immediately prior to use using the procedures described in the factory instruction manual.

2.4.2 Battery Check. Batteries in both the meter and calibrator shall be checked before calibration.

2.4.3 Instrument Calibration. The instrument shall be set to the correct level range, weighting scale and meter response. The calibrator shall be placed on the microphone of the meter. The output indicated on the meter shall then be adjusted to the correct calibration level.

2.4.4 Microphone Height. The sound level meter may be hand held or placed on a tripod. The microphone shall be positioned four and one-half feet above the ground.

2.4.5 Windscreens. Windscreens made of open cell polyurethane foam furnished by the instrument manufacturer shall be placed over the microphone after calibration.

COMMENT: The windscreen reduces the effect of wind noise and protects the microphone diaphragm from dust or other airborne matter.

2.4.6 Annual Calibration. Within one year prior to use, each set of sound measuring instruments, sound level meter including octave band filter, and calibrator, shall receive a laboratory calibration in accordance to the manufacturer's specifications. This calibration shall be traceable to the National Bureau of Standards.

COMMENT: An inspection label will be attached to each instrument set to determine when the calibration was performed.

2.5 Sound Level Measurement

2.5.1 Preliminary Steps. The following steps shall be followed before taking a measurement.

(a) Turn meter on.

(b) Switch meter to "A" weighting scale.

(c) Switch meter to "FAST" response.

(d) Set the meter to the appropriate range to measure the anticipated sound level.

2.5.2 Mounting. The sound level meter shall be hand held or placed on a tripod according to the manufacturer's instructions.

2.5.3 Orientation. The orientation of the sound level meter microphone shall be according to the manufacturer's instructions to obtain random incidence.

2.5.4 Variations. Allowances are necessary due to unavoidable variations in measurement sites and test equipment. Vehicles are not considered in violation unless they exceed the regulated limit by 2 dBA or more.

2.6 Vehicle Test Procedure.

2.6.1 Vehicle Sound Level. The sound levels for stationary motor vehicles shall be determined by tests performed according to the following procedures.

2.6.2 Location. The microphone shall be located on the microphone line at the position where the maximum sound level is expected to occupy. (See Figure 2-1).

2.6.3 Preliminary Tests. Sufficient preliminary tests shall be made to enable the driver to become thoroughly familiar with the test procedure.

2.6.4 Vehicle Operation. The vehicle shall be stationary, in a neutral gear, at its normal operating temperature.

a. Governed Engines. Engines with speed governors shall be run at low idle with the throttle closed. The throttle shall then be fully opened as fast as possible. As soon as the engine reaches and stabilizes at governed speed, the throttle shall be fully closed as quickly as possible.

b. Non-Governed Engines. Engines without speed governors shall be operated the same as governed engines except that the throttle shall be closed quickly enough to prevent excessive engine speed and possible damage to the engine. Drivers of vehicles supplied with tachometers should use the tachometer to monitor engine speed.

2.6.5 Visual Reading. The highest sound level observed, exclusive of peaks due to unrelated ambient noise, shall be reported for each test.

2.6.6 Reported Sound Level. The reported sound level for the vehicle shall be the highest reading which is no more than one dB higher than the next highest reading.

2.6.7 Stationary Motor Vehicle Test Form. A form to record all pertinent information and data is presented in Figure 2-2. This form, NPCS-24 or any other Department approved form for this use, shall be used for stationary tests.

STATIONARY VEHICLE NOISE TEST

NOISE POLLUTION DIVISION
DEPARTMENT OF ENVIRONMENTAL QUALITY

DATE

YEAR	VEHICLE MAKE	VEHICLE TYPE	LICENSE NO.	MODEL

REGISTERED OWNER

ADDRESS

DRIVER

D.L. NO.

ADDRESS

ENGINE TYPE	HP	ENGINE DISPLACEMENT	LOCATION	VEHICLE MILEAGE

EXHAUST OUTLET	CHECK POSITION AND SIZE OF OUTLET	RESONATORS	MUFFLER TYPE	TIRE SIZE	GEAR RATIOS
☐ Single ☐ L. Side ☐ Rear ☐ Dual ☐ R. Side ☐ Vertical	☐ Straight ☐ 45° to rear ☐ 45° to Side ☐ ___ dia	☐ Single ☐ Dual		___ x ___	Diff. ___ : ___ Spkt. ___ : ___ (No. of Teeth)

RECORDER MODEL AND DEQ NO.

METER MODEL AND DEQ NO.

CALIBRATOR AND DEQ NO.

TEST DRIVER

TEST ENGINEER

METER CHECK
☐ BAT. ☐ WINDSCREEN ☐ "A" SCALE ☐ FAST ☐ CALIB.

OPERATING CONDITIONS	Time	READINGS dBA	READINGS LOCATION NUMBER	MAX. RPM

TEST CONDITIONS

WEATHER CONDITION	TEMP.	R.H.	WIND SPEED

Sketch in this space the measurement site peculiarities, and using the proper symbols indicate the direction of wind, vehicle orientation and reading locations.

Key: WIND DIRECTION - - - →
VEHICLE ←→
MICROPHONE LOCATION NO. ⇨

INSTRUMENTATION SET UP AT 25 FT FROM EDGE OF VEHICLE

NPCS-24

Figure 2.2

Stationary Vehicle Noise Test

CHAPTER 3

IN-USE VEHICLE MOVING SOUND LEVEL MEASUREMENTS

Scope. This chapter describes the procedure for selecting sites and setting up equipment for measurement of noise from vehicles on the highway, off-road or on water.

This procedure is used to test and monitor moving vehicles at distances of 35 to 118 feet (typically 50 feet) from the vehicle path. The standards for road vehicles and off-road recreational vehicles are found in Tables 3 and 4 of OAR 340-35-030.

Measurement Sites.

3.2.1 Types of Sites. Two types are established for measuring vehicles in use on the highway. They are a standard measuring site requiring a large clear open area and a restricted measuring site in which sound-reflecting objects are permitted. When selecting measuring sites, care shall be taken to measure sites carefully and determine if a correction factor must be applied.

3.2.2 Standard Measuring Sites. Standard measuring sites are those where the microphone can be placed 50 feet from the center of the vehicle path and where there are no sound-reflecting objects within 100-foot radius of the microphone point (which is the point on the vehicle path that is closest to the microphone). (See Figure 3-1) When making measurements of vehicle sound levels in standard measuring sites, the instrument readings shall be recorded with no correction factor applied.

3.2.3 Restricted Measuring Sites. Restricted measuring sites are those where the distance from the center of the vehicle path to the microphone is other than 50 feet or where there are sound reflecting surfaces closer than 100 feet from the microphone or the microphone point. Vehicle noise measurements may be made in such areas when the proper correction factors described in this chapter are applied to the recorded sound levels. (See Figure 3-2)

3.2.4 Measuring Distance. The actual distance from the microphone to the microphone point at the center of the vehicle path may range from 35 to 118 feet when the factor obtained from Figure 3-3 is added to the sound level meter readings to correct the reading to what it would be at the standard measuring distance of 50 feet.

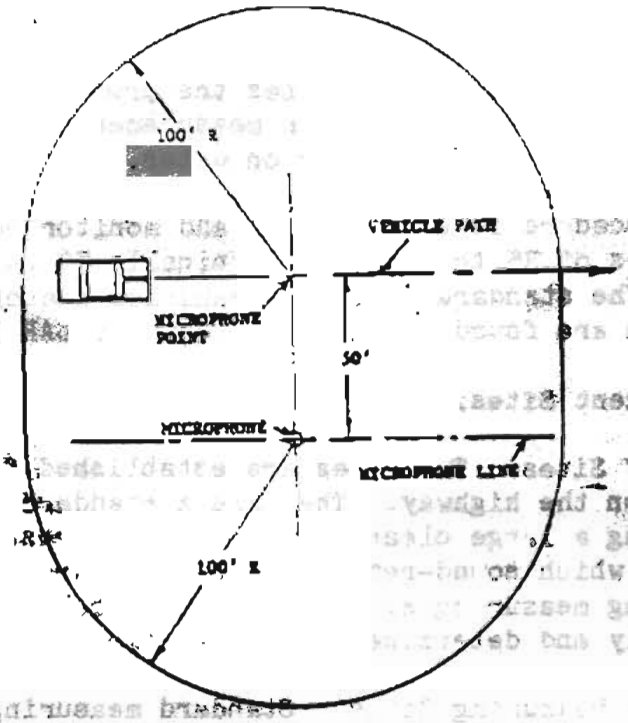


Fig. 3-1. Standard Measuring Site

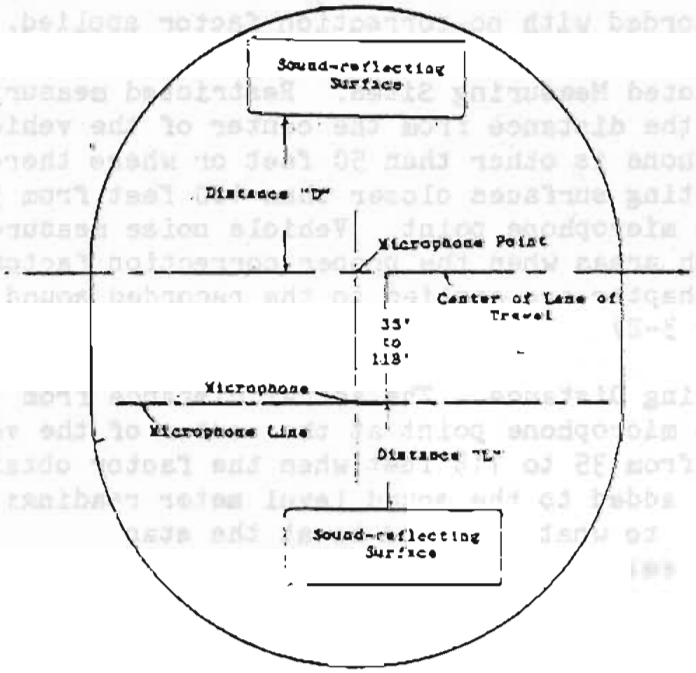


Fig. 3-2. Restricted Measuring Site

Distance from Microphone to Pathway Centerline	dBA Correction Factor
35 - 39 ft	-3
39 - 43 ft	-2
43 - 48 ft	-1
48 - 58 ft	0
58 - 70 ft	+1
70 - 83 ft	+2
83 - 99 ft	+3
99 - 118 ft	+4

Example: If the distance between the microphone and the pathway centerline is 36 feet instead of 50 feet and a vehicle is measured at 90 dBA, the recorded reading will be as follows:

90	dBA	Uncorrected reading
-3	dBA	Correction factor
87	dBA	Corrected reading

Fig 3-3 Measuring Distance Correction Factors

3.2.5 Sound-reflecting Surfaces. A "sound-reflecting surface" is any object or landscape surface in the immediate vicinity of a measurement site which reflects sufficient sound to require the application of a correction factor to the sound level meter reading.

a. Correction factors determined from paragraph 3.2.7 may be applied only when sound-reflecting surfaces are basically parallel to the lane of travel.

b. A basically parallel surface may have irregularities or projections of not more than two feet measured perpendicular to the lane of travel, with the distance to the microphone line or vehicle path measured from the closest point of the projection.

3.2.6 Surfaces Not Requiring Correction Factors. Correction factors shall not be applied to the sound level reading when the following surfaces are within the measuring area defined by paragraph 3.2.2:

a. Any surface that measures less than eight feet in length in a direction parallel to the vehicle path, regardless of height (such as telephone booth or tree trunk) or less than one foot in height, regardless of length (such as a curb or guard rail).

b. Any vertical surface, regardless of size (such as billboard) with the lower edge more than fifteen feet above the surface.

c. Any uniformly smooth slanting surface with less than a forty-five degree slope above horizontal.

d. Any slanting surface with a forty-five to ninety degree slope above horizontal where the line at which the slope begins to exceed forty-five degrees is more than fifteen feet above the surface.

e. Any trees, brushes, shrubs, hedges, grass or other vegetation.

3.2.7 Correction Factors for Sound-reflecting Surfaces. Correction factors to be applied to sound level meter readings when there are sound-reflecting surfaces within 100 feet of either the microphone or microphone point are determined as follows:

a. Reflecting Surfaces. Sites where there are sound-reflecting surfaces basically parallel to the vehicle path within the clear area of the standard site may be used by measuring the distances shown in Figure 3.4 and 3.5, and applying the correction factor obtained from the nomogram in Figure 3-6.

b. Smooth Embankments. The point of measurement from smooth embankments shall be the place on the embankment where the slope begins to exceed forty-five degrees above horizontal (See Figure 3-4). The point of measurement from irregular embankments shall be the place on the embankment where the irregularity begins. A smooth embankment is one with vegetation, concrete, asphalt, dirt or other relatively smooth cover.

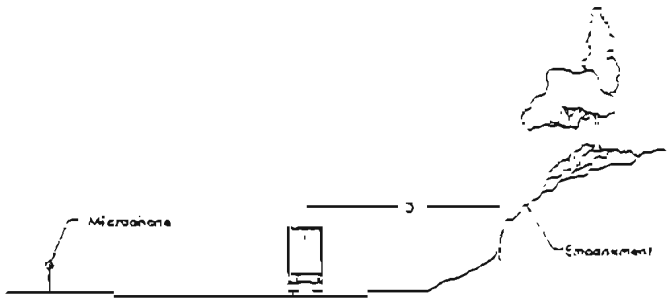


Fig. 3-4. Measurement of Distance to Embankment

c. Taking Measurements. To determine the correction factor for sound-reflecting surfaces within the measuring site, measure the distances shown in Figure 3-5. Measurement "D" is the shortest distance between the sound-reflecting surface and the centerline of the lane of travel. Measurement "L" is the shortest distance between the sound-reflecting surface and a line parallel to the lane of travel that passes through the microphone (microphone line).

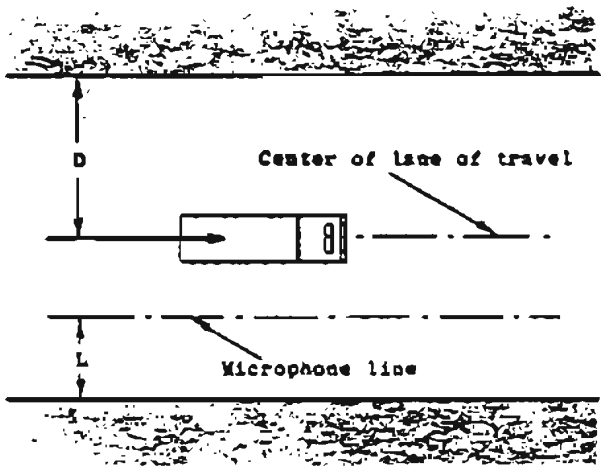
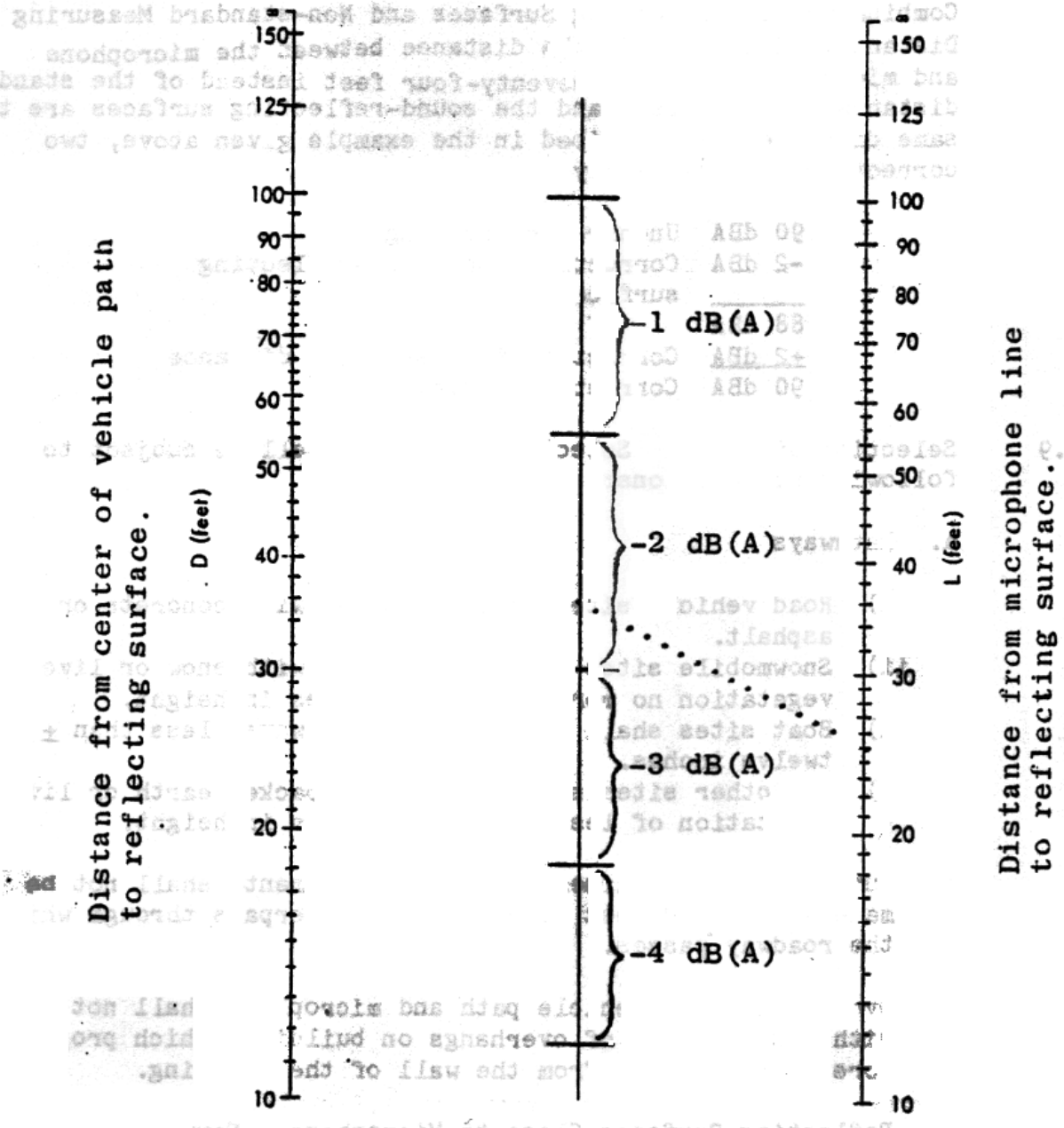


Fig. 3-5 Correction Factor Distances "D" and "L"

d. Determining Correction Factor. Locate the points on the left and right scales of the nomogram (Figure 3-6) corresponding to the distances "D" and "L." Place a straight edge across the nomogram so that it connects the two points. The point where the straight edge intersects the center axis indicates the correction factor to be applied to the sound level meter reading.

e. Example. The dotted line in Figure 3-6 illustrates the use of the nomogram for a reflecting surface fifty-two feet from the center of the lane of travel (distance "D") and one twenty-five feet from the microphone line (distance "L"). These measurements plotted on the nomogram result in a correction factor of -2 dBA. With the microphone at the standard measuring distance of fifty feet and a vehicle measured at ninety dBA, the corrected reading would be recorded as follows.

90 dBA	Uncorrected reading
-2 dBA	Correction from Figure 3-6
88 dBA	Corrected reading



On centerline read dB(A) correction to be subtracted from meter reading.

Fig. 3-6 Nomogram for Reflecting Surfaces

3.2.8 Combination of Reflecting Surfaces and Non-standard Measuring Distance. Example. If the distance between the microphone and microphone point is seventy-four feet instead of the standard distance of fifty feet and the sound-reflecting surfaces are the same distances as described in the example given above, two corrections are necessary.

90 dBA	Uncorrected reading
-2 dBA	Correction for sound-reflecting surfaces
88 dBA	
+2 dBA	Correction for measuring distance
90 dBA	Corrected reading

3.2.9 Selection of Sites. Selection of sites shall be subject to the following restrictions:

a. Pathways

i) Road vehicle sites shall be paved with concrete or asphalt.

ii) Snowmobile sites shall be covered with snow or live vegetation no more than four inches in height.

iii) Boat sites shall be on water with waves less than ± twelve inches.

iv) All other sites shall be on hard packed earth or live vegetation of less than four inches in height.

b. Tunnels and Overpasses. Sound measurements shall not be made within 100 feet of a tunnel or overpass through which the roadway passes.

c. Overhangs. The vehicle path and microphone shall not be within fifty feet of overhangs on buildings which project more than two feet from the wall of the building.

d. Reflecting Surfaces Close to Microphone. Sound reflecting surfaces, other than the ground or water, shall be no closer than ten feet from the microphone line.

e. Reflecting Surfaces Close to Lane of Travel. Sound reflecting surfaces shall be no closer than ten feet from the center of the lane of travel for a distance of 100 feet parallel to the vehicle path on either side of the microphone point.

f. Non-parallel Reflecting Surfaces. Large reflecting surfaces that are not basically parallel to the lane of travel shall be 100 feet or more from the microphone or microphone point. (see Figure 3-7).

g. Grades. The standards for road vehicles on "level roadways" contained in Table 3 of OAR 340-35-030 may be applied to vehicles traveling on any roadway that does not exceed a grade of plus two (2) percent.

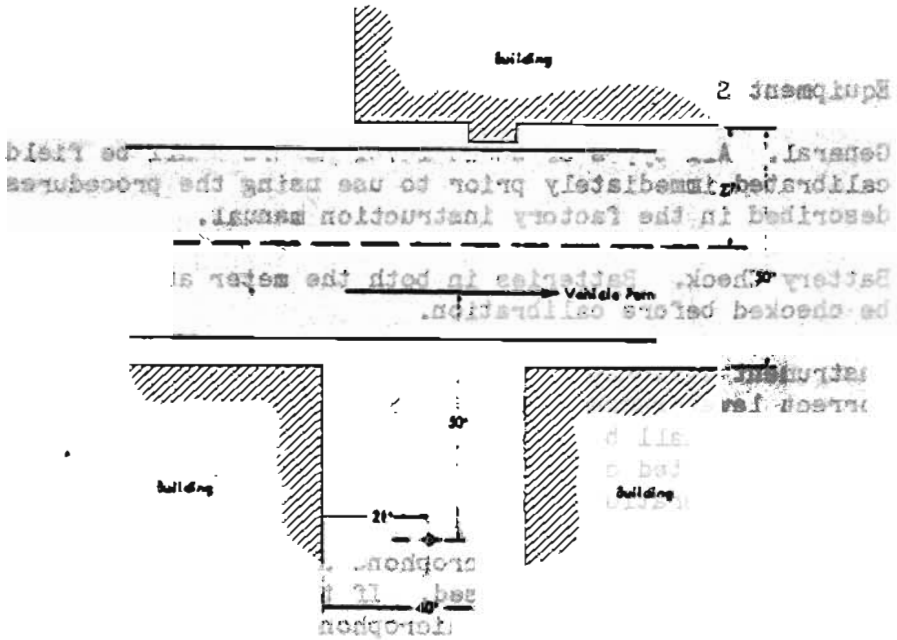


Fig. 3.7. Unacceptable Measuring Site

3.3 Sound Level Measuring Precautions

3.3.1 Identification. It is most important that the noise recorded is actually from the vehicle being measured. Care must be taken to ensure that noise from another vehicle does not add to that from the one being measured.

3.3.2 Intensity. The sound level of the vehicle under scrutiny must rise at least 6 dBA before and fall at least 6 dBA after the maximum sound level occurs.

3.3.3 Recording. The sound level recorded shall be the highest level obtained as the vehicle passes by, disregarding unrelated peaks due to extraneous ambient noises.

3.3.4 Wind. Always use the wind screen on the microphone when taking measurements. Do not conduct measurements when wind velocity at the test location exceeds ten miles per hour.

3.3.5 Precipitation. Do not conduct measurements when falling precipitation affects results. Streets shall be dry during road vehicle measurements.

Ambient Noise. The ambient sound level shall be at least 10 dBA below the sound level of the vehicle being measured.

3.4 Equipment Setup and Use

3.4.1 General. All types of sound level meters shall be field calibrated immediately prior to use using the procedures described in the factory instruction manual.

Battery Check. Batteries in both the meter and calibrator shall be checked before calibration.

3.4.3 Instrument Calibration. The instrument shall be set to the correct level range, weighting scale and meter response. The calibrator shall be placed on the microphone of the meter. The output indicated on the meter shall then be adjusted to the correct calibration level.

Microphone Height. The microphone shall be placed on a tripod if an extension cable is used. If the cable is not used, the sound level meter with the microphone attached may be hand held or placed on a tripod. The microphone shall be positioned at height of 4 $\pm$ 1/2 ft as shown in Figure 3.8.

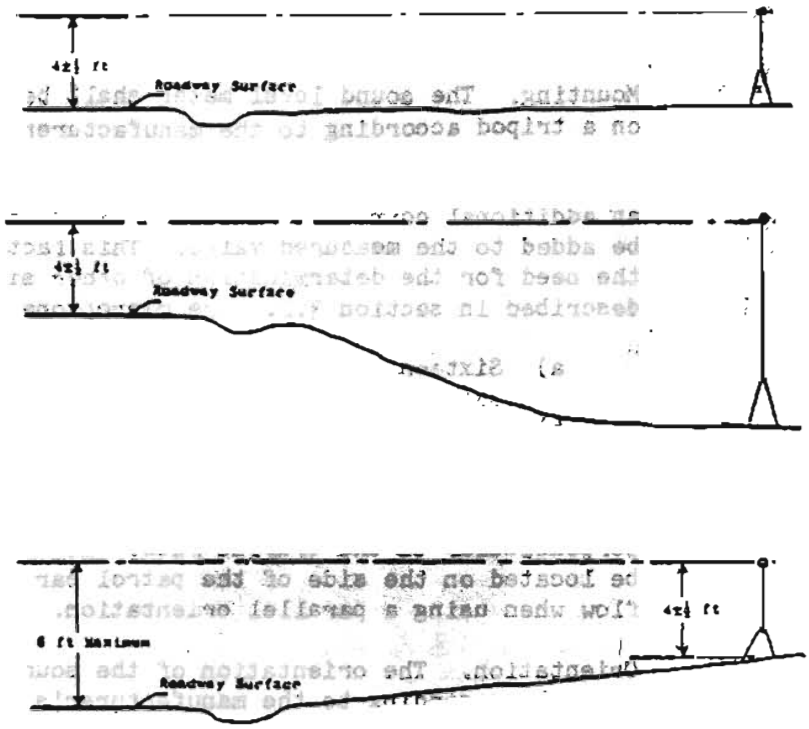


Fig. 3-8. Microphone Height

3.4.5 Windscreens. Windscreens made of open cell polyurethane foam furnished by the instrument manufacturer shall be placed over the microphone after calibration.

3.4.6 Annual Calibration. Within one year prior to use, each set of sound measuring instruments, sound level meter including octave band filter, and calibrator, shall receive a laboratory calibration in accordance to the manufacturer's specifications. This calibration shall be traceable to the National Bureau of Standards.

COMMENT: An inspection label will be attached to each instrument set to determine when the calibration was performed.

3.5 Sound Level Measurement

3.5.1 Preliminary Steps. The following steps shall be followed before taking a measurement.

a) Turn meter on.

b) Switch meter to "A" weighting scale.

c) Switch meter to "FAST" response.

d) Set the meter to the appropriate range to measure the anticipated sound level.

3.5.2 Mounting. The sound level meter shall be hand held or placed on a tripod according to the manufacturer's instructions.

The meter microphone may also be mounted above a patrol car with an additional correction factor of minus two decibels (-2 dBA) to be added to the measured value. This factor does not preclude the need for the determination of other site correction factors described in section 3.2. The microphone shall be mounted:

a) Sixteen (16) to twenty-four inches above the plane of the car roof, and
b) Not fore of the roof-windshield line nor aft of the roof-rear window line.

The patrol vehicle may be orientated either parallel or perpendicular to the traffic flow. However, the microphone shall be located on the side of the patrol car closest to the traffic flow when using a parallel orientation.

3.5.3 Orientation. The orientation of the sound level meter microphone shall be according to the manufacturer's instructions to obtain random incidence.

3.5.4 Variations. Allowances are necessary due to unavoidable variations in measurements sites and test equipment. Vehicles are not considered in violation unless they exceed the regulated limit by 2 dBA or more.

3.6 Vehicle Test Procedures

The moving vehicle test can be made after the following steps are accomplished.

a) The test site is selected and correction factors are determined as defined in Section 3.2.

b) The necessary measuring precautions are taken as described in Section 3.3.

c) The test equipment is setup as described in Section 3.4.

A form to record all pertinent information and data is presented in Figure 3-9. This form, NPCS-25, or any other Department approved form for this use shall be used for the moving vehicle noise tests.

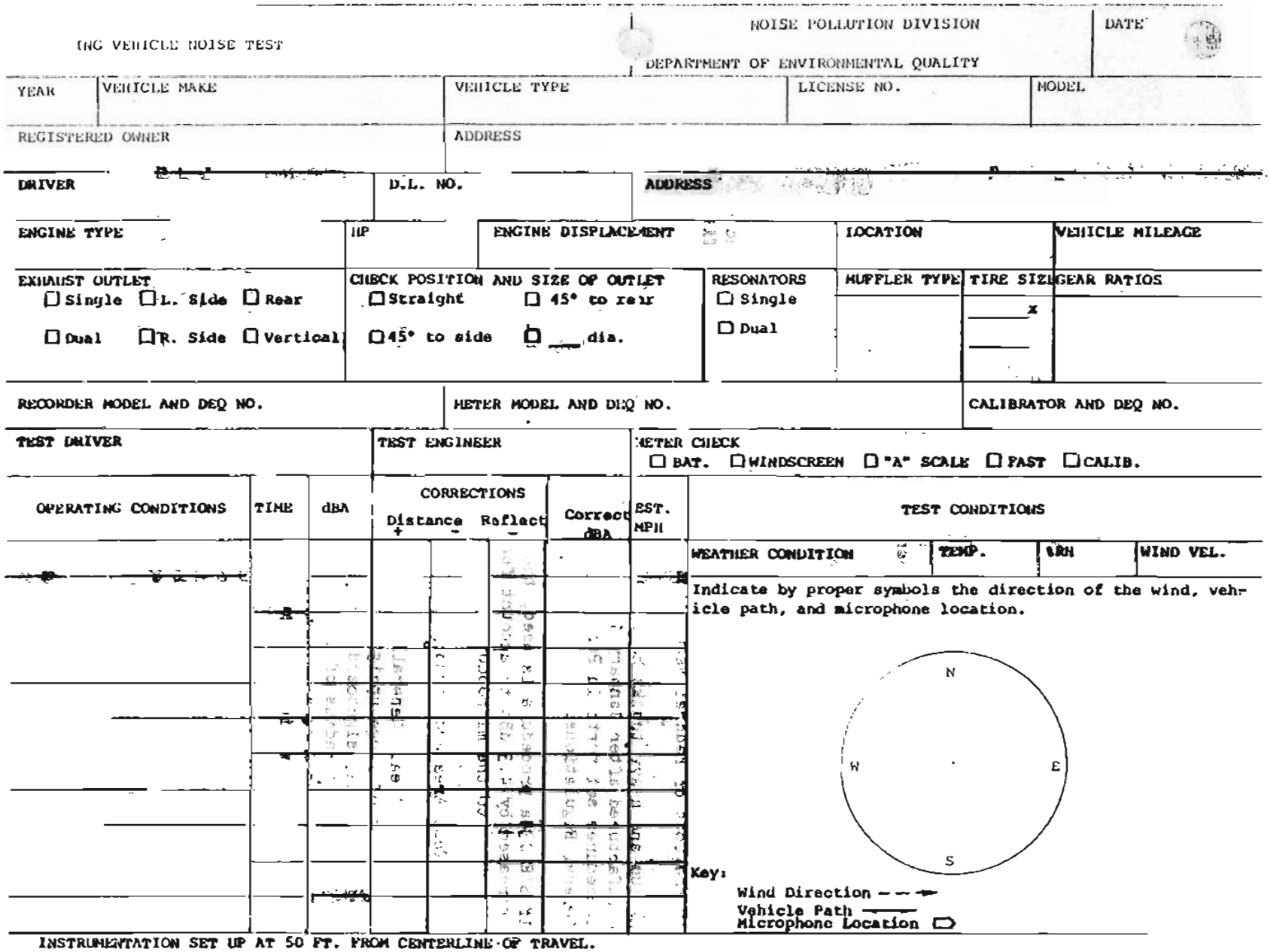


Figure 3-9

Moving Motor Vehicle Test

CHAPTER 4

NEW VEHICLE SOUND LEVEL MEASUREMENT

4.1 Scope. This Chapter establishes procedures for setting up and calibrating sound measuring equipment and conducting tests to determine vehicle sound level output.

OAR 340-35-025 requires all new motor vehicles offered for sale be certified as meeting noise emission limits specified in Table 1. Standards are established for new motorcycles, snowmobiles, automobiles, trucks, buses and motorboats. Emission test procedures for each of these categories are described in this chapter. In lieu of the procedures of this chapter, the following procedures adopted by the Society of Automotive Engineers (SAE) have also been approved:

Motorcycles	SAE J331a*
Snowmobiles	SAE J192a
Autos & Light Trucks	SAE J986NOV 81
Trucks and Buses	SAE J366b**
Motorboats	SAE J34***

Revised 4-1-88

* Motorcycles manufactured after December 31, 1982 shall be tested in accordance with procedures set forth in Part 205 Subpart D of Title 40 of the Code of Federal Regulations.

** Medium and heavy trucks having a GVWR in excess of 10,000 pounds and manufactured after January 1, 1978 shall be tested in accordance with procedures set forth in Part 205 Subpart B of Title 40 of the Code of Federal Regulations.

*** If SAE J34a procedure is used, the resulting emission levels shall be increased by 4.3 dBA to account for the increased distance from the motorboat to the microphone.

4.2 Test Area and Personnel.

4.2.1 Test Area. Generally, the test area shall be a flat open space free of large upright sound reflecting surfaces, such as parked vehicles, signboards, building, or hillsides, located within 100 feet radius of the microphone as shown in Figure 4-1. Detailed test area layouts are provided in Section 4.5 for specific vehicle categories.

4.2.2 Surface Condition. The surface of the ground within the measuring site for road vehicles shall be smooth asphalt or concrete free of snow, soil or ashes in at least the triangular area formed by the microphone location and points on the vehicle path 50 feet before and beyond the microphone point. The ground surface in the above area for snowmobiles shall be live

vegetation (grass) no more than four inches in height. Motorboats shall be tested on a calm water surface.

4.2.3 Roadway Surface. The surface of the vehicle path shall be dry, smooth asphalt or concrete pavement free of extraneous material, except that the pathway for snowmobiles shall be covered with live vegetation (grass) no more than four inches in height or a maximum of three inches of loose snow over a base of at least two inches of compacted snow.

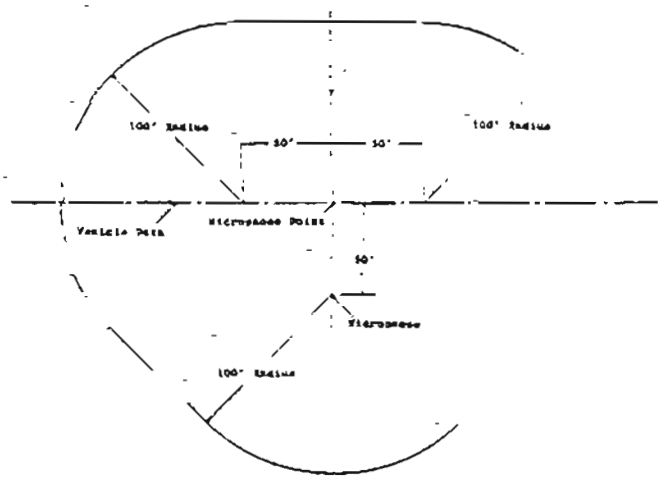


Fig. 4-1. New Vehicle Test Area Layout

4.2.4 Wind. Do not conduct sound measurements when wind velocity at the test area exceeds ten miles per hour.

4.2.5 Personnel Location. Excercise care to prevent interference with sound level measurements caused by personnel in the measuring area.

a. Bystander Location. Bystanders shall remain at least fifty feet from the microphone and the vehicle being measured during sound level measurements.

b. Technician Location. The technician making direct readings from the sound level meter with microphone attached shall stand with the instrument positioned in accordance with the manufacturer's instructions.

Equipment Setup and Use.

General. All types of sound level meters shall be field calibrated immediately prior to use using the procedures described in the factory instruction manual.

4.3.2 Battery Check. Batteries in both the meter and calibrator shall be checked before calibration.

Instrument Calibration. The instrument shall be set to the correct level range, weighting scale, and meter response. The calibrator shall be placed on the microphone of the meter. The output indicated on the meter shall then be adjusted to the correct calibration level.

4.3.4 Microphone Location. Attach the microphone or sound level meter to the tripod, extending the tripod legs so that the microphone, when aimed at the microphone point, will be at a height of 4 ± 1/2 ft. above the plane of the roadway or water surface. Position the tripod so the microphone is at a distance of 50 ± 1 ft. from the center of the lane of travel.

COMMENT: Connect extension cable between the instruments. Secure the cable to the foot of the tripod leg nearest the recorder location. This will help prevent the tripod from being pulled over by an accidental tug on the cable.

4.3.5 Windscreens. Windscreens made of open cell polyurethane foam furnished by the instrument manufacturer shall be placed over the microphone after calibration.

COMMENT: The windscreen reduces the effect of wind noise and protects the microphone diaphragm from dust or other airborne matter.

Annual Calibration. Within one year prior to use, each set of sound measuring instruments, sound level meter including octave band filter, and calibrator, shall receive a laboratory calibration in accordance to the manufacturer's specifications. This calibration shall be traceable to the National Bureau of Standards.

COMMENT: An inspection label will be attached to each instrument set to determine when the calibration was performed.

Sound Level Measurement

Preliminary Steps. The following steps shall be followed before taking a measurement.

a) Turn meter on.

b) Switch meter to "A" weighting scale.

c) Switch meter to "FAST" response.

d) Set the meter to the appropriate range to measure the anticipated sound level.

4.4.2 Mounting. The sound level meter shall be placed on a tripod according to the manufacturer's instructions.

4.4.3 Orientation. The orientation of the sound level meter microphone shall be according to the manufacturer's instructions !to obtain random incidence1.

4.4.4 Variations. Allowances are necessary due to unavoidable variations in measurement sites and test equipment. Vehicles are not considered in violation unless they exceed the regulated limit by 2 dBA or more.

4.4.5 Weather Measurement. Record wind velocity and direction with a wind gauge, and temperature and relative humidity with a sling psychrometer or other Department approved instruments.

4.4.6 Data Recording. Record all required vehicle data, type of test equipment, and weather information on the New Vehicle Test Form, (NPCS-26), as shown in Figure 4-2 or any other form approved in writing by the Department.

4.5 New Vehicle Test Procedure

4.5.1 Vehicle Sound Level. The sound levels for new motor vehicles shall be determined by tests performed according to procedures established for each particular class of vehicle.

4.5.2 Definitions. For the purpose of these procedures, the following terms have the meanings indicated:

a. Maximum RPM. "Maximum rpm" means the maximum governed engine speed, or if ungoverned, the rpm at maximum engine horsepower as determined by the engine manufacturer in accordance with the procedures in Society of Automotive Engineers Standard, Engine Power Test Code - Spark Ignition and Diesel - SAE J1349 DEC 80.

b. Microphone Point. "Microphone point" means the unmarked location on the center of the lane of travel that is closest to the microphone.

c. Vehicle Reference Point. "Vehicle reference point" means the location of the vehicle used to determine when the vehicle is at any of the points on the vehicle path. The primary vehicle reference point is the front of the vehicle.

NEW VEHICLE NOISE TEST

DEPARTMENT OF ENVIRONMENTAL QUALITY

DATE

YEAR	VEHICLE MAKE	VEHICLE TYPE	LICENSE NO.	MODEL
REGISTERED OWNER		ADDRESS		
DRIVER	D.L. NO.	ADDRESS		
ENGINE TYPE	HP	ENGINE DISPLACEMENT	LOCATION	VEHICLE MILEAGE

EXHAUST OUTLET
☐ Single ☐ L. Side ☐ Rear
☐ Dual ☐ R. Side ☐ Vertical

CHECK POSITION AND SIZE OF OUTLET
☐ Straight ☐ 45° to rear
☐ 45° to side ☐ dia.

RESONATORS
☐ Single
☐ Dual

MUFFLER TYPE

TIRE SIZE

Diff. ____ : ____
Sprkt. ____ : ____
(No. of Teeth)

RECORDER MODEL AND DEQ NO.	METER MODEL AND DEQ NO.	VEHICLE SUPPLIED BY	CALIBRATOR AND DEQ NO.

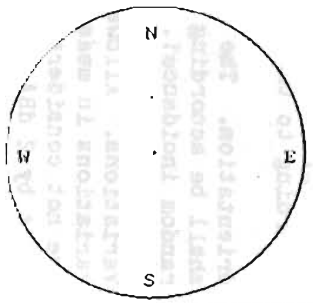
TEST DRIVER	TEST ENGINEER	METER CHECK
		☐ BAT. ☐ WINDSCREEN ☐ "A" SCALE ☐ FAST ☐ CALIB.

OPERATING CONDITIONS	TIME	dBA READINGS L.S.	dBA READINGS R.S.	MAXIMUM RPM	MAXIMUM MPH

TEST CONDITIONS

WEATHER CONDITION	TEMP.	%RH	WIND VEL.

Indicate by proper symbols the direction of the wind, vehicle path, and microphone location.



Key:
Wind Direction
Vehicle Path
Microphone Location

INSTRUMENTATION SET UP AT 50 FT. FROM CENTERLINE OF TRAVEL.

NPCS-26

Figure 4-2
New Vehicle Test

4.5.3 Operation

a. Preliminary Runs. Sufficient preliminary runs shall be made to enable the test driver to become familiar with the operation of the vehicle and to stabilize engine operating conditions.

b. Test Runs. At least four test runs shall be made for each side of the vehicle.

c. Reported Noise Level. The reported sound level for each side of the vehicle shall be on the average of the two highest readings on that side which are within 2 dBA of each other. The sound level reported for the vehicle shall be the sound level of the loudest side.

d. Visual Reading and Recording. Visual readings shall be taken from the sound level meter during preliminary test runs and recorded. The readings from the sound level meter shall be compared with those of the recorder and there shall be no more than $\pm$ 0.5 dBA variation between the readings. When the variation is greater, the equipment shall be checked and recalibrated. If the variation still exists, the test shall be conducted using only direct readings from the sound level meter.

4.5.4 Motorcycles. Motorcycles shall be tested as follows:

a. Vehicle Path. The test area shall include a vehicle path of sufficient length for safe acceleration, deceleration, and stopping of the vehicle.

b. Test Area Layout. The following points and zones shown in Figure 4-3 where only one directional approach is illustrated for purposes of clarity, shall be established on the vehicle path so that measurements can be made on both sides of the vehicle:

1. Microphone point.

2. Acceleration point - a location 25 feet before the microphone point.

3. End point - a location 100 feet beyond the microphone point.

4. End zone - the last 75-feet distance between the microphone point and the end point.

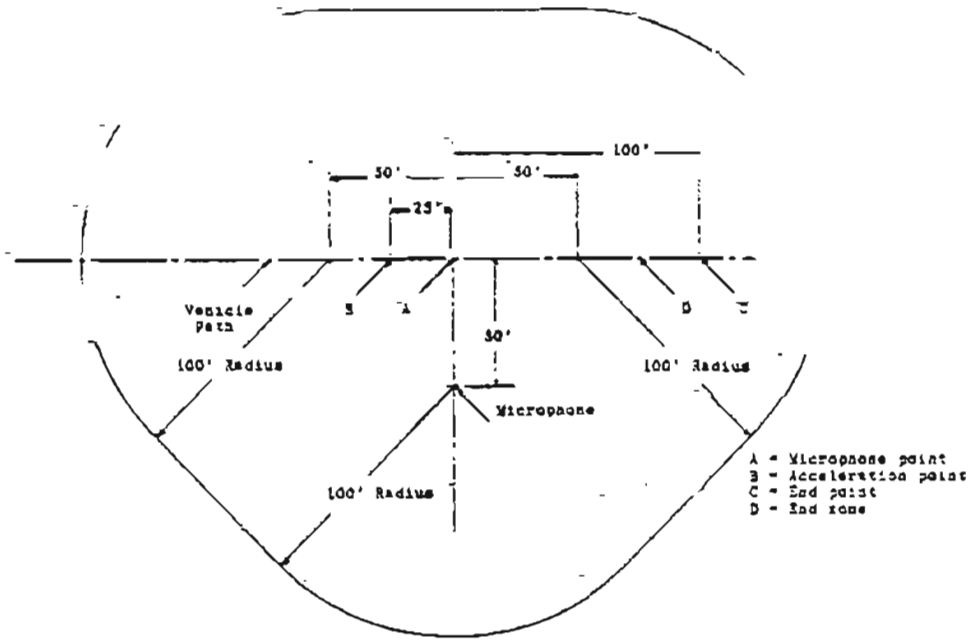


Fig. 4-3. Test Area Layout for Motorcycles

c. Test Procedures. Vehicles shall be tested according to the following procedures:

1. Gear Selection. Motorcycles shall be operated in second gear. Vehicles which reach maximum rpm at less than 30 mph or before a point of 25 feet beyond the microphone point shall be operated in the next higher gear.

If the motorcycle has an automatic transmission or torque converter, then gear selection shall follow the following procedure:

If the gear range is selectable, employ the lowest range. If the vehicle reaches maximum rpm at less than 30 mph or before a point 25 feet beyond the microphone point (see Figure 4-3), use the next higher range. If maximum rpm is reached before a point 25 feet beyond the microphone point when the vehicle is in the highest gear range, then the throttle shall be opened less rapidly, but in such a manner that full throttle and maximum rpm are attained while within the end zone.

If the gear range is not selectable, then the throttle shall be opened less rapidly, but in such a manner that full throttle and maximum rpm are attained while within the end zone.

2. Acceleration. The vehicle shall proceed along the test path at a constant approach speed which corresponds either to an engine speed of 60 percent of maximum rpm or to 30 mph, whichever is lower. When the vehicle reference point reaches the acceleration point, the throttle shall be rapidly and fully opened. The throttle shall be held open until the vehicle reference point reaches the end point or until the maximum rpm is reached within the end zone, at which point the throttle shall be closed. Wheel slip shall be avoided.

3. Deceleration. Tests during deceleration shall be conducted when deceleration noise appears excessive. The vehicle shall proceed along the vehicle path at maximum rpm in the same gear selected for the tests during acceleration. When the reference point on the vehicle reaches the acceleration point, the throttle shall be rapidly closed and the vehicle shall be allowed to decelerate to less than 1/2 of maximum rpm.

4. Engine Temperature. The engine temperature shall be within normal operating range before each test run.

5. Test Weight. The total weight of test driver and test instrumentation shall be 165 lbs. For small drivers, additional weights shall be used to bring the total to 165 lbs.

6. 1983 and Subsequent Models. These models shall be tested in accordance with U.S. EPA procedures. See paragraph 4.1 of this Chapter.

4.5.5 Snowmobiles. Snowmobiles shall be tested as follows:

a. Vehicle Path. The test area shall include a vehicle path of sufficient length for safe acceleration, deceleration, and stopping of the vehicle.

b. Test Area Layout. The following points and zones shown in Figure 4-3, where only one directional approach is illustrated for the purposes of clarity, shall be established on the vehicle path so that measurements can be made on both sides of the vehicle.

1 Microphone point.

2. End point - a location 50 feet beyond the microphone point.

3. Acceleration point - a location on the vehicle path established as follows: Position the vehicle headed

away from the microphone point with the vehicle reference point at 25 feet from the microphone point. From a standing start with transmission in low gear, rapidly apply wide-open throttle, accelerating until maximum rpm is attained. The location on the vehicle path where maximum rpm was attained is the acceleration point for test run in the opposite direction.

4. Maximum rpm zone.

c. Test Procedures. From a standing start, with transmission in low gear and the vehicle reference point positioned at the acceleration point, the throttle shall be rapidly and fully opened and held through the maximum rpm zone until the reference point on the vehicle reaches the end point after which the throttle shall be closed.

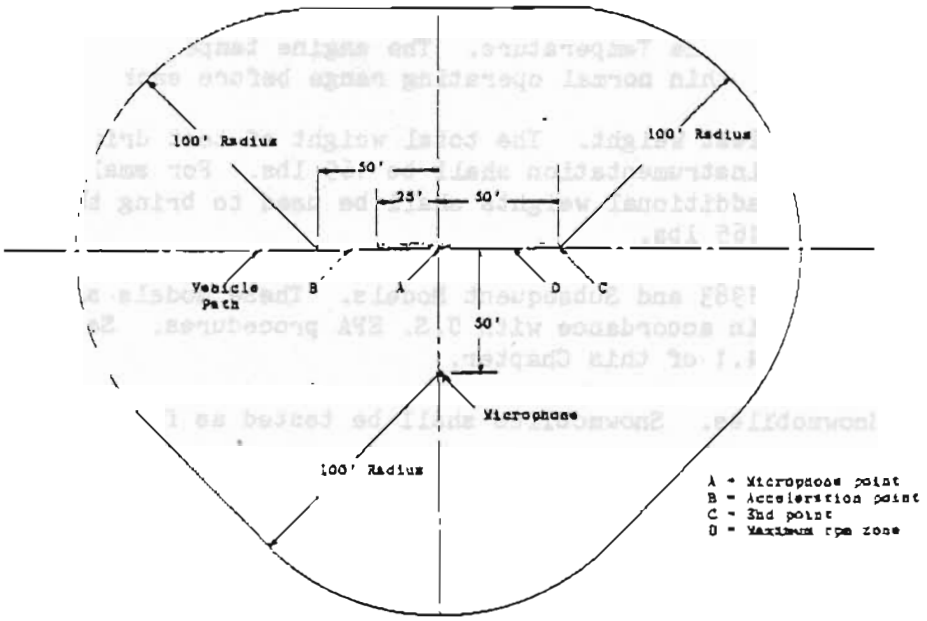


Fig 4-4. Test Area Layout for Snowmobiles

4.5.6 Heavy Trucks, Truck Tractors, and Buses. The test procedure for vehicles with a manufacturer's gross vehicle weight rating of 10,000 lbs or more shall be as follows:

(1) Test Area Layout. The test area shall include a vehicle path of sufficient length for safe acceleration, deceleration, and stopping of the vehicle. The following points and zones shall be established on the vehicle path

as shown in Figure 4-5, where only one directional approach is illustrated for purposes of clarity.

(A) Microphone point.

(B) Acceleration point - a location 50 ft before the microphone point.

(C) End point - a location 50 ft beyond the microphone point.

(D) End zone - the last 40-ft distance between the microphone point and the end point.

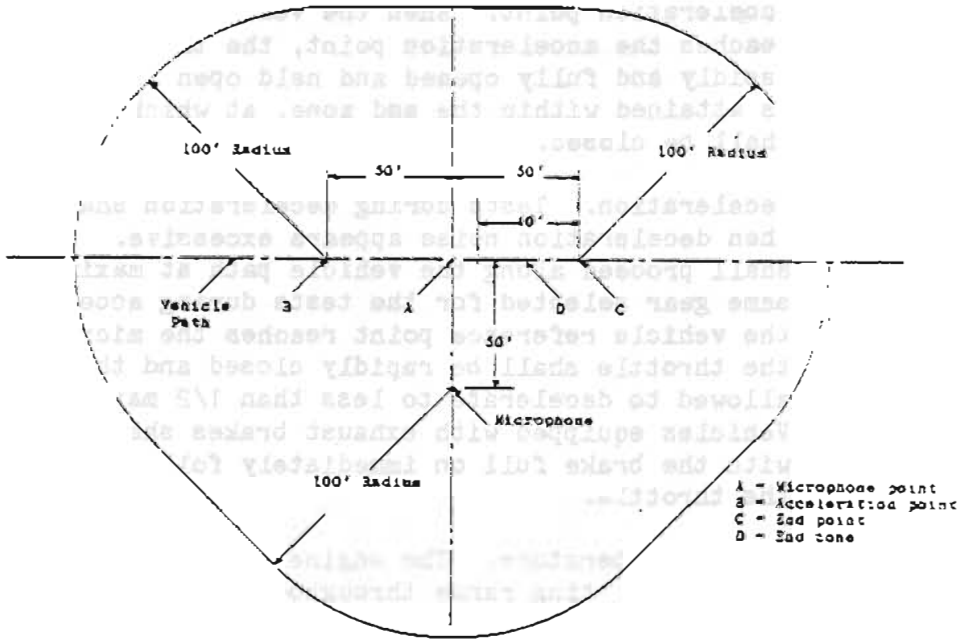


Figure 4-5. Test Area Layout for Trucks.

(2) Gear Selection. A gear shall be selected (manual or automatic transmission) which will result in the vehicle beginning at an approach rpm of no more than 2/3 maximum rpm at the acceleration point and reaching maximum rpm within the end zone without exceeding 35 mph.

(A) When maximum rpm is attained before reaching the end zone, the next higher gear shall be selected, up to the gear where maximum rpm produces over 35 mph.

(B) When maximum rpm still occurs before reaching the end zone, the approach rpm shall be decreased in 100 rpm

increments until maximum rpm is attained within the end zone.

(C) When maximum rpm is not attained until beyond the end zone, the next lower gear shall be selected until maximum rpm is attained within the end zone.

(D) When the lowest gear still results in reaching maximum rpm beyond the end zone, the approach rpm shall be increased in 100 rpm increments above 2/3 maximum rpm until the maximum rpm is reached within the end zone.

(3) Acceleration. The vehicle shall proceed along the vehicle path maintaining the approach engine rpm in the gear selected for at least 50 ft before reaching the acceleration point. When the vehicle reference point reaches the acceleration point, the throttle shall be rapidly and fully opened and held open until maximum rpm is attained within the end zone, at which point the throttle shall be closed.

(4) Deceleration. Tests during deceleration shall be conducted when deceleration noise appears excessive. The vehicle shall proceed along the vehicle path at maximum rpm in the same gear selected for the tests during acceleration. When the vehicle reference point reaches the microphone point, the throttle shall be rapidly closed and the vehicle allowed to decelerate to less than 1/2 maximum rpm. Vehicles equipped with exhaust brakes shall also be tested with the brake full on immediately following closing of the throttle.

(5) Engine Temperature. The engine temperature shall be within normal operating range throughout each test run.

(6) Demand-Activated Fans. If the test vehicle contains a demand-activated fan, the fan may be in the "off" position during the test.

(7) 1978 and Subsequent Model Trucks. These models shall be tested in accordance with U.S. EPA procedures. See paragraph 4.1 of this Chapter.

4.5.7 Automobiles, Light Trucks, Truck Tractors, Buses, and All Other Vehicles. The test procedure for trucks, truck tractors, and buses with a manufacturer's gross vehicle weight rating of less than 10,000 lbs and all passenger cars shall be as follows:

1) Test Area Layout. The test area shall include a vehicle path of sufficient length for safe acceleration, deceleration, and stopping of the vehicle. The following

points and zones shall be established on the vehicle path as shown in Figure 4-6, where only one directional approach is illustrated for purposes of clarity:

Microphone point.

(B) Acceleration point - a location 25 ft before the microphone point.

End point - a location 100 ft beyond the microphone point.

End zone - the last 75-ft distance between the microphone point and the end point.

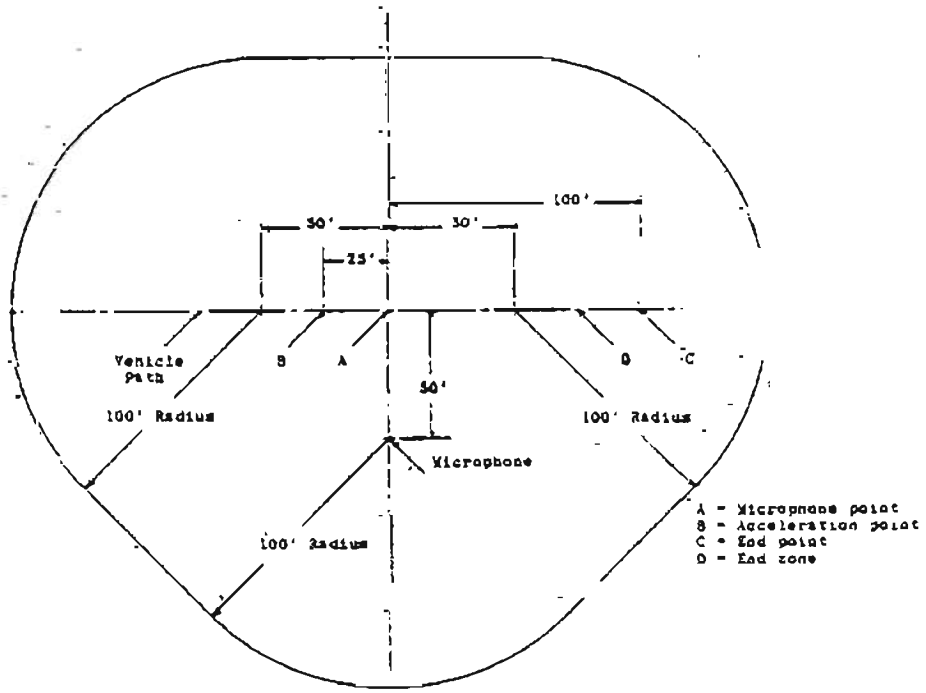


Figure 4-6. Test Area Layout for Passenger Cars

(2) Gear Selection. Motor vehicles equipped with three-speed manual transmissions and with automatic transmissions shall be operated in first gear. Vehicles equipped with manual transmissions of four or more speeds shall be operated in first gear and in second gear. Vehicles which reach maximum rpm at less than 30 mph or before reaching the end zone shall be operated in the next higher gear. Auxiliary step-up ratios (overdrive) shall not be engaged on vehicles so equipped.

Acceleration. The vehicle shall proceed along the vehicle path at a constant speed of 30 mph in the selected gear for at least 50 ft before reaching the acceleration point. When the vehicle reference point reaches the acceleration point, the throttle shall be rapidly and fully opened. The throttle shall be held open until the vehicle reference point reaches the end point or until maximum rpm is reached within the end zone. At maximum rpm, the throttle shall be closed sufficiently to keep the engine just under maximum rpm until the end point, at which time the throttle shall be closed.

(4) Deceleration. Tests during deceleration shall be conducted when deceleration noise appears excessive. The vehicle shall proceed along the vehicle path at a stabilized engine speed (rpm) the same as the maximum engine speed attained during the acceleration test and in the same gear. This approach speed is rated engine speed, if attained in the acceleration test mode, or the average of the terminal engine speed values at the end of the end zone as determined from the acceleration test. When the front of the vehicle reaches the acceleration point, the throttle shall rapidly be closed and the vehicle allowed to decelerate to one-half the approach speed or until the front of the vehicle reaches the end of the end zone.

(5) Engine Temperature. The engine temperature shall be within normal operating range throughout each test run. The engine shall be idled in neutral for at least one minute between runs.

4.5.8 Motorboats. The test procedure for motorized water craft (motorboats) shall be as follows:

Test Area Layout. A suitable test site is a calm body of water, large enough to allow full-speed pass-bys. The area around the microphone and boat shall be free of large obstructions, such as buildings, boats, hills, large piers, breakwater, etc., for a minimum distance of 100 ft. (30 m). Three markers (buoys or posts) will be placed in line, 50 ft. (15 m) apart, to mark the course the boat is to follow while being tested.

(2) Test Procedure. The boat shall pass all three markers on a straight course at wide-open throttle with the engine operating at the midpoint of the manufacturer's recommended full-throttle rpm range. The engine speed tolerance shall be $\pm$ 100 rpm if this falls in the recommended full-throttle

speed range. If a single top speed rpm is recommended, the tolerance shall be +0, -100 rpm.

(3) Measurements. The microphone shall be placed 50 ft (15 m) from the line determined by the three markers, normal to the line and opposite the center marker. It will also be placed 3 1/2 - 4 1/2 ft (1.1 - 1.4 m) above the water surface, and no closer than 2 ft (0.6 m) from the surface of the dock or platform on which the microphone stands, as near to the end of the dock as possible or overhanging the end of the dock. Measurements shall be taken while the boat is passing no more than three (3) feet (0.9 m) on the far side of all three markers.

CHAPTER 5

AUXILIARY EQUIPMENT SOUND LEVEL MEASUREMENT

5.1 Scope. This Chapter establishes procedures for setting up and calibrating sound measuring equipment and conducting tests to determine the sound level output of auxiliary motor vehicle equipment.

5.2 Measurement Sites. Measurement sites shall be free of sound-reflecting objects within one-hundred feet of the microphone and one-hundred feet of the vehicle to be tested.

5.2.1 Microphone Location. The microphone shall be located fifty feet ± six inches from the rear or from either side of the equipment to be tested. The locus of points thus defined is the microphone line. (See Figure 5-1) The microphone should be located at the point on the microphone line at which the maximum sound level occurs.

5.2.2 Sound-reflecting Surfaces. A "sound-reflecting surface" is any object or landscape surface in the immediate vicinity of a measurement site which reflects sufficient sound to require the application of a correction factor to the sound level meter reading. Surfaces which are not sound-reflecting surfaces are defined in paragraph 5.2.3, and all other surfaces are considered sound-reflecting surfaces.

5.2.3 Surfaces Which are not Sound-reflecting. The following surfaces may be present in the test area:

a. Any surface that measures less than eight feet in length in a direction parallel to the portion of the microphone line on which the microphone is positioned, regardless of height (such as a telephone booth or a tree trunk) or less than one foot in height, regardless of length (such as a curb or guard rail).

b. Any vertical surface, regardless of size (such as a billboard with the lower edge more than fifteen feet above the roadway).

c. Any uniformly smooth slanting surface with less than a forty-five degree slope above horizontal.

d. Any slanting surface with a forty-five to ninety degree slope above the horizontal where the line at which the slope begins to exceed forty-five degrees is more than fifteen feet above the roadway.

e. Any trees, bushes, shrubs, hedges, grass or other vegetation.

5.3 Sound Level Measuring Precaution

5.3.1 Wind. Do not conduct measurements when wind velocity at the test location exceeds ten miles per hour.

5.3.2 Precipitation. Do not conduct measurements when falling precipitation affects results. However, measurements may be taken when streets are wet.

5.3.3 Ambient Noise. The ambient sound level shall be at least 10 dBA below the sound level of the equipment being measured.

5.3.4 Recording. The sound level recorded shall be the highest level obtained during each test, disregarding unrelated peaks due to extraneous ambient noises.

Equipment Setup and Use

5.4.1 Microphone Height. The sound level meter may be hand held or placed on a tripod. The microphone shall be positioned four and one-half feet above the ground.

5.4.2 Windscreens. Windscreens made of open cell polyurethane foam furnished by the instrument manufacturer may be placed over the microphone after calibration. The windscreen reduces the effect of wind noise and protects the microphone diaphragm from dust or other airborne matter.

5.4.3 Sound Level Meter Setup and Use. Procedures for setup, calibration and use of the sound level meter is contained in this section.

a) General. All types of sound level meters shall be calibrated using the procedures described in the factory instruction manual. All instruments shall be calibrated prior to use. A general discussion of calibration procedures follows.

b) Battery Check. The state of the battery shall be checked before the calibration of the instrument. Batteries in both the meter and the calibrator shall be checked.

c) Instrument Calibration. The instrument shall be set to the correct level range, weighting scale and meter response. The calibrator shall be placed on the microphone of the meter. The output indicated on the meter is then adjusted to the correct calibration level using a screwdriver on the adjustment screw.

d) Annual Calibration. Annually, or when determined to be necessary, each set of sound measuring instruments, sound level meter and calibrator, shall be returned for calibration to the manufacturer's specifications. An inspection label will be attached to each instrument set to determine when the calibration was performed.

e) Sound Level Measurement

1 The following steps should be followed before taking a measurement

(a) Turn the meter on.
(b) Switch on the "A" weighting scale.
(c) Switch on the "FAST" meter response.
(d) Set the meter to the appropriate number to measure the anticipated sound level.

2. The sound level meter should be hand-held or placed on a tripod according to the manufacturer's instructions.

3. The orientation of the microphone should be according to the manufacturer's instructions.

4. Allowances are necessary due to unavoidable variations in measurement sites and test equipment. Equipment is not considered in violation unless it exceeds the regulated limit by 2 dBA or more.

5.5 Equipment Test Procedure

5.5.1 Vehicle Sound Level. The sound levels for auxiliary equipment shall be determined by tests performed according to the following procedures.

5.5.2 Location. The microphone shall be located on the microphone line at the position where the maximum sound level is expected to occur (See Figure 5-1).

5.5.3 Preliminary Tests. Sufficient preliminary tests shall be made to enable the operator to become thoroughly familiar with the equipment.

5.5.4 Equipment Operation. The equipment shall be operated at the combination of load and speed which produces the maximum sound level without violating the manufacturer's operation specifications.

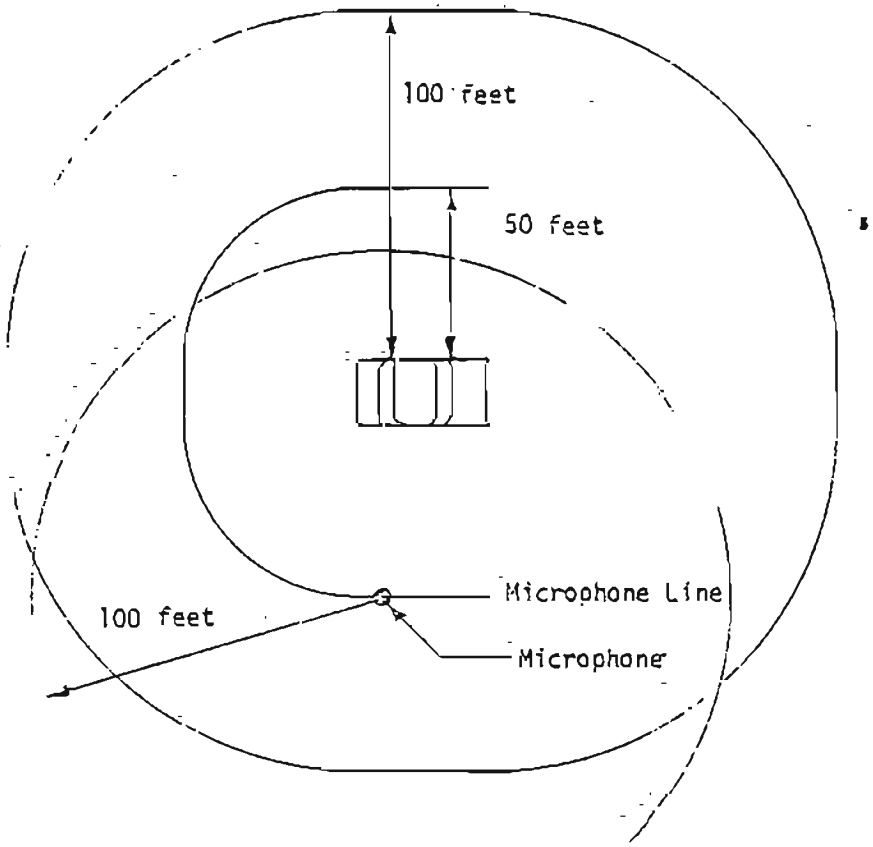


Figure 5-1. Auxiliary Equipment Measurement Site

5.5.5 Visual Reading. The highest sound level observed, exclusive of and peaks due to unrelated ambient noise, shall be reported for each test.

5.5.6 Reported Sound Level. The reported sound level for the vehicle shall be the highest reading which is no more than one dB higher than the next highest reading.

5.5.7 Auxiliary Equipment Test Form. A form to record all pertinent information and data is presented in Figure 5-2. This form, or any other Department approved form for this use, shall be used for auxiliary equipment tests.

AUXILIARY EQUIPMENT NOISE TEST

NOISE POLLUTION DIVISION
DEPARTMENT OF ENVIRONMENTAL QUALITY

DATE

YEAR | EQUIPMENT MAKE | EQUIPMENT TYPE | LICENSE NO. | MODEL

REGISTERED OWNER | ADDRESS

DRIVER | D.L. NO. | ADDRESS

ENGINE TYPE | Primary / Secondary | HP | ENGINE DISPLACEMENT | LOCATION | EQUIP. MILEAGE/HRS.

EXHAUST OUTLET
☐ Single ☐ L. Side ☐ Rear
☐ Dual ☐ R. Side ☐ Vertical

CHECK POSITION AND SIZE OF OUTLET
☐ Straight ☐ 45° to rear
☐ 45° to Side ☐ ___ dia

RESONATORS
☐ Single
☐ Dual

MUFFLER TYPE

RECORDER MODEL AND DEQ NO. | METER MODEL AND DEQ NO. | CALIBRATOR AND DEQ NO.

TEST DRIVER | TEST ENGINEER

METER CHECK
☐ BAT. ☐ WINDSCREEN ☐ "A" SCALE ☐ FAST ☐ CALIB.

OPERATING CONDITIONS	Time	READINGS dBA	READINGS LOCATION NUMBER	MAX. NPN

TEST CONDITIONS

WEATHER CONDITION	TEMP.	R.H.	WIND SPEED

Sketch in this space the measurement site peculiarities, and using the proper symbols indicate the direction of wind, vehicle orientation and reading locations.

Key: WIND DIRECTION - - - ←
VEHICLE . . . —
MICROPHONE LOCATION NO. ⇨

INSTRUMENTATION SET UP AT 50 FT FROM EDGE OF VEHICLE

NPCS-27

Figure 5-2

Auxiliary Equipment Noise Test

CHAPTER 6

NEAR FIELD STATIONARY MOTOR VEHICLE

SOUND LEVEL MEASUREMENTS

20 Inches 1/2 Meter)

6.1 Scope. This chapter establishes procedures for setting up and calibrating sound measuring equipment and conducting tests to determine the sound level output of a stationary vehicle as measured 20 inches (.5 meter) from the exhaust exit. This procedure allows testing indoors and at sites limited in open space.

These procedures are used to conduct emission tests on automobiles, light trucks under 8,000 pounds GVWR, motorcycles and motorboats containing atmosphere terminating exhaust systems. Standards for these vehicles are found in Tables 2 and 4 of OAR 340-35-030.

6.2 Initial Inspection.

6.2.1 Subjective Evaluation. Before a vehicle is tested according to the near field procedures, a subjective evaluation of the vehicle noise shall be made by experienced personnel to determine if an objective test is necessary. The subjective test, using the human ear as a sensing device, shall be conducted at engine idle and during rapid partial throttle opening in neutral gear. The inspector shall stand on the exhaust exit side and near the rear of the vehicle during this evaluation. The exhaust noise shall not be discernably louder than the engine noise and they shall blend together to be acceptable.

6.2.2 Visual Inspection. If a vehicle is found to be subjectively loud, a visual inspection of the exhaust system shall be conducted. This inspection should include the entire system from the engine to the outlet pipe.

COMMENT: Under Oregon Administrative Rules Chapter 340 Section 35-030 the following defects are a violation:

a) No muffler

b) Leaks in the exhaust system

c) A pinched outlet pipe

6.2.3 Near Field Test. If the subjective evaluation warrants further inspection and the visual check does not disclose a violation, then the vehicle shall be subjected to the near field noise test as described in Section 6.5. This test uses a sound level meter to measure the noise level of the vehicle under controlled test conditions.

Measurement Sites.

6.3.1 Vehicle Location. The vehicle must rest on the open water, ground or pavement, the shop floor, or on a dynamometer. It should not be on a hoist, rack, or over a pit. Shop doors should be open to avoid excessively high readings and reflective surfaces should be as far as possible from the sound level meter.

6.3.2 Bystanders. Bystanders should not stand within 10 feet (3 meters) of the microphone or vehicle during noise tests, except for operating personnel.

6.3.3 Wind. Do not conduct noise measurements when wind velocity at the test location exceeds 20 miles per hour (32 km/hr).

6.3.4 Precipitation. Do not conduct noise measurements if precipitation is falling, unless the microphone and instruments are protected from moisture and results are not affected.

Warning: Do not let any moisture on microphone. This will cause damage. Do not attempt to clean microphone.

6.3.5 Ambient Noise. The ambient noise levels shall be at least 10 dBA below the sound level of the vehicle being tested.

Equipment Setup and Use.

6.4.1 Meter Specifications. The specifications for sound level meters are defined in Noise Pollution Control Section manual NPCS-2 Requirements for Sound Measuring Instruments and Personnel. The minimum meter required is a Type II as defined by American National Standards Institute number S1.4-1971.

6.4.2 Battery. A battery check shall be conducted on the Meter and Calibrator before each calibration.

6.4.3 Calibration. The sound level meter shall be field calibrated immediately prior to use following procedures described by the manufacturer's instruction manual. Meters should be calibrated at least at the beginning and end of each business day and at intervals not exceeding 2 hours when the instrument is used for more than a 2-hour period.

COMMENT: If the instrument is damaged or in need of service, contact the Noise Pollution Control office or Motor Vehicles office.

6.4.4 Annual Calibration. Within one year prior to use, each set of sound level meters shall receive a laboratory calibration in accordance with the manufacturer's specifications. This calibration shall be traceable to the National Bureau of Standards.

6.4.5 Windscreens. Windscreens of open cell polyurethane foam furnished by the manufacturer shall be placed over the microphone after calibration. This will protect it from dust or other airborne matter.

Warning: Do not let exhaust gases impinge on microphone.

6.4.6 Meter Setting. The meter shall be set on the "A" scale and used in the slow response mode.

6.4.7 Tachometer. A calibrated engine tachometer shall be used to determine when the test RPM is attained. Tachometers shall have the following characteristic:

Steady state accuracy of ± 2% of full scale.

The tachometer shall be calibrated at least once a year in accordance with manufacturer's calibration procedures.

6.5 Sound Level Measurements.

6.5.1 Preliminary Steps:

a) Field calibration.
b) Windscreen on.
c) Set meter to the appropriate range to measure the anticipated sound level.
d) Switch to "A" weighting scale and slow response mode.
e) Turn meter on.

6.5.2 Mounting. The sound level meter shall be hand-held or placed on a tripod according to the manufacturer's instructions.

6.5.3 Orientation. The orientation of the sound level meter microphone shall be according to the manufacturer's instructions.

COMMENT: Generally, the operating personnel will be to one side. The "General Radio" 1565B Sound Level Meter shall be oriented such that the microphone points aft and the sound path will "graze" the surface of the microphone (See Figure 6.1 and 6.2).

6.5.4 Microphone Position. The microphone for the sound level meter shall be at the same height as the center of the exhaust outlet but no closer to the surface than 8 in. (203 mm). The microphone shall be positioned with its longitudinal axis parallel to the ground, 20 in. (508 mm) from the edge of the exhaust outlet, and 45 ± 10 deg. from the axis of the outlet (Figure 6.1 & 6.2). For exhaust outlets located inboard from the vehicle body, the microphone shall be located at the specified angle and at least 8 in. (203 mm) from the nearest part of the vehicle.

For motorcycles with more than one outlet per side, the measurement shall be made at the rearmost outlet.

Note: If a measuring device is attached to the exhaust outlet and the meter to maintain proper distance, ensure no vibrations from the vehicle are transmitted to the instrument.

6.5.5 Vehicle Operation. Vehicles tested to determine exhaust system sound levels shall be operated as follows:

a) Automobiles and Light Trucks and other Automotive Powered Vehicles. The engine shall be operated at normal operating temperatures with transmission in park or neutral. Sound level measurements shall be made at 3/4 (75%) of the RPM for rated horsepower ± 100 RPM of meter reading.

COMMENT: Tables of the 75% RPM (test RPM) versus the engines are given in the Near Field Motor Vehicle Test RPM Tables, NPCS-31.

b) Motorcycles. The rider shall sit astride the motorcycle in a normal riding position with both feet on the ground. The engine shall be operated at normal operating temperatures with the transmission in neutral. If no neutral is provided, the motorcycle shall be operated either with the rear wheel 5-10 cm (2-4 in) clear of the ground, or with the drive chain or belt removed. The sound level measurement shall be made with the engine speed stabilized at one of the following values:

(A) If the motorcycle engine data is available, test the motorcycle at 1/2 (50%) of the RPM for maximum rated horsepower ± 100 RPM.

(B) If the engine data is not available and if the motorcycle has a tachometer indicating the manufacturer's recommended maximum engine speed ("Red Line"), test the motorcycle at 45% of the "Red Line" RPM ± 100 RPM.

Motorcycle tachometers generally show a red area at the upper part of the scale. The "Red Line RPM" is the lowest value within the red area.

If the engine data and red line RPM are not available, test the motorcycle at:

(i) 3500 RPM ± 100 RPM for motorcycles with total cylinder dispacement between 0-950 cc (0-58 in^3)

(ii) 2800 RPM ± 100 RPM for motorcycles with total cylinder displacement greater than 950 cc (58 in^3)

c) Trucks and Buses. To be determined.

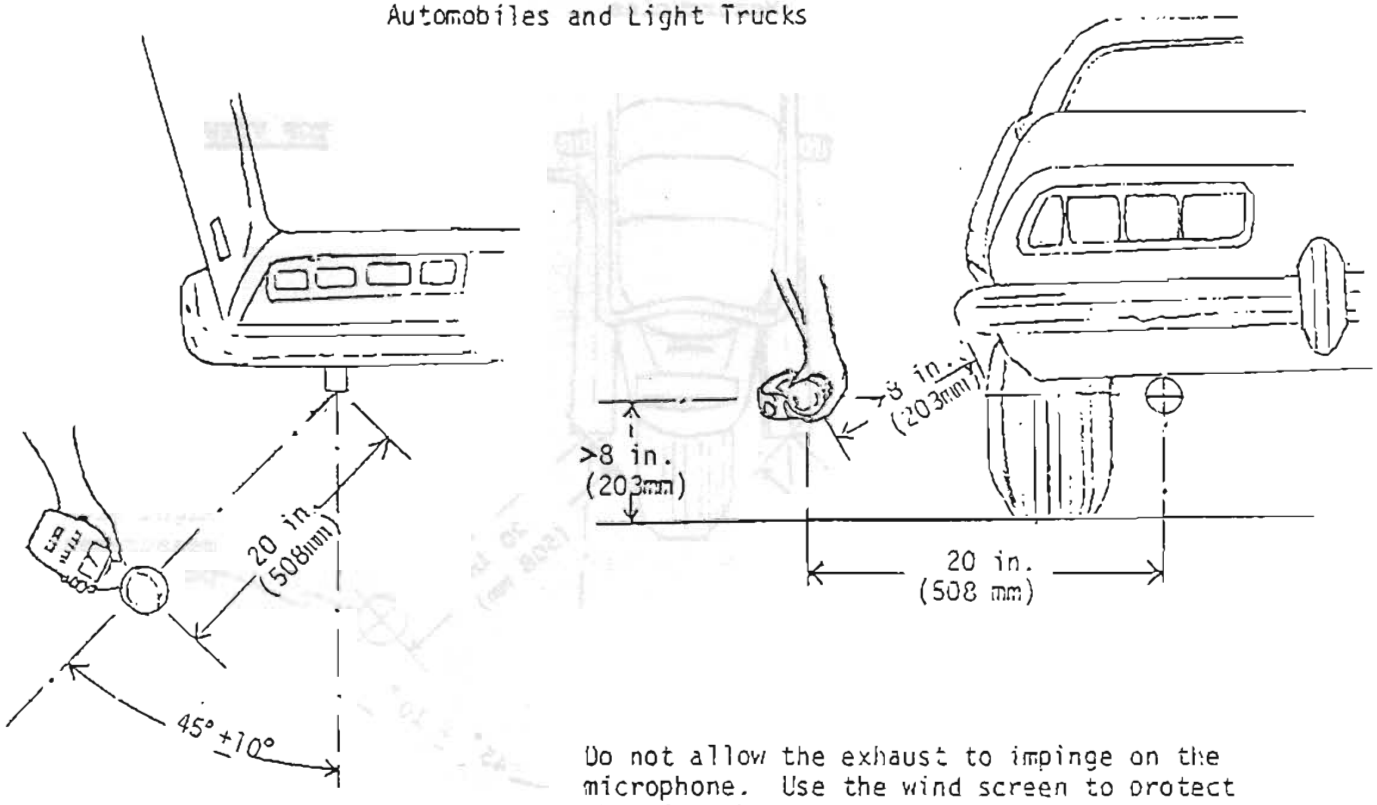
6.5.6 Reported Sound Levels. The reported exhaust system sound level reading shall be the highest reading obtained during the test, exclusive of peaks due to unrelated ambient noise or extraneous impulsive type noise obtained during the acceleration or deceleration portion of the test. When there is more than one exhaust outlet, the reported sound level shall be for the loudest outlet.

COMMENT: The purpose of this test is to measure exhaust noise, so there should not be any other noises within 10 dBA below the exhaust noise (See Ambient Noise).

6.5.7 Variations. Allowances are necessary due to unavoidable variations in measurement sites and test equipment. Vehicles are not considered in violation unless they exceed the regulated limit by the value shown in the following table or more.

Sound Level Meter Type	Allowable Exceedance
ANSI Type I	1 dBA
ANSI Type II	2 dBA

Figure 6.1
Microphone Placement for
Automobiles and Light Trucks



Do not allow the exhaust to impinge on the microphone. Use the wind screen to protect the microphone.

For dual exhausts, measure both and record the higher of the two readings.

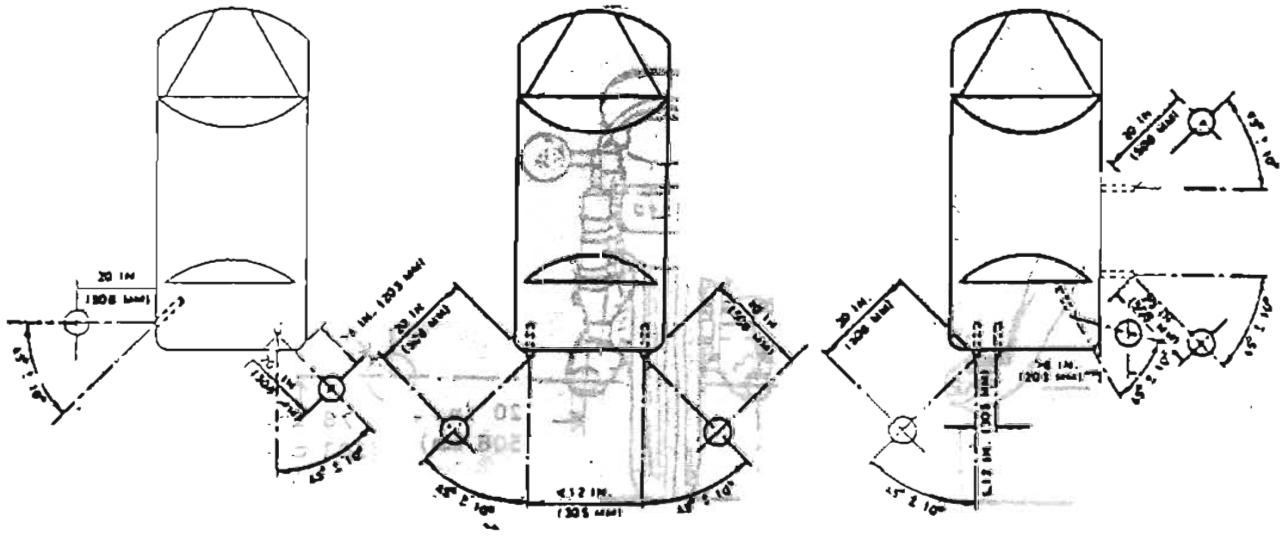
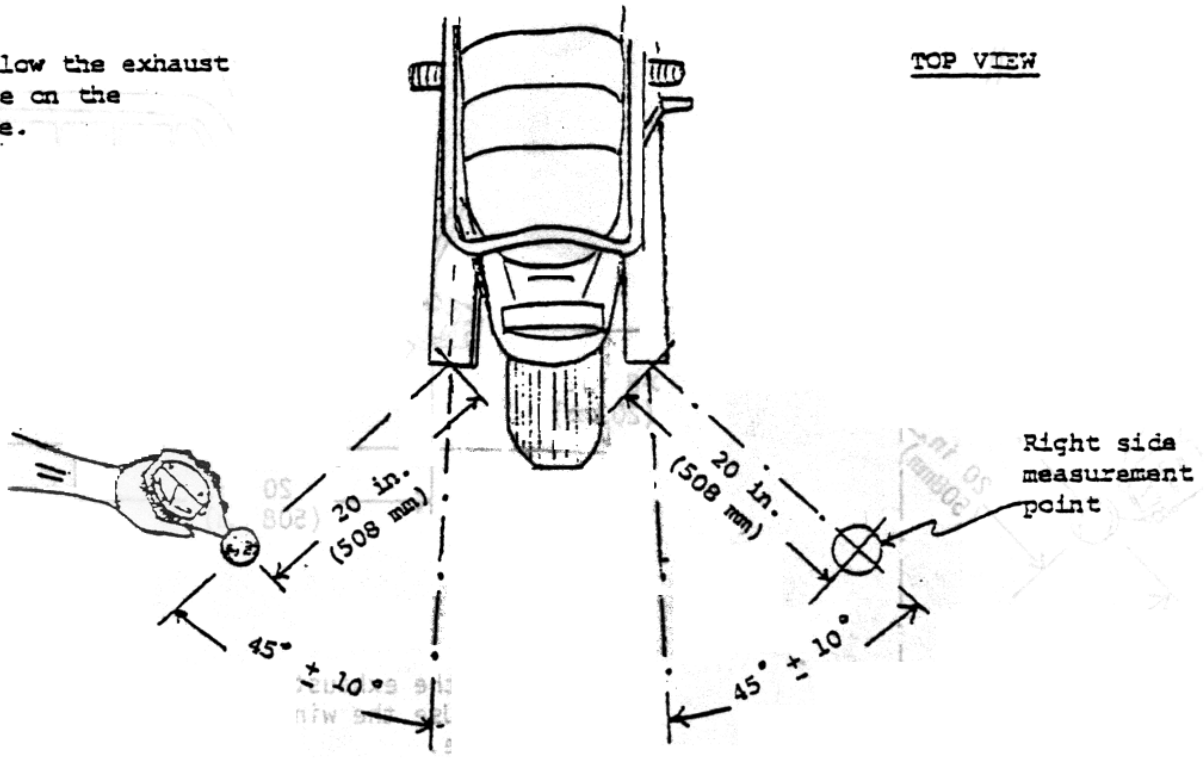


Figure 6.2
Microphone Placement for
Motorcycles

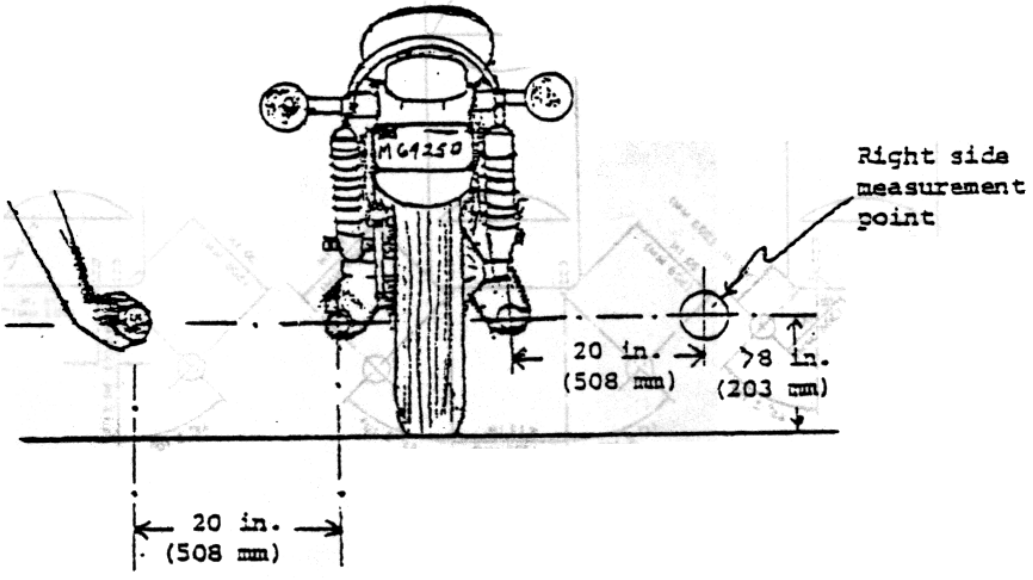
Do not allow the exhaust to impinge on the microphone.

TOP VIEW



For exhaust outlets on both sides, measure both and report the highest of the two readings.

Rear View



AMEND: 340-035-0035

RULE TITLE: Noise Control Regulations for Industry and Commerce

NOTICE FILED DATE: 04/13/2016

RULE SUMMARY: Existing tables and publications included in the rule.

RULE TEXT:

(1) Standards and Regulations:

(a) Existing Noise Sources. No person owning or controlling an existing industrial or commercial noise source shall cause or permit the operation of that noise source if the statistical noise levels generated by that source and measured at an appropriate measurement point, specified in subsection (3)(b) of this rule, exceed the levels specified in Table 7, except as otherwise provided in these rules. [Table not included. See ED. NOTE.]

(b) New Noise Sources:

(A) New Sources Located on Previously Used Sites. No person owning or controlling a new industrial or commercial noise source located on a previously used industrial or commercial site shall cause or permit the operation of that noise source if the statistical noise levels generated by that new source and measured at an appropriate measurement point, specified in subsection (3)(b) of this rule, exceed the levels specified in Table 8, except as otherwise provided in these rules. For noise levels generated by a wind energy facility including wind turbines of any size and any associated equipment or machinery, subparagraph (1)(b)(B)(iii) applies. [Table not included. See ED. NOTE.]

(B) New Sources Located on Previously Unused Site:

(i) No person owning or controlling a new industrial or commercial noise source located on a previously unused industrial or commercial site shall cause or permit the operation of that noise source if the noise levels generated or indirectly caused by that noise source increase the ambient statistical noise levels, L10 or L50, by more than 10 dBA in any one hour, or exceed the levels specified in Table 8, as measured at an appropriate measurement point, as specified in subsection (3)(b) of this rule, except as specified in subparagraph (1)(b)(B)(iii).

(ii) The ambient statistical noise level of a new industrial or commercial noise source on a previously unused industrial or commercial site shall include all noises generated or indirectly caused by or attributable to that source including all of its related activities. Sources exempted from the requirements of section (1) of this rule, which are identified in subsections (5)(b)–(f), (j), and (k) of this rule, shall not be excluded from this ambient measurement.

(iii) For noise levels generated or caused by a wind energy facility:

(I) The increase in ambient statistical noise levels is based on an assumed background L50 ambient noise level of 26 dBA or the actual ambient background level. The person owning the wind energy facility may conduct measurements to determine the actual ambient L10 and L50 background level.

(II) The “actual ambient background level” is the measured noise level at the appropriate measurement point as specified in subsection (3)(b) of this rule using generally accepted noise engineering measurement practices. Background noise measurements shall be obtained at the appropriate measurement point, synchronized with windspeed measurements of hub height conditions at the nearest wind turbine location. “Actual ambient background level” does not include noise generated or caused by the wind energy facility.

(III) The noise levels from a wind energy facility may increase the ambient statistical noise levels L10 and L50 by more than 10 dBA (but not above the limits specified in Table 8), if the person who owns the noise sensitive property executes a legally effective easement or real covenant that benefits the property on which the wind energy facility is located. The easement or covenant must authorize the wind energy facility to increase the ambient statistical noise levels, L10 or L50 on the sensitive property by more than 10 dBA at the appropriate measurement point.

(IV) For purposes of determining whether a proposed wind energy facility would satisfy the ambient noise standard where a landowner has not waived the standard, noise levels at the appropriate measurement point are predicted assuming that all of the proposed wind facility’s turbines are operating between cut-in speed and the wind speed corresponding to the maximum sound power level established by IEC 61400-11 (version 2002-12). These predictions must be compared to the highest of either the assumed ambient noise level of 26 dBA or to the actual ambient

background L10 and L50 noise level, if measured. The facility complies with the noise ambient background standard if this comparison shows that the increase in noise is not more than 10 dBA over this entire range of wind speeds.
(V) For purposes of determining whether an operating wind energy facility complies with the ambient noise standard where a landowner has not waived the standard, noise levels at the appropriate measurement point are measured when the facility's nearest wind turbine is operating over the entire range of wind speeds between cut-in speed and the windspeed corresponding to the maximum sound power level and no turbine that could contribute to the noise level is disabled. The facility complies with the noise ambient background standard if the increase in noise over either the assumed ambient noise level of 26 dBA or to the actual ambient background L10 and L50 noise level, if measured, is not more than 10 dBA over this entire range of wind speeds.
(VI) For purposes of determining whether a proposed wind energy facility would satisfy the Table 8 standards, noise levels at the appropriate measurement point are predicted by using the turbine's maximum sound power level following procedures established by IEC 61400-11 (version 2002-12), and assuming that all of the proposed wind facility's turbines are operating at the maximum sound power level. [Table not included. See ED. NOTE.]
(VII) For purposes of determining whether an operating wind energy facility satisfies the Table 8 standards, noise generated by the energy facility is measured at the appropriate measurement point when the facility's nearest wind turbine is operating at the windspeed corresponding to the maximum sound power level and no turbine that could contribute to the noise level is disabled. [Table not included. See ED. NOTE.]
(c) Quiet Areas. No person owning or controlling an industrial or commercial noise source located either within the boundaries of a quiet area or outside its boundaries shall cause or permit the operation of that noise source if the statistical noise levels generated by that source exceed the levels specified in Table 9 as measured within the quiet area and not less than 400 feet (122 meters) from the noise source. [Table not included. See ED. NOTE.]
(d) Impulse Sound. Notwithstanding the noise rules in Tables 7 through 9, no person owning or controlling an industrial or commercial noise source shall cause or permit the operation of that noise source if an impulsive sound is emitted in air by that source which exceeds the sound pressure levels specified below, as measured at an appropriate measurement point, as specified in subsection (3)(b) of this rule: [Table not included. See ED. NOTE.]
(A) Blasting. 98 dBC, slow response, between the hours of 7 a.m. and 10 p.m. and 93 dBC, slow response, between the hours of 10 p.m. and 7 a.m.
(B) All Other Impulse Sounds. 100 db, peak response, between the hours of 7 a.m. and 10 p.m. and 80 dB, peak response, between the hours of 10 p.m. and 7 a.m.
(e) Octave Bands and Audible Discrete Tones. When the Director has reasonable cause to believe that the requirements of subsection (1)(a), (b), or (c) of this rule do not adequately protect the health, safety, or welfare of the public as provided for in ORS Chapter 467, the Department may require the noise source to meet the following rules:
(A) Octave Bands. No person owning or controlling an industrial or commercial noise source shall cause or permit the operation of that noise source if such operation generates a median octave band sound pressure level which, as measured at an appropriate measurement point, specified in subsection (3)(b) of this rule, exceeds applicable levels specified in Table 10. [Table not included. See ED. NOTE.]
(B) One-third Octave Band. No person owning or controlling an industrial or commercial noise source shall cause or permit the operation of that noise source if such operation generates a median one-third octave band sound pressure level which, as measured at an appropriate measurement point, specified in subsection (3)(b) of this rule, and in a one-third octave band at a preferred frequency, exceeds the arithmetic average of the median sound pressure levels of the two adjacent one-third octave bands by:
(i) 5 dB for such one-third octave band with a center frequency from 500 Hertz to 10,000 Hertz, inclusive. Provided: Such one-third octave band sound pressure level exceeds the sound pressure level of each adjacent one-third octave band; or
(ii) 8 dB for such one-third octave band with a center frequency from 160 Hertz to 400 Hertz, inclusive. Provided: Such one-third octave band sound pressure level exceeds the sound pressure level of each adjacent one-third octave band; or
(iii) 15 dB for such one-third octave band with a center frequency from 25 Hertz to 125 Hertz, inclusive. Provided: Such

one-third octave band sound pressure level exceeds the sound pressure level of each adjacent one-third octave band;
(iv) This rule shall not apply to audible discrete tones having a one-third octave band sound pressure level 10 dB or more below the allowable sound pressure levels specified in Table 10 for the octave band which contains such one-third octave band.
(2) Compliance. Upon written notification from the Director, the owner or controller of an industrial or commercial noise source operating in violation of the adopted rules shall submit a compliance schedule acceptable to the Department. The schedule will set forth the dates, terms, and conditions by which the person responsible for the noise source shall comply with the adopted rules.
(3) Measurement:
(a) Sound measurements procedures shall conform to those procedures which are adopted by the Commission and set forth in Sound Measurement Procedures Manual (NPCS-1), or to such other procedures as are approved in writing by the Department;
(b) Unless otherwise specified, the appropriate measurement point shall be that point on the noise sensitive property, described below, which is further from the noise source:
(A) 25 feet (7.6 meters) toward the noise source from that point on the noise sensitive building nearest the noise source;
(B) That point on the noise sensitive property line nearest the noise source.
(4) Monitoring and Reporting:
(a) Upon written notification from the Department, persons owning or controlling an industrial or commercial noise source shall monitor and record the statistical noise levels and operating times of equipment, facilities, operations, and activities, and shall submit such data to the Department in the form and on the schedule requested by the Department. Procedures for such measurements shall conform to those procedures which are adopted by the Commission and set forth in Sound Measurement Procedures Manual (NPCS-1);
(b) Nothing in this rule shall preclude the Department from conducting separate or additional noise tests and measurements. Therefore, when requested by the Department, the owner or operator of an industrial or commercial noise source shall provide the following:
(A) Access to the site;
(B) Reasonable facilities, where available, including but not limited to, electric power and ladders adequate to perform the testing;
(C) Cooperation in the reasonable operation, manipulation, or shutdown of various equipment or operations as needed to ascertain the source of sound and measure its emission.
(5) Exemptions: Except as otherwise provided in subparagraph (1)(b)(B)(ii) of this rule, the rules in section (1) of this rule shall not apply to:
(a) Emergency equipment not operated on a regular or scheduled basis;
(b) Warning devices not operating continuously for more than 5 minutes;
(c) Sounds created by the tires or motor used to propel any road vehicle complying with the noise standards for road vehicles;
(d) Sounds resulting from the operation of any equipment or facility of a surface carrier engaged in interstate commerce by railroad only to the extent that such equipment or facility is regulated by pre-emptive federal regulations as set forth in Part 201 of Title 40 of the Code of Federal Regulations, promulgated pursuant to Section 17 of the Noise Control Act of 1972, 86 Stat. 1248, Public Law 92-576; but this exemption does not apply to any standard, control, license, regulation, or restriction necessitated by special local conditions which is approved by the Administrator of the EPA after consultation with the Secretary of Transportation pursuant to procedures set forth in Section 17(c)(2) of the Act;
(e) Sounds created by bells, chimes, or carillons;
(f) Sounds not electronically amplified which are created by or generated at sporting, amusement, and entertainment events, except those sounds which are regulated under other noise standards. An event is a noteworthy happening and does not include informal, frequent, or ongoing activities such as, but not limited to, those which normally occur at bowling alleys or amusement parks operating in one location for a significant period of time;

(g) Sounds that originate on construction sites.
(h) Sounds created in construction or maintenance of capital equipment;
(i) Sounds created by lawn care maintenance and snow removal equipment;
(j) Sounds generated by the operation of aircraft and subject to pre-emptive federal regulation. This exception does not apply to aircraft engine testing, activity conducted at the airport that is not directly related to flight operations, and any other activity not pre-emptively regulated by the federal government or controlled under OAR 340-035-0045;
(k) Sounds created by the operation of road vehicle auxiliary equipment complying with the noise rules for such equipment as specified in OAR 340-035-0030(1)(e);
(l) Sounds created by agricultural activities;
(m) Sounds created by activities related to the growing or harvesting of forest tree species on forest land as defined in subsection (1) of ORS 526.324.
(6) Exceptions: Upon written request from the owner or controller of an industrial or commercial noise source, the Department may authorize exceptions to section (1) of this rule, pursuant to rule 340-035-0010, for:
(a) Unusual and/or infrequent events;
(b) Industrial or commercial facilities previously established in areas of new development of noise sensitive property;
(c) Those industrial or commercial noise sources whose statistical noise levels at the appropriate measurement point are exceeded by any noise source external to the industrial or commercial noise source in question;
(d) Noise sensitive property owned or controlled by the person who controls or owns the noise source;
(e) Noise sensitive property located on land zoned exclusively for industrial or commercial use.
[ED. NOTE: You can view a PDF of Publications and tables by clicking on this link.]

STATUTORY/OTHER AUTHORITY: ORS 467

STATUTES/OTHER IMPLEMENTED: ORS 467.030

OAR 340-035-0035
Table 7
Existing Industrial and Commercial Noise Source Standards
Allowable Statistical Noise Levels in Any One Hour

7:00 a.m. – 10:00 p.m.	10:00 p.m. – 7:00 a.m.
L_{50} – 55 dBA	L_{50} – 50 dBA
L_{10} – 60 dBA	L_{10} – 55 dBA
L_{1} – 75 dBA	L_{1} – 60 dBA

OAR 340-035-0035
Table 8
New Industrial and Commercial Noise Source Standards
Allowable Statistical Noise Levels in Any One Hour

7:00 a.m. – 10:00 p.m.	10:00 p.m. – 7:00 a.m.
L_{50} – 55 dBA	L_{50} – 50 dBA
L_{10} – 60 dBA	L_{10} – 55 dBA
L_{1} – 75 dBA	L_{1} – 60 dBA

OAR 340-035-0035
Table 9
Industrial and Commercial Noise Source Standards for Quiet Areas
Allowable Statistical Noise Levels in Any One Hour

	7:00 a.m. – 10:00 p.m.	10:00 p.m. – 7:00 a.m.
L_{50}	50 dBA	45 dBA
L_{10}	55 dBA	50dBA
L_{1}	60 dBA	55dBA

OAR 340-035-0035
Table 10
Median Octave Band Standards
For Industrial and Commercial Noise Sources
Allowable Octave Band Sound Pressure Levels

Octave Band Frequency (Hz)	7:00 a.m. – 10:00 p.m.	10:00 p.m. – 7:00 a.m.
31.5	68	65
63	65	62
125	61	56
250	55	50
500	52	46
1000	49	43
2000	46	40
4000	43	37
8000	40	34

Sound Measurement Procedures Manual

NPCS - 1

DEQ

State of Oregon
Department of Environmental Quality

REVISION RECORD

INSTRUCTIONS FOR USE: All revisions of this manual will be numbered to assure each manual holder that he has received all revisions. The date and initials of the person inserting revisions to the manual should be entered on this revision record opposite the appropriate revision number. If the sequence is broken, copies of the missing revisions may be requested from the Noise Control Section.

Rev. No.	Date Inserted	Initials	
1.	4-30-74	JH	[illegible]
2.	8-16-74	JH	[illegible]
3.	11-25-74	NT	[illegible]
4.	8-27-76	JH	EQC Amendments
5.	5-6-83	JH	EQC Amendments
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FOREWORD

The Sound Measurement Procedures Manual has been prepared to specify the equipment to be used and the procedures to be followed when measuring environmental noise. The procedures established in the manual, when carefully followed, will ensure that the noise readings obtained are accurate, will support enforcement action, and aid in reducing environmental noise.

The scope of this manual includes industrial noise, commercial noise, noise from races and racetracks, noise from public roads and ambient noise measurements. Individual motor vehicle noise measurements are covered in a separate manual.

The objective of the manual is to establish procedures to implement the provisions of the Environmental Quality Commission. Further, if the practices and procedures herein are adhered to, the result will be a uniform enforcement program which will accomplish the intent of the Legislature and fulfill the Commission's responsibility under ORS Chapter 467.

Office of the Administrator
Air Quality Control Division
Department of Environmental Quality

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LIST OF FIGURES

CHAPTER 1

INTRODUCTION

Policy

1.1.1 The Department of Environmental Quality, through the Noise Pollution Control Section shall establish a noise measurement program to implement the laws and regulations applying to environmental noise.

1.1.2 The Noise Pollution Control Section shall be responsible for the conformity of environmental noise measurement.

1.1.3 This manual contains procedures for the Noise Pollution Control Section, and all other persons taking environmental noise measurements. Guidance is provided in the "Comments".

1.2 Authority

Statutory and administrative law governing authority to the guidance and direction contained in the following sources:

a. Oregon Revised Statutes, Chapter 467, Sections 467.010, 467.020, 467.030, 467.040, 467.050, 467.990.

b. Oregon Administrative Rules, Chapter 340, Division 35, Department of Environmental Quality.

Instruments and Training

1.3.1 Specific requirements for instruments and personnel are defined under procedure manual, Noise Pollution Control Section - 2, Requirements for Sound Measuring Instruments and Personnel.

CHAPTER 2

INSTRUMENTATION

Sound Level Meters

The specifications for sound level meters (SLM) are defined in manual Noise Pollution Control Section (NPCS-2) Requirements for Sound Measuring Instruments and Personnel. The minimum meter required is a Type II as defined by American National Standard Institute Number S1.4-1971.

2.2 Accessories

The minimum accessories shall be a windscreen and an acoustically coupled calibrator.

Comment: Additional accessories that have been found to be valuable in gathering data are tabulated below:

(1) Noise data forms
(2) Clipboard
(3) Tripod
(4) Wind meter
(5) Sling psychrometer
(6) Screwdriver
(7) Spare batteries
(8) Watch with sweep second hand or digital equivalent

Tape Recorders and Level Recorders

Recording systems shall conform to NPCS-2.

Comment: The recording system should be able to duplicate the measurements as taken in the field. For tape recorders, a table of frequency response tolerances is given in SAE standards. Graphic level recorder systems standards are also described in the manual.

Octave Band Filter Sets

The octave band filter sets shall be those defined in NPCS-2.

Comment: These sets may either be integral to a sound level meter or they may be a separate piece of equipment.

Special Study Instruments

Comment: In some instances, special types of equipment may be found to be useful in studying a noise problem. The Department has several specialized noise instruments to be used in study situations. These instruments include a random noise generator, a loud speaker system, and a one-third octave band filter set.

One-Third Octave Band Filter Sets

The one-third octave band filter sets shall be those defined in NPCS-2.

Comment: These sets may be integral to a sound level meter or they may be a separate piece of equipment. Sets shall contain the preferred one-third octave band filters.

Impulse Meters

Impulse meters shall be those defined in NPCS-2.

Comment: These meters are integral to some Type I precision sound level meters set for a peak unweighted response. Blasting impulse noise is measured on a standard Type I or Type II meter set to the "C" weighting scale and the "SLOW" dumping response.

CHAPTER 3

INSTRUMENT CALIBRATION

General

All types of sound level meters shall be field calibrated immediately prior to use, using the procedures described in the factory instruction manual.

Battery Check

Batteries in both the meter and the calibrator shall be checked before calibration.

Instrument Calibration

The instrument shall be set to the correct level range, weighting scale and meter response. The calibrator shall be placed on the microphone of the meter. The output indicated on the meter shall then be adjusted to the correct calibration level.

Annual Calibration

Within a year prior to use, each sound level meter, including octave band filter and calibrator, shall receive a laboratory calibration in accordance with the manufacturer's specifications. This calibration shall be traceable to the National Bureau of Standards.

Comment: An inspection label may be attached to each instrument set to determine when the calibration was performed.

CHAPTER 4

ENVIRONMENTAL NOISE MEASUREMENT

4.1 Application

This chapter applies to ambient measurements, noise emissions from industrial facilities, and commercial facilities, and to ambient noise limits from motor vehicles. Individual motor vehicle noise measurements, airports and racetracks are covered in separate manuals.

4.1.2 Persons selected to measure environmental noise shall meet the requirements of NPCS-2 Requirements for Sound Measuring Instruments and Personnel.

Site Selection

4.2.1 The measurement location shall be at any point, no more than 25 feet from the noise sensitive building where the noise level is generally greatest, as illustrated in Figure 4-1.

If the noise sensitive building is closer than 25 feet from the property line, the measurement location shall be at any point on the property line, providing it is no more than 25 feet from the building, or at any other point within the noise sensitive property no more than 25 feet from the noise sensitive building, wherever the noise level is generally greatest, as illustrated in Figure 4-2. For any measurement, sound reflective surfaces shall not be closer than 10 feet from the measurement point.

Comment: Sound reflective surfaces do not include trees, shrubs, hedges or other vegetation.

Comment: Measurements for noise sensitive property on which the noise sensitive building lies within 10 feet of the noise sensitive property line may require sound level projection techniques described in 4.8 of the manual.

Equipment Set-Up

4.3.1 The sound level meter or microphone, either hand held or placed on a tripod, shall be 4 feet or more above the ground or floor surface.

4.3.2 Comment: A microphone extension cable may be used in areas where accessibility is difficult. Example: Changes in ground elevation, reflective surfaces, height or source or receiver.

Figure 4-1 Measurement Point 25 Feet From Building

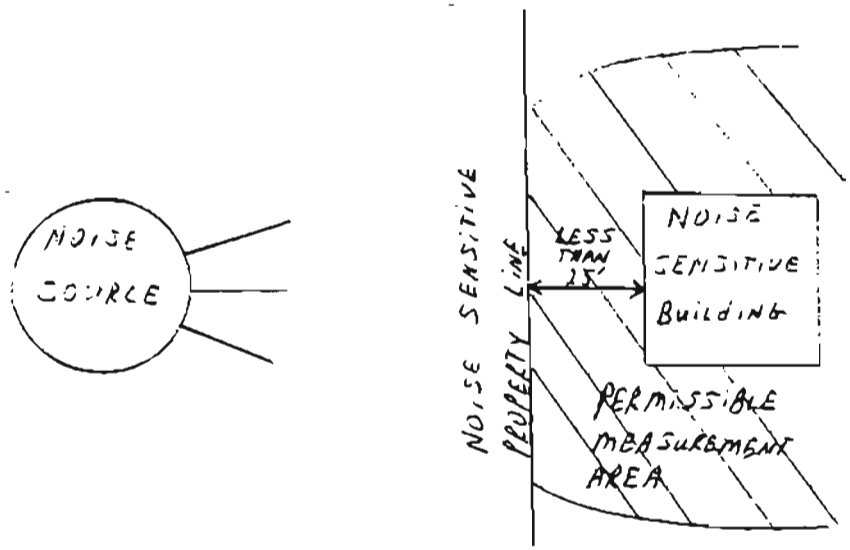


Figure 4-2 Measurement Point on Property Line

Instrument Calibration and Battery Check

4.4.1 Refer to Chapter 3 of NPCS-1 for instructions.

Noise Level Measurements

4.5.1 Comment: That information and data submitted to the Department should be recorded on Forms NPCS-4 and NPCS-5 as shown in Figure 4-3 and Figure 4-5, or on forms approved in writing by the Department.

4.5.2 Weather Conditions

a. The wind speed and direction shall be determined before measurements are taken and recorded on a form. Measurements shall not be taken when the wind speed exceeds 10 mph. The sound level meter windscreen shall always be installed on the microphone while taking measurements.

b. The relative humidity may be determined for the time measurements are taken. Measurements shall not be taken when precipitation affects results.

Comment: Measurements may be taken when the ground is wet if the readings are not influenced by motor vehicle tire noise on wet pavement.

c. Comment: The barometric pressure has an effect on the calibration level of most calibrators. This effect is usually small but can introduce some error under very low atmospheric pressure conditions or at high elevations. Typically no correction is needed at elevations below 2,000 feet. Above 2,000 feet elevation, the manufacturers correction factor must be applied to the instrument during calibration.

4.5.3 Determination of Meter Speed

a. Comment: The "FAST" meter speed is used for sounds of an essentially continuous nature. This speed is such that the indication instrument attains its final reading in approximately 0.2 seconds. In general, the "FAST" meter is used where meter fluctuations do not exceed 3 dB, or where the meter is required to follow fast changes in level such as an automobile or aircraft pass-by measurements.

b. Comment: The "SLOW" meter speed is used for sounds where the noise level fluctuates by + or - 3 dB and meter variations make the instrument display unreadable. The slower action of the meter provides an averaging effect that is helpful in measuring sounds of a rapidly varying nature or of low frequencies. However, for a noise pulse of 0.5 second duration, such a meter will typically read 2 to 6 dB low. It is not satisfactory for measuring intermittent sounds.

4.5.4 "A" Weighting Scale Measurements

Comment: Maximum noise level measurements with the "A" network weighting scale are taken with the sound level meter switched to the "A" network per the manufacturer's instructions. The meter must be properly positioned with respect to the noise source per the manufacturer's instructions. Information and data taken during the measurements should be recorded on Form NPCS-4 or equivalent as shown in Figure 4-3.

4.5.5 Statistical Noise

Comment: The statistical noise level is that noise level exceeded a stated percentage of the time. An $L_{10} = 65$ dBA means that in any consecutive 60 minute period of the day 65 dBA is equalled or exceeded only 10% of the time, or for a total of 6 minutes. Several procedures are in use by the Department to determine statistical noise levels and other methods may be approved in writing from the Department. Three acceptable procedures to determine the statistical noise level are presented in Section 6 of this Chapter. Information and data taken during the measurements should be recorded on Form NPCS-10-1 or equivalent as shown in Figure 4-9. Statistical calculations can be carried out on Forms NPCS-10-2 and NPCS-10-3 and should be summarized in "L" terminology on Form NPCS-4. An example of a completed Form NPCS-4 is presented in Figure 4.4.

4.5.6 Ambient Noise Determination

Comment: The ambient noise level is a composite of sounds from many sources near and afar. As the ambient noise level will be compared to the noise level with the source included in any consecutive 60 minute period, it is important that data is obtained in time periods of interest during the day and also both the week and

the weekend to obtain data which are representative. It is also important to note that the data must be taken without emphasis on either noise peaks or unusual quiet.

Measurements should not be taken in weather conditions which may create a bias in the data. Wet streets or snow accumulations could bias the data unless these conditions are typical for the community.

Measurements should be made at least at several appropriate locations within the sampling area under consideration. Measurements should be made randomly in the sense that each location and each sampling time has the same chance of being sampled and that the selection of any one factor in no way influences the choice of another. Measurements should be made on at least three separate days.

The ambient statistical noise levels obtained or predicted with the noise source in question operating, should include all noises generated by that source. This may include such sources as increased motor vehicle traffic noise, safety warning device noise, and other sounds that may be exempted from the rules due to other considerations.

Procedures to determine the L_{10} and L_{50}, statistical noise levels are presented in Section 6 of this Chapter. Information and data taken during the measurements should be recorded on Form NPCS-4 or equivalent as shown in Figure 4-4.

4.5.7 Octave Band Noise Measurement

Octave band noise measurements shall be made on an octave band frequency analyzer per document NPCS-2, Requirements for Sound Measuring Instruments and Personnel.

Comment: Octave band sound pressure levels may be measured in the same manner as the "A" weighting scale measurements, except that the octave band filters shall be used in place of the "A" weighting network. Information and data taken during the measurements should be recorded on Form NPCS-5 or equivalent as shown in Figure 4.5. An example of a completed form NPCS-5 is presented in Fig. 4-6.

4.5.8 Tape Recording

Comment: Tape recording of the noise and a calibration signal is optional. The tape recorder system must conform to the specifications defined in document NPCS-2 Requirements for Sound Measuring Instruments and Personnel.

4.5.9 One-Third Octave Band Noise Measurement

One-third octave band noise measurements shall be made on a one-third octave band frequency analyzer per document NPCS-2, Requirements for Sound Measuring Instruments and Personnel.

Comment: One-third octave band sound pressure levels may be measured in the same manner as the "A" weighting scale measurements, except that the one-third octave band filter shall be used in place of the "A" weighting network. Information and data taken during the measurements should be recorded on form NPCS-29 or equivalent as shown in Figure 4-7. An example is shown in Figure 4-8.

4.5.10 Impulse Measurements

Impulse measurements shall be made on meters per document NPCS-2, Requirements for Sound Measuring Instruments and Personnel. Impulse sound pressure levels are to be taken with the meter set to the linear unweighted scale with the peak detector circuit engaged for unweighted (dB) impulse measurements. For "C" weighted (dBC) impulse measurements the meter is set to the "C" weighting scale and the meter speed is set to the "SLOW" damping response.

Comment: Information and data should be recorded on Form NPCS-4 or equivalent as shown in Figure 4-3. An example of a completed form is presented in Figure 4-4.

DEPARTMENT OF ENVIRONMENTAL QUALITY

File _____

SOUND PRESSURE LEVEL DATA SHEETS

County

SOURCE _____ BY

DATE

SHEET

COMPLAINANT _____

COMPLAINT DATE _____

INSTRUMENTATION		
EQT	TYPE	SERIAL
SLM		
MIC		
FLTR		
CAL		
Windscreen ON OFF		

Time	Bat. Ck.	Cal. dB	°F dry bulb	°F wet bulb	% RH	Press. mm Hg	Wind mph	Wind Direct

Measurement Position	Meter Fast/Slow	A Scale	C Scale	Linear Scale	L_1	L_{10}	L_{50}	Peak Impulse

Comments _____

Form NPCS-4

INSTRUMENT SET-UP
CHECK-OFF LIST

- ☐ Site Selection
- ☐ SLM Position
- ☐ Battery Check
- ☐ Calibration Adjustment
- ☐ Wind Below 10 MPH
- ☐ Humidity Below 95%
- ☐ Windscreen

1. Days of Operation
   - A. Mon. - Fri.
   - B. Mon. - Sat.
   - C. Mon. - Sun.
2. Time of Operation
   - A. 8 a.m. - 5 p.m.
   - B. _ a.m. - _ p.m.
3. Number of Shifts
   - A. One
   - B. Two
   - C. Three
4. Distance from Receiver to source _____ feet.
5. Visibility to Source
   - A. Direct _____
   - B. Hill or Berm
   - C. Trees _____
   - D. Other _____
6. Zoning
   - A. Residence _____
   - B. Plant or Facility _____
7. Who came first?
   - A. Residence...Date _____
   - B. Plant or Facility _____
8. Petition Submitted
   - A. Yes... Number _____
   - B. No

SKETCH OF MEASUREMENT SITE AND SOURCE

REVERSE SIDE FORM NPCS-4
FIGURE 4-3

NPCS-4

DEPARTMENT OF ENVIRONMENTAL QUALITY

SOUND PRESSURE LEVEL DATA SHEETS

File Industry

County Multnomah

SOURCE Oregon Paving Co.
1000 SE 101st, Portland
Rock crusher

BY C. M. Sroka

DATE 6/6/74

SHEET 1/2

COMPLAINANT Mr. Eastland
155 SE Millman Dr, Portland

COMPLAINT DATE 5/10/74

INSTRUMENTATION		
EQT	TYPE	SERIAL
SLM	GR 1565B	
MIC	GR	
FLTR		
CAL	GR 1567	Del [illegible]
Windscreen (ON) OFF		

Time	Bat. Ck.	Cal. dB	°F dry bulb	°F wet bulb	% RH	Press. mm Hg	Wind mph	Wind Direct
1:45p	✓	114	67	51	29	—	0.5	W

Measurement Position	Meter Fast/Slow	A Scale	C Scale	Linear Scale	L_1	L_{10}	L_{50}	Peak Impulse
1	fast	78		85				106
2	fast				79	75	70	

Comments An occasional bus or truck; ambient noise without crusher operating is 51-57 dBA.

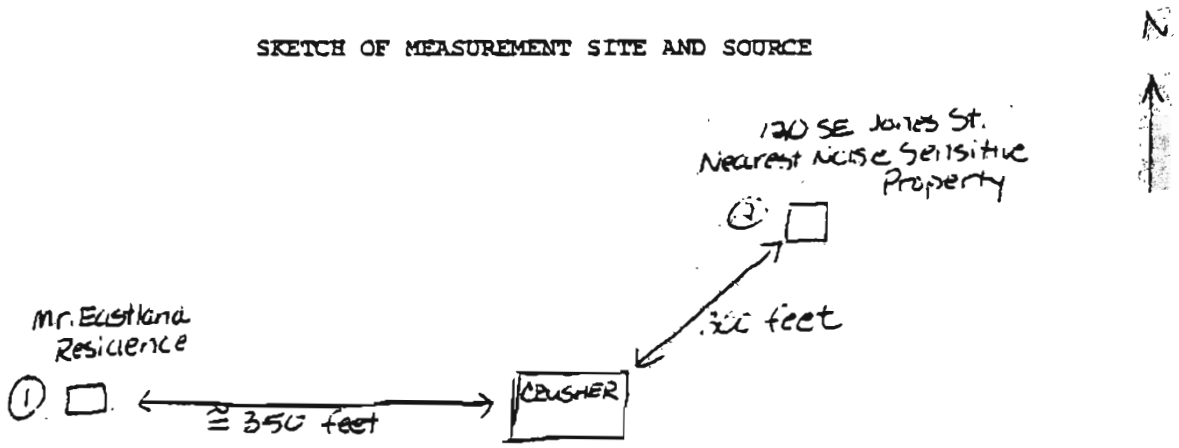
Example Form NPCS-4

INSTRUMENT SET-UP
CHECK-OFF LIST

- ☑ Site Selection
- ☑ SLM Position
- ☑ Battery Check
- ☑ Calibration Adjustment
- ☑ Wind Below 10 MPH
- ☑ Humidity Below 95%
- ☑ Windscreen

1. Days of Operation
   - (A) Mon. - Fri.
   - B. Mon. - Sat.
   - C. Mon. - Sun.
2. Time of Operation
   - A. 8 a.m. - 5 p.m.
   - (B) 6 a.m. - 9 p.m.
3. Number of Shifts
   - A. One
   - (B) Two
   - C. Three
4. Distance from Receiver to source 300-350 feet.
5. Visibility to Source
   - (A) Direct _____
   - B. Hill or Berm _____
   - C. Trees _____
   - D. Other _____
6. Zoning
   - (A) Residence _____
   - B. Plant or Facility _____
7. Who came first?
   - (A) Residence...Date _____
   - B. Plant or Facility
8. Petition Submitted
   - (A) Yes... Number 300 Sig?
   - B. No

SKETCH OF MEASUREMENT SITE AND SOURCE



Example Form NPCS-4
Figure 4-4 REVERSE SIDE FORM

DEPARTMENT OF ENVIRONMENTAL QUALITY

SOUND PRESSURE LEVEL DATA SHEETS

File _____

County _____

SOURCE _____

BY

DATE _____

SHEET 1

COMPLAINANT _____

COMPLAINT DATE _____

INSTRUMENTATION		
EQT	TYPE	SERIAL
SLM		
MIC		
FLTR		
CAL		

Windscreen ON OFF

Time	Bat. Ck.	Cal. dB	°F dry bulb	°F wet bulb	% RH	Press. mm Hg	Wind mph	Wind Direct

Position	Fast/ Slow	A Scale	Lin. Scale	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz

Comments _____

Form NPCS-5
Figure 4-5

NPCS-5

INSTRUMENT SET-UP
CHECK-OFF LIST

- ☐ Site Selection
- ☐ SLM Position
- ☐ Battery Check
- ☐ Calibration Adjustment
- ☐ Wind Below 10 MPH
- ☐ Humidity Below 95%
- ☐ Windscreen

1. Days of Operation
   - A. Mon. - Fri.
   - B. Mon. - Sat.
   - C. Mon. - Sun.
2. Time of Operation
   - A. 8 a.m. - 5 p.m.
   - B. _ a.m. - _ p.m.
3. Number of Shifts
   - A. One
   - B. Two
   - C. Three
4. Distance from Receiver to source _____feet.
5. Visibility to Source
   - A. Direct _____
   - B. Hill or Berm _____
   - C. Trees _____
   - D. Other _____
6. Zoning
   - A. Residence _____
   - B. Plant or Facility _____
7. Who came first?
   - A. Residence...Date _____
   - B. Plant or Facility _____
8. Petition Submitted
   - A. Yes... Number _____
   - B. No

SKETCH OF MEASUREMENT SITE AND SOURCE

FIGURE 4-5
REVERSE SIDE FORM NPCS-5

DEPARTMENT OF ENVIRONMENTAL QUALITY

SOUND PRESSURE LEVEL DATA SHEETS

File Industry

County Lane

SOURCE Sam's Sawmill
1200 East Road
Eugene

BY LCVR - GCS

DATE 4/27/74

SHEET 1 / 1

COMPLAINANT Mr. Ed Jones
100 Martin St., Eugene

COMPLAINT DATE April 19, 1974

INSTRUMENTATION		
EQT	TYPE	SERIAL
SLM	G.R. 1933	2250 1591
MIC	G.R.	[illegible]
FLTR	G.R.	1250
CAL	G.R. [illegible]	[illegible]
Windscreen ON OFF		

Time	Bat. Ck.	Cal. dB	°F dry bulb	°F wet bulb	% RH	Press. mm Hg	Wind mph	Wind Direct
3:40 pm	OK	114	67	51	47	—	4	W
4:07 pm	OK	114.0						

Position	Fast/ Slow	A Scale	Lin. Scale	31.5 Hz	63 Hz	125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	8000 Hz
1	S	47	63	55	55	54	54	50	44	38	30	[illegible]

Comments Measurements taken during "blower" operation. Readings taken from 3:51 through 4:02 pm.

Example Form NPCS-5
Figure 4-6

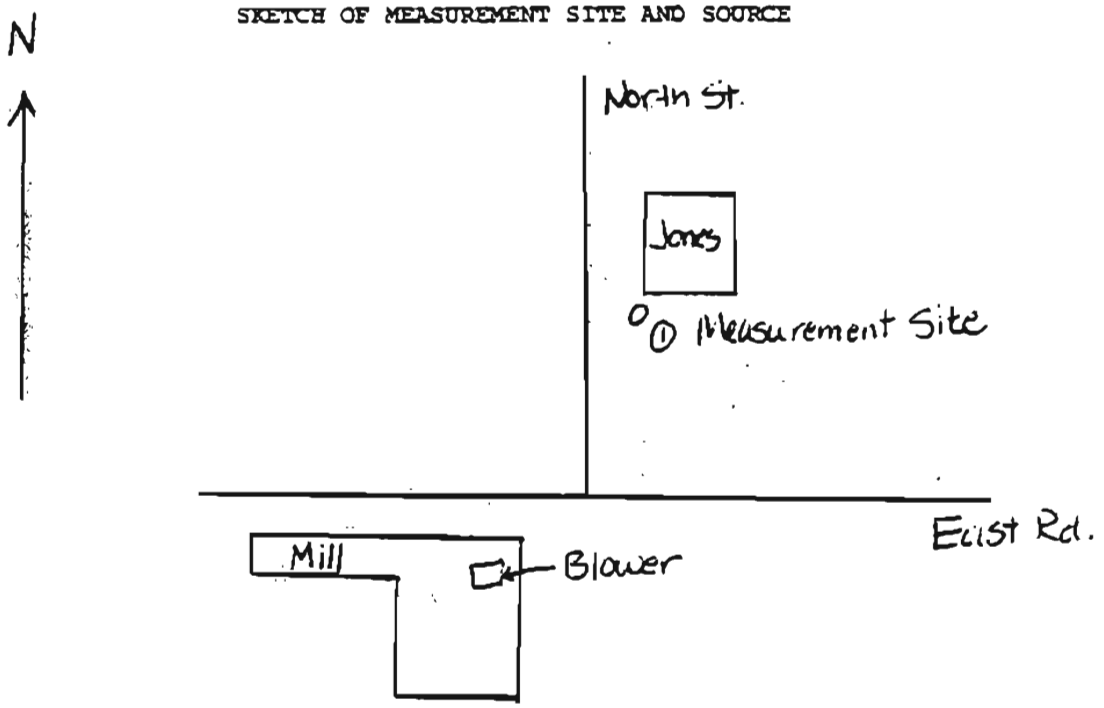
NPCS-5

INSTRUMENT SET-UP
CHECK-OFF LIST

- [x] Site Selection
- [x] SLM Position
- [x] Battery Check
- [x] Calibration Adjustment
- [x] Wind Below 10 MPH
- [x] Humidity Below 95%
- [x] Windscreen

1. Days of Operation
   - A. Mon. - Fri.
   - (B) Mon. - Sat.
   - C. Mon. - Sun.
2. Time of Operation
   - A. 8 a.m. - 5 p.m.
   - (B) 8 a.m. - 4 p.m.
3. Number of Shifts
   - A. One
   - (B) Two
   - C. Three
4. Distance from Receiver to source ≈300 feet.
5. Visibility to Source
   - A. Direct X
   - B. Hill or Berm
   - C. Trees
   - D. Other
6. Zoning
   - A. Residence X
   - B. Plant or Facility
7. Who came first?
   - (A) Residence...Date 1952
   - B. Plant or Facility
8. Petition Submitted
   - A. Yes... Number
   - (B) No

SKETCH OF MEASUREMENT SITE AND SOURCE



Example Form NPCS-5
Figure 4-6
REVERSE SIDE OF FORM

DEPARTMENT OF ENVIRONMENTAL QUALITY

1/3 OCTAVE BAND DATA SHEET

File

County _____

SOURCE _____ BY _____

_____ DATE

_____ SHEET

_____

COMPLAINANT _____

_____

COMPLAINT DATE _____

INSTRUMENTATION		
EQT	TYPE	SERIAL
SLM		
MIC		
FLTR		
CAL		

Windscreen ON OFF

Time	Bat. Ck.	Cal. dB	°F dry bulb	°F wet bulb	% RH	Press. mm Hg	Wind mph	Wind Direct

PREFERRED CENTER FREQUENCIES FOR 1/3 OCTAVE BANDS

osition	Lin. Scale	20 Hz	25 Hz	30 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz
osition	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000	10,000	12,500

omments _____

_____

_____

_____

Figure 4-7 Form NPCS-29

NPCS-29

DEPARTMENT OF ENVIRONMENTAL QUALITY

1/3 OCTAVE BAND DATA SHEET

I+C

File NP-ABC Lumber

County Coos

SOURCE ABC Lumber Co.
1000 "F" St.
Coos Bay, OR

BY B. Hammon

DATE 9-18-81

COMPLAINANT Mr. Joe Smith
1245 "D" St., Coos Bay

COMPLAINT DATE 9-16-81

INSTRUMENTATION		
EQT	TYPE	SERIAL
SLM	B+K 2209	396 472
MIC	B+K 4145	311 347
FLTR	B+K 1618	923111
CAL	B+K 4220	376042
MAG TAPE	B+K 7003	704619
Windscreen	(ON)	OFF

Time	Bat. Ck.	Cal. dB	°F dry bulb	°F wet bulb	% RH	Press. mm Hg	Wind mph	Wind Direct
2:00 PM	✓	124.0	66°	PARTLY CLOUDY			4-6	SW
3:10 PM	✓	124.0	69°	"			2-4	"

PREFERRED CENTER FREQUENCIES FOR /3 OCTAVE BANDS

Position	Lin. Scale	20 Hz	25 Hz	30 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz
1	70	58	60	59	58	59	60	59	59	58	57	56	54	52	51

Position	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	6300	8000		
1	50	48	46	45	53	43	41	40	40	37	38	36	37	32	28

Comments SAMPLE TAKEN 2:13 TO 2:35 PM PDT. PRIMARY IS A LARGE SAW. PRODUCES WHINE IN 1250 Hz. BAND

4.6 Statistical Noise Level Calculations

4.6.1 Hand Sample Method (Comment)

a. For this method use forms NPCS-10-1, NPCS-10-2, and NPCS-10-3 as shown in Figures 4-9 through 4-11 or equivalent.

b. Perform a short noise survey to determine the approximate range of sound levels produced by the noise source being investigated. Enter the approximate high and low noise levels as well as the central tendency on form NPCS-10-1. Use the minimum and maximum sound levels and the table at the back-bottom of form NPCS-10-1 to estimate the minimum number of good sound samples needed to be taken from the source in question. For example, in Figure 4-12 the noise varied from a high of approximately 67 dBA to a low of 61 dBA. This is a 6 dBA variation. The table on NPCS-10-1 indicates that a minimum of 132 good readings needs to be taken.

The table on NPCS-10-1 is designed to give an acceptable statistical confidence in the L_{10} and L_{50} noise level. For determining the L_1 noise level with confidence or for more complex noise sources, more noise samples than indicated in the table may be necessary.

c. Record the noise levels in dBA on Form NPCS-10-1 at five second intervals, at ten second intervals, or at fifteen second intervals. An example of such a measurement is presented in Figure 4-12. Note any unusual activity from the noise source in question. Also indicate all external or extraneous noise sources which may contaminate the noise reading. Examples include sounds from passing vehicle traffic and aircraft. The sound readings associated with these external sources will not be included in the statistical noise level calculations. If external sounds contaminate the measurements for a significant amount of time, it may be necessary to conduct the survey during a period of the day in which these other sources are absent or quieter.

d. Using Form NPCS-10-2, tally the recorded noise levels in 1 dBA increments as the example shows in Figure 4-13. Record on NPCS-2 only those sound levels which are legitimately associated with the source in question, ignoring all other contaminating sound levels.

In the "Number of Readings" column, sum the total readings at each dBA level. Using the "Number Greater Than" column, calculate the number of readings taken that are greater than each particular level. For example, in Figure 4-13 there are no readings greater than 74 dBA, hence the "Number Greater Than " is zero. There is one reading taken at a level greater than 73 dBA, and three (1 plus 2) readings greater than 72 dBA.

The percent greater than (% Greater Than) column contains the statistical percent for each dBA level. The percent is calculated by dividing the numbers in the "Number Greater Than" column by the total number of readings times 100. For example, the percent of 73 dBA is calculated as (1/194) x 100 = 0.5%, and the percent at 72 dBA is (3/194) x 100 = 1.5%.

e. Using Form NPCS-10-3, the dBA levels versus the "percent greater than" numbers are plotted. An example of this is shown in Figure 4-14.

From the resulting graph, the statistical noise level at any required percentage may be found. For example, the L_{50} and L_{10} are found to be 63 dBA and 66 dBA, respectively. Note that a normalized or randomly varying noise source will result in a straight line when plotted on form NPCS-10-3.

f. The results from the statistical survey are then summarized on form NPCS-4 (see Figure 4-4). On the back of NPCS-4 a sketch of the measurement site should be drawn.

g. A typical noise survey will require approximately 20 minutes of measuring to record the required number of samples at a 5-second sample interval. However, the noise standards for industrial and commercial noise sources (OAR 340-35-035) are specified for a one-hour (60 minute) period. Therefore, the noise investigator must ensure that the noise survey represents sounds that are typical of a full 60-minute operation of the noise source. If the source significantly changes its operation for the remainder of the hour, it is recommended that a full 60 minutes of samples are measured and recorded for the statistical analysis.

h. The documentation of the L_1 statistical noise level is often better accomplished by the "time above" method. For noise sources that operate for a short period of time at a constant sound level, an accurate determination of the L_1 noise level can be determined by measuring the total amount of time the noise source operates in a one-hour period. If

the source operates for a period of 36 seconds or greater within the hour (but less than 6 minutes), then the L_1 is equal to the measured noise level. If the source operates for 6 minutes or more during the hour, then the measured level is the L_{10} statistical noise level.

4.6.2 Noise Exposure Counter or Monitor Method

Comment: Statistical noise levels may be obtained through the use of several commercially designed devices that sample and classify the data.

4.6.3 Programmable Calculator Method

Comment: The noise staff of the Department has developed a program to calculate statistical noise levels on a Wang 600 series programmable calculator. This method will digitally make the necessary calculations after the analog noise data has been converted to digital data. As this method is specialized to the Department's facilities, it will not be presented here. A complete explanation of the method and program listing is on file at the Department in Manual NPCS-22, Analysis of Ambient Noise with the Wang 600 Series Programmable Calculator.

DEPARTMENT OF ENVIRONMENTAL QUALITY

STATISTICAL NOISE SURVEY

SOURCE: _____ DATE:

_____ BY:

MEASUREMENT SITE: _____ COUNTY: _____

_____ SHEET: /

Time	Bat.	Calibration dB	F dry bulb	F wet bulb	%RH	Press. mm Hg.	Wind MPH	Wind direct.

INSTRUMENTATION		
EQUT	TYPE	SERIAL
SLM		
MIC		
CAL		

WINDSCREEN: ON OFF

~ Range of Noise: Hi _____ dBA Low _____ dBA Central Tend. _____ dBA

Start Time: _____ Sample Interval: 5 10 15 seconds

DATA POINTS	SOUND PRESSURE LEVEL dBA					
1 - 6						
7 - 12						
13 - 18						
19 - 24						
25 - 30						
31 - 36						
37 - 42						
43 - 48						
47 - 54						
55 - 60						
61 - 66						
67 - 72						
73 - 78						
79 - 84						
85 - 90						
91 - 96						
97 - 102						
103 - 108						
109 - 114						
115 - 120						
121 - 126						
127 - 132						

Figure 4-9
Form NPCS-10-1

Note: See back for the minimum number of samples.
Indicate all missing data points and give an explanation.

NPCS-10-1

6/76

133 - 138						
139 - 144						
145 - 150						
151 - 156						
157 - 162						
163 - 168						
169 - 174						
175 - 180						
181 - 186						
187 - 192						
193 - 198						
199 - 204						
205 - 210						
211 - 216						
217 - 222						
223 - 228						
229 - 234						
235 - 240						
241 - 246						
247 - 252						
253 - 258						
259 - 264						
265 - 270						
271 - 276						
277 - 282						
283 - 288						
289 - 294						
295 - 300						
301 - 306						
307 - 312						
313 - 318						
319 - 324						
325 - 330						
331 - 336						

Figure 4-9
Reverse Side Form NPCS-10-1

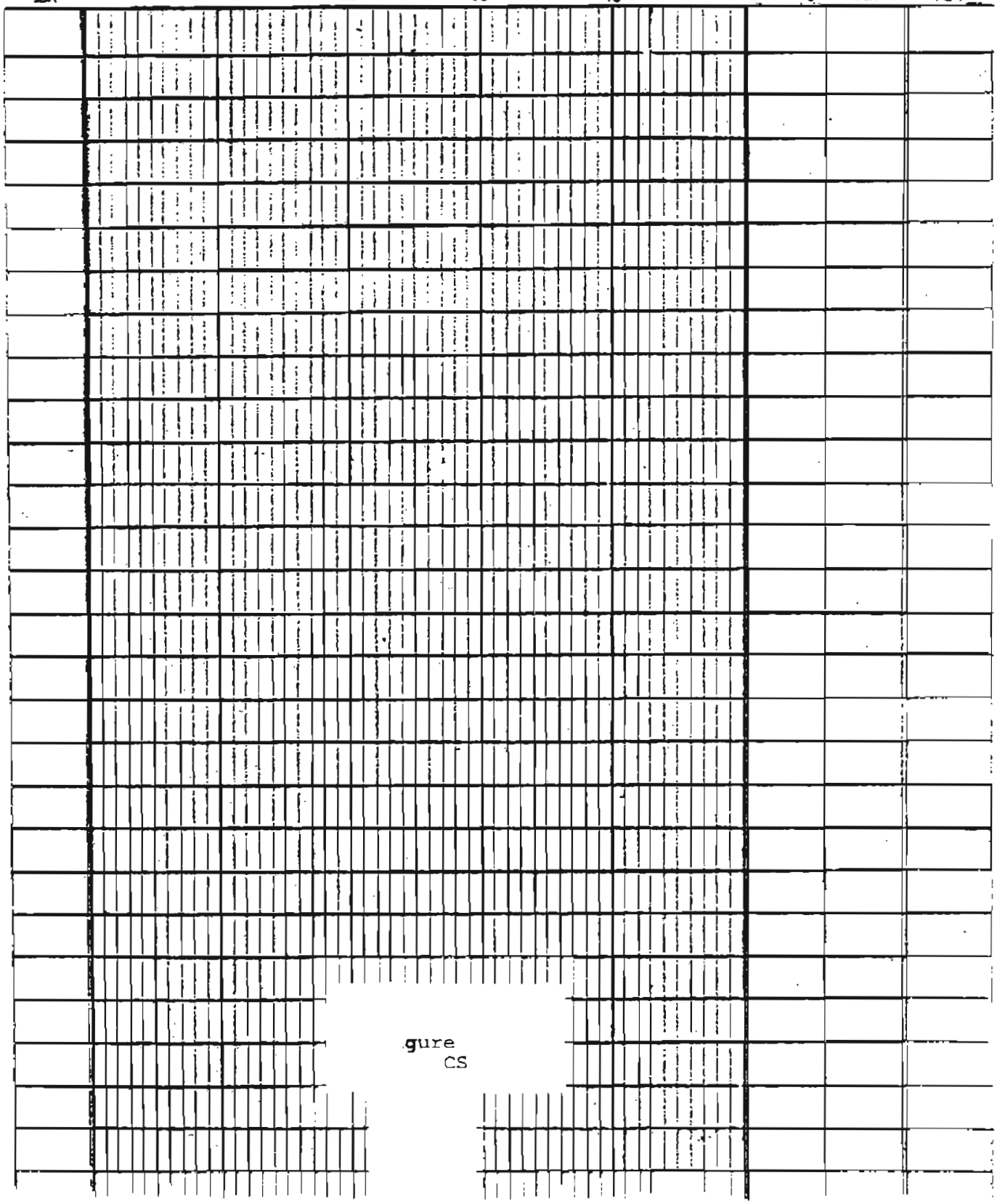
Maximum - Minimum Levels (difference in range)													
0-8	9	10	11	12	13	14	15	16	17	18	19	20	21
132	138	174	210	246	288	336	384	438	498	558	618	684	756
Minimum Number "Good" Samples													

Note: Indicate all missing data points and give an explanation. Additional data points may be needed to document an L_1 violation.

NPCS-10-1

DEPARTMEN OF ENVIRONMENTAL QUALITY
STATISTICAL COMPUTATION SHEE

te. _____ rce: _____ /



gure
CS

NPCS 2 6/76

Figure 4-11
Form NPCS-10-3

SOURCE: ACME WOOD PRODUCTS INC. DATE: 9-16-81

1581 S.W. 76TH (DEBARKER, SAW, CHIPPER) BY: GTW

MEASUREMENT SITE: SITE 1, MR & MRS. JONES' NSP COUNTY: MULT.

1576 S.W. 76TH, PORTLAND SHEET: 2/4

Time	Bat.	Calibration dB	F dry bulb	F		Press. mm Hg.	Wind MPH	Wind direct.
1410	✓	114.0					0-5	NW
1515	✓	114.0					2-6	NW

~ Range of Noise: Hi 67 dBA Low 61 dBA Central Tend. 63 dBA

Start Time: 1420 PDT Sample Interval: (5) 10 15 seconds

INSTRUMENTATION		
EQUT	TYPE	SERIAL
SLM	GR 1565	12345
MIC	1"	
CAL	GR 1987	1790

WINDSCREEN (ON) OFF

DATA POINTS	SOUND PRESSURE LEVEL dBA					
1 - 6	65	63	62	61	64	65
7 - 12	63	61	65	CAR	CAR	64
13 - 18	63	62	70	65	63	62
19 - 24	70	62	DOG	64	63	61
25 - 30	62	63	63	61	67	67
31 - 36	TRUCK →	T	T	64	66	65
37 - 42	62	63	64	63	62	64
43 - 48	63	63	64	63	73 R	62
47 - 54	63	63	65	62	64	63
55 - 60	61	64	65	63	63	65
61 - 66	65	66	64	61	62	66
67 - 72	60	61	63	63	64	70
73 - 78	72	61	73 R	74 R	64	64
79 - 84	63	62	60	65	62	64
85 - 90	61	62	67	63	JET	JET →
91 - 96	JET	JET	65	64	64	64
97 - 102	70 R	63	64	63	62	65
103 - 108	66	65	66	62	64	63
109 - 114	64	64	62	63	65	64
115 - 120	64	67	63	64	DOG	DOG
121 - 126	65	66	67	64	66	69
127 - 132	69	CAR	CAR	63	66	64

Note: See back for the minimum number of samples. NPCS-10-1
Indicate all missing data points and give an explanation.

6/76

133 - 138	63	66	65	64	63	66
139 - 144	62	63	65	64	63	64
145 - 150	64	64	65	66	62	64
151 - 156	66	63	68	63	63	63
157 - 162	62	63	64	63	63	62
163 - 168	63	65	64	62	63	68
169 - 174	← COMPLAINANT		TALKING →		64	61
175 - 180	63	63	63	64	63	65
181 - 186	64	61	61	BIRDS →	B	63
187 - 192	64	63	64	62	65	64
193 - 198	62	64	63	62	64	62
199 - 204	CAR	CAR	63	64	60	63
205 - 210	64	62	62	TRUCK →	T	T
211 - 216	T	T	T	63	64	64
217 - 222	69	63	65	63	65	63
223 - 228						
229 - 234						
235 - 240						
241 - 246						
247 - 252						
253 - 258						
259 - 264						
265 - 270						
271 - 276						
277 - 282						
283 - 288						
289 - 294						
295 - 300						
301 - 306						
307 - 312						
313 - 318						
319 - 324						
325 - 330						
331 - 336						

Maximum - Minimum Levels (difference in range)

0-8	9	10	11	12	13	14	15	16	17	18	19	20	21
132	138	174	210	246	288	336	384	438	498	558	618	684	756

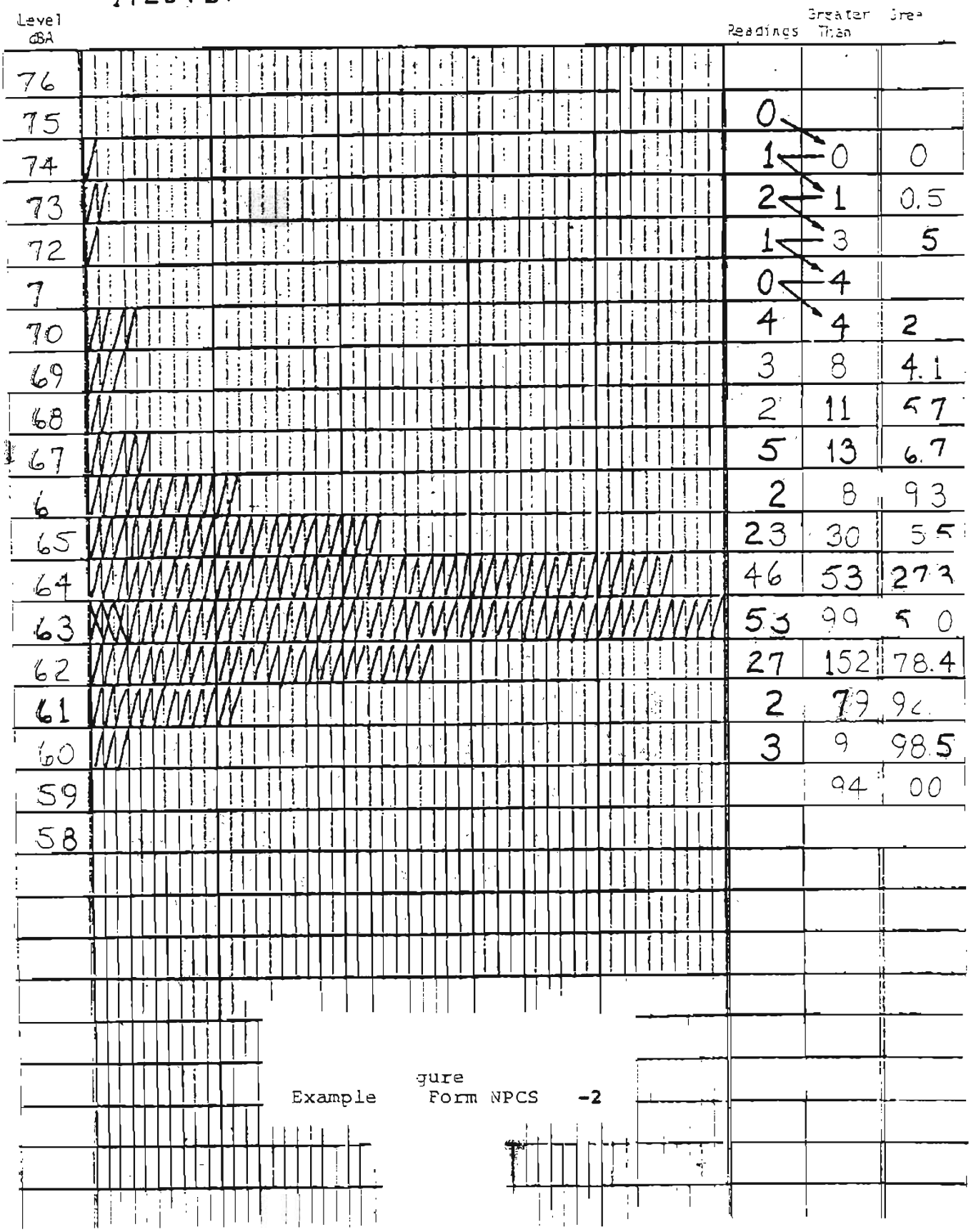
Minimum Number "Good" Samples

Additional data

NPCS-10-1

ICAL COMPI

Date 9-16-81 1420 PDT Source: ACME WOOD PRODUCTS INC. Sheet 3/4



Level dBA	Readings	Greater Than	Grea
76			
75	0		
74	1	0	0
73	2	1	0.5
72	1	3	5
7	0	4	
70	4	4	2
69	3	8	4.1
68	2	11	57
67	5	13	6.7
6	2	8	93
65	23	30	55
64	46	53	273
63	53	99	50
62	27	152	78.4
61	2	79	9[illegible]
60	3	9	98.5
59		94	00
58			

Example gure Form NPCS -2

NPCS 2

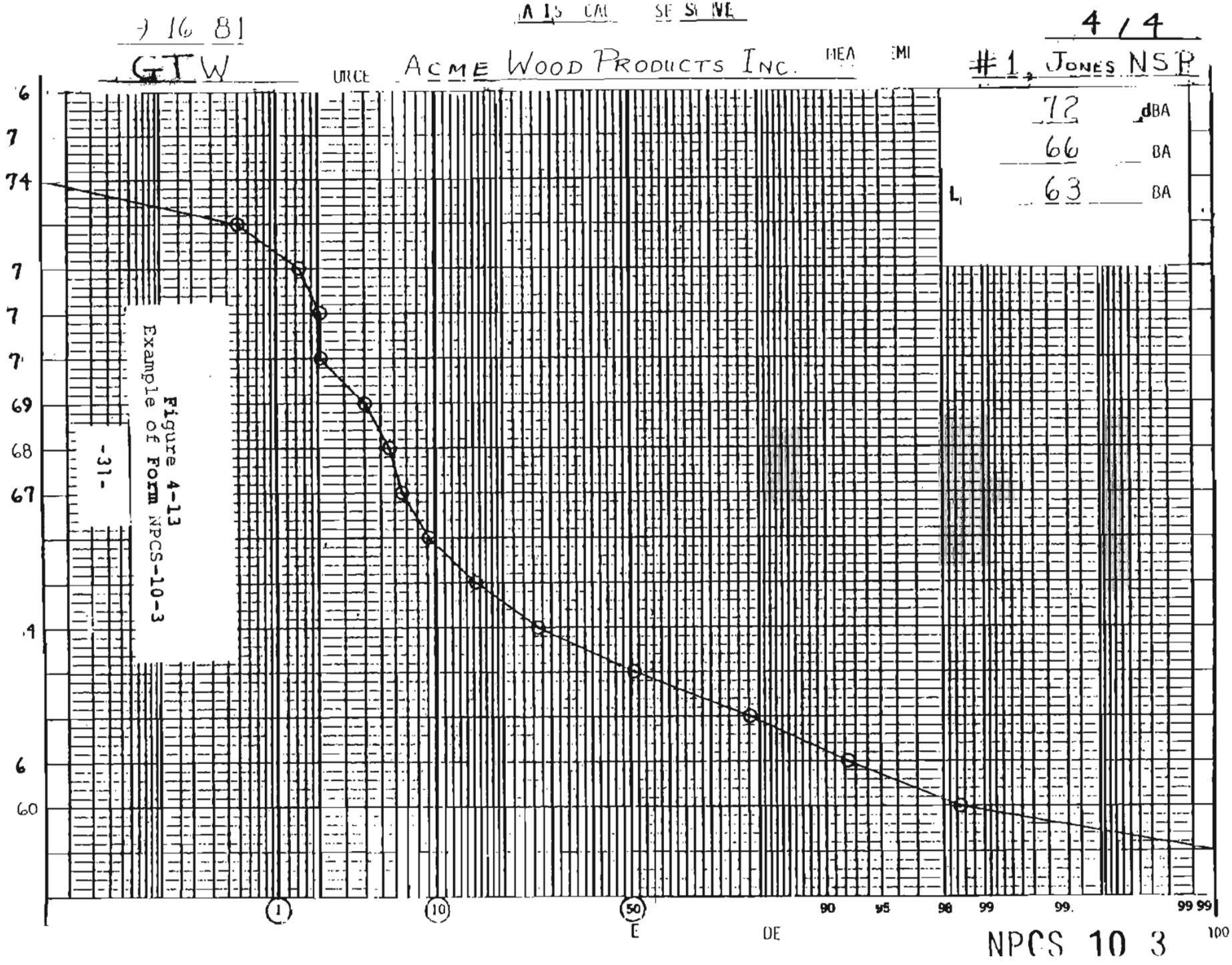


Figure 4-13
Example of Form NPCS-10-3

4.8.1 Point Source

Comment: The sound pressure level at a point r feet from a point source can be calculated from a sound pressure level measurement at a point r_o feet from the point source using the following equation:

$$SPL = SPL_o - 20 \log (r/r_o)$$

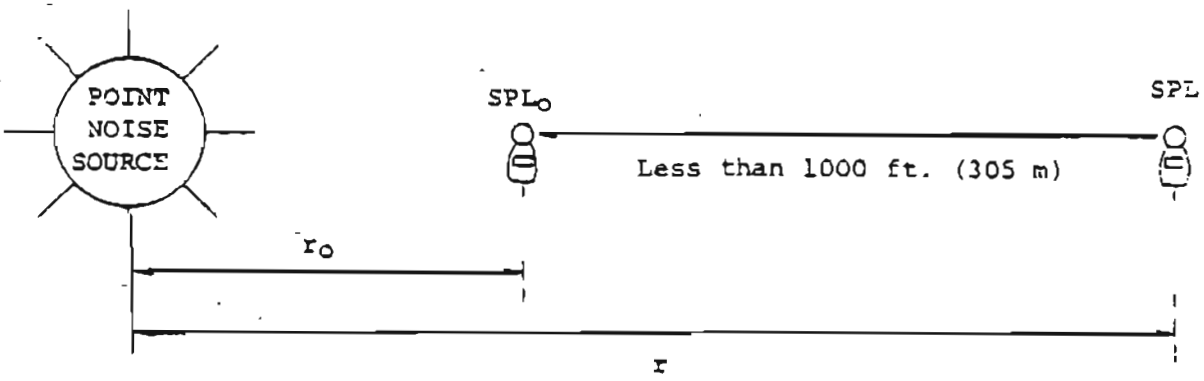
where:

SPL = sound pressure level at r feet from the source.

SPL_o = sound pressure level at r_o feet from the source. Note that r_o is a reference distance and that the distance r is always greater than r_o. The point r_o must be in the far field of the source.

Figure 4-15 illustrates a point source, such as an industrial site, and the distance at which the measurement SPL_o is taken and the distance where the required level, SPL is needed.

This projection technique is applicable only if the distance between r and r_o is less than 1000 feet. This projection technique should be used only when it is not practical to make a sound pressure level reading at r.



SOUND LEVEL ADJUSTMENT WITH DISTANCE

FIGURE 4-15

4.8.2 Line Source

Comment: The sound pressure level at a point r feet from a line source can be calculated from a sound pressure level measurement at a point r_o feet from the line source using the following equation:

$$SPL = SPL_o - 10 \log (r/r_o)$$

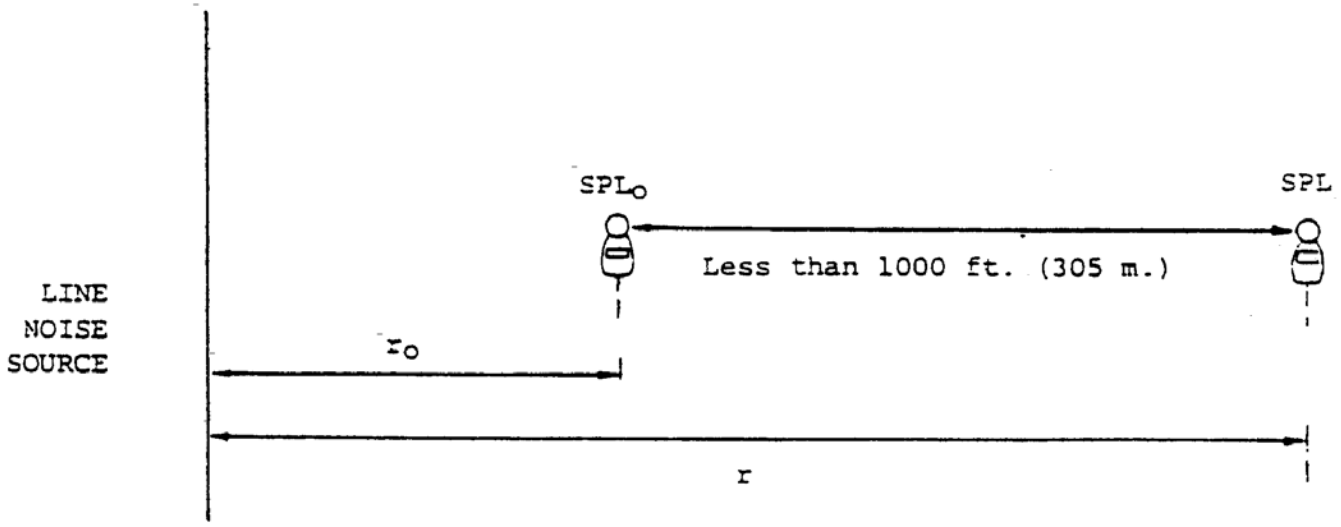
where:

SPL = sound pressure level at r feet from the source.

SPL_o = sound pressure level at r_o feet from the source. Note that r_o is a reference distance and that the distance r is always greater than r_o. The point r_o must be in the far field of the source.

Figure 4-16 illustrates a line source, such as a highway with closely spaced moving vehicles, and the distance at which the measurement, SPL_o is taken and the distance where the required level SPL is needed.

This projection technique is applicable only if the distance between r and r is less than 1000 feet. This projection technique should be used only when it is not practical to make a sound pressure level reading at point r.



LINE NOISE SOURCE DISTANCE ADJUSTMENT

FIGURE 4-16

AMEND: 340-035-0040

RULE TITLE: Noise Control Regulations for Motor Sports Vehicles and Facilities

NOTICE FILED DATE: 04/13/2016

RULE SUMMARY: Existing tables and publications included in the rule.

RULE TEXT:

(1) Statement of Purpose:

(a) The Commission finds that the periodic noise pollution caused by Oregon motor sports activities threatens the environment of citizens residing in the vicinity of motor sports facilities. To mitigate motor sports noise impacts, a coordinated statewide program is desirable to ensure that effective noise abatement programs are developed and implemented where needed. This abatement program includes measures to limit the creation of new noise impacts and the reduction of existing noise impacts to the extent necessary and practicable;

(b) Since the Commission also recognizes the need of Oregon's citizens to participate in recreational activities of their choice, these rules balance those citizen needs which may conflict when motor sports facilities are in operation. Therefore, a policy of continuing participation in standards development through the active cooperation of interested parties is adopted. The choice of these parties is to limit the noise emission levels of racing and recreational vehicles, to designate equipment requirements, and to establish appropriate hours of operation. It is anticipated that safety factors, limited technology, special circumstances, and special events may require exceptions to these rules in some instances; therefore, a mechanism to accommodate this necessity is included in this rule;

(c) This rule is designed to encourage the motor sports facility owner, the vehicle operator, and government to cooperate to limit and diminish noise and its impacts. These ends can be accomplished by encouraging compatible land uses and controlling and reducing the racing vehicle noise impacts on communities in the vicinity of motor sports facilities to acceptable levels;

(d) This rule is enforceable by the Department and civil penalties ranging from a minimum of $25 to a maximum of $500 may be assessed for each violation. The motor sports facility owner, the racing vehicle owner and the racing vehicle driver are held responsible for compliance with provisions of this rule. A schedule of civil penalties for noise control may be found under OAR 340-012-0052.

(2) Standards:

(a) Drag Racing Vehicle. No motor sports facility owner and no person owning or controlling a drag racing vehicle shall cause or permit its operation at any motor sports facility unless the vehicle is equipped with a properly installed and well maintained muffler;

(b) Oval Course Racing Vehicle. No motor sports facility owner and no person owning or controlling an oval course racing vehicle shall cause or permit its operation at any motor sports facility unless the vehicle is equipped with a properly installed and well-maintained muffler and noise emissions from its operation do not exceed 105 dBA at trackside;

(c) Sports Car Racing Vehicle. No motor sports facility owner and no person owning or controlling a sports car racing vehicle shall cause or permit its operation at any motor sports facility unless the vehicle is equipped with a properly installed and well-maintained muffler and noise emissions from its operation do not exceed 105 dBA at trackside;

(d) Closed Course Motorcycle Racing Vehicle. No motor sports facility owner and no person owning or controlling a closed course motorcycle racing vehicle shall cause or permit its operation at any motor sports facility unless the vehicle is equipped with a properly installed and well-maintained muffler and noise emissions from its operation do not exceed 105 dBA at trackside or 105 dBA at 20 inches (.5 meter) from the exhaust outlet during the stationary measurement procedure;

(e) Open Course Motorcycle Racing Vehicle. No motor sports facility owner and no person owning or controlling an open course motorcycle racing vehicle shall cause or permit its operation at any motor sports facility unless the vehicle is equipped with a properly installed and well-maintained muffler and noise emissions do no exceed 105 dBA at 20 inches (.5 meter) from the exhaust outlet during the stationary measurement procedure;

(f) Four Wheel Drive Racing Vehicles. No motor sports facility owner and no person owning or controlling a four wheel drive racing vehicle shall cause or permit its operation at any motor sports facility unless the vehicle is equipped with a properly installed and well-maintained muffler and noise emissions from its operation do not exceed 105 dBA at trackside;
(g) Watercraft Racing Vehicle. No motor sports facility owner and no person owning or controlling a watercraft racing vehicle shall cause or permit its operation at any motor sports facility unless the vehicle is equipped with a properly installed and well-maintained muffler and noise emissions from its operation do not exceed 105 dBA at trackside;
(h) Autocross or Solo Racing Vehicle. No motor sports facility owner and no person owning or controlling an autocross or solo racing vehicle shall cause or permit its operation on any temporary autocross or solo course unless the vehicle is equipped with a properly installed and well-maintained muffler and noise emissions from its operation do not exceed 90 dBA at trackside. Autocross and solo events conducted on a permanent motor sports facility, such as a sports car or go-kart course, shall comply with the requirements for sports car racing vehicles specified in subsection (2)(c) of this rule;
(i) Go-Kart Racing Vehicle. No motor sports facility owner and no person owning or controlling a go-kart racing vehicle shall cause or permit its operation at any motor sports facility unless the vehicle is equipped with a properly installed and well-maintained muffler and noise emissions from its operation do not exceed 105 dBA at trackside.
(3) New Motor Sports Facilities. Prior to the construction or operation of any permanent new motor sports facility, the facility owner shall submit for Department approval the projected motor sports facility noise impact boundaries. The data and analysis used to determine the boundary shall also be submitted to the Department for evaluation. Upon approval of the boundaries, this information shall be submitted to the appropriate local planning unit and the Department of Land Conservation and Development for their review and appropriate action.
(4) Practice Sessions. Notwithstanding section (2) of this rule, all racing vehicles in order to operate in practice sessions, shall comply with a noise mitigation plan which shall have been submitted to and approved by the motor sports advisory committee and the Director. Such plans may be developed and submitted prior to each racing season. An approved plan may be varied with prior written approval of the Department.
(5) Recreational Park. When a motor sports facility is used as a recreational park for the operation of off-road recreational vehicles, the ambient noise limits of OAR 340-035-0030(1)(d) shall apply.
(6) Operations:
(a) General. No motor sports facility owner and no person owning or controlling a racing vehicle shall permit its use or operation at any time other than the following:
(A) Sunday through Thursday during the hours 8 a.m. to 10 p.m. local time; and
(B) Friday through Saturday, state and national holidays and the day preceding, not to exceed three consecutive days, during the hours 8 a.m. to 11 p.m. local time.
(b) Overruns. Each motor sports facility may overrun the specified curfew times, including the time specified in subsection (11)(c) of this rule, not to exceed 30 minutes, no more than six days per year due to conditions beyond the control of the owner. Each overrun shall be documented to the Department within ten days of the occurrence;
(c) Special Events. Any approved special motor racing event may also be authorized to exceed this curfew pursuant to subsection (12)(a) of this rule.
(d) Continued Special Events. Any approved special event that cannot be completed within established curfew times due to circumstances beyond the control of the owner, such as but not limited to oil spills and accidents, may be continued the following day under the same conditions provided in the special event exception. The Department shall be notified within ten days of any continued special event.
(7) Measurement and Procedures. All instruments, procedures and personnel involved in performing sound level measurements shall conform to the requirements specified in Motor Race Vehicle and Facility Sound Measurement and Procedure Manual, NPCS-35, or to standard methods approved in writing by the Department.
(8) Monitoring and Reporting:
(a) It shall be the responsibility of the motor sports facility owner to measure and record the required noise level data as specified under subsections (2)(b)–(i) of this rule and the Motor Race Vehicle and Facility Sound Measurement and

Procedure Manual, NPCS-35. The owner shall either keep such recorded noise data available for a period of at least one calendar year or submit such data to the Department for storage. Upon request the owner shall make such recorded noise data available to the Department;
(b) When requested by the Department, any motor sports facility owner shall provide the following:
(A) Free access to the facility;
(B) Free observation of noise level monitoring;
(C) Cooperation and assistance in obtaining the reasonable operation of any Racing Vehicle using the facility as needed to ascertain its noise emission level.
(9) Vehicle standards. No motor sports facility owner and no person owning or controlling a racing vehicle shall cause or permit a racing event or practice session unless the vehicle is equipped and operated in accordance with these rules.
(10) Vehicle Testing. Nothing in this section shall preclude the motor sports facility owner from testing or barring the participation of any racing vehicle for non-compliance with these rules.
(11) Exemptions:
(a) Any motor sports facility whose racing surface is located more than 2 miles from the nearest noise sensitive property shall be exempt from this rule;
(b) Any top fuel-burning drag racing vehicle shall be exempt from the requirements of subsection (2)(a) of this rule. No later than January 31, 1985 the Department shall report to the Commission on progress toward muffler technology development for this vehicle class and propose any necessary recommendations to amend this exemption;
(c) Operation of non-complying jet powered dragsters between the hours of 11 a.m. and 10 p.m.;
(d) Operation of non-muffled racing vehicles at practice sessions between 12 noon and 3 p.m. as part of an approved plan as required pursuant to section (4) of this rule.
(12) Exceptions. The Department shall consider the majority and minority recommendations of the motor sports advisory committee prior to the approval or denial of any exception to these rules. Exceptions may be authorized by the Department for the following pursuant to OAR 340-035-0010:
(a) Special motor racing events;
(b) Race vehicle or class of vehicles whose design or mode of operation makes operation with a muffler inherently unsafe or technically unfeasible;
(c) Motor sports facilities previously established in areas of new development of noise sensitive property;
(d) Noise sensitive property owned or controlled by a motor sports facility owner;
(e) Noise sensitive property located on land zoned exclusively for industrial or commercial use;
(f) Any motor sports facility owner or race sanctioning body that proposes a racing vehicle noise control program that accomplishes the intended results of the standards of section (2) of this rule, the measurement and procedures of section (7) of this rule, the monitoring and the reporting of section (8) of this rule;
(g) Any motor sports facility demonstrating that noise sensitive properties do not fall within the motor sports facility noise impact boundaries may be except from the curfew limits of section (6) of this rule and the monitoring and reporting requirements of section (8) of this rule;
(h) Any practice session for non-muffled racing vehicles that does not meet the exemption requirements specified in subsection (11)(d) of this rule.
(13) Motor Sports Advisory Committee Actions. The committee shall serve at the call of the chairman who shall be elected by the members in accordance with the rules adopted by the committee for its official action.
(14) Effective Date. These rules shall be effective January 1, 1982.
[Ed. Note: You can view a PDF of publications by clicking on this link.]

STATUTORY/OTHER AUTHORITY: ORS 467

STATUTES/OTHER IMPLEMENTED: ORS 467.030

Motor Race Vehicle and Facility Sound Measurement and Procedure Manual

NPCS - 35

DEQ
State of Oregon
Department of
Environmental
Quality

REVISION RECORD

INSTRUCTIONS FOR USE: All revisions of this manual will be numbered to assure each manual holder that he has received all revisions. The date, a description of the revision, and the initials of the person inserting the revision shall be listed.

Rev. No.	Date	Description of Revision	Initial
1.	1-8-'83	Delete muffler lengths on non-drag	~~HH~~
2.			
3.			
4.			
5.			
6.			
7.			
8.			
9.			
10.			
11.			
12.			
15.			

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CHAPTER 1

INTRODUCTION

1.1 Policy.

1.1.1 The Environmental Quality Commission (EQC), through the Department of Environmental Quality (DEQ) shall establish a noise measurement program to implement the laws and regulations applying to Motor Sports Vehicles and Facilities.

1.1.2 The person owning or controlling the motor sports facility shall be responsible for compliance with the Oregon Noise Control Regulations for Motor Sports Vehicles and Facilities (OAR 340-35-040).

1.1.3 This manual contains procedures to be followed in complying with the Motor Sports Vehicles and Facilities Noise Control Regulations. Guidance is provided in the "Notes" and "Comments".

Authority. The statutory and administrative law governing authority which provide guidance and direction for this manual are contained in:

a) Oregon Revised Statutes, Chapter 467
b) Oregon Administrative Rules for Noise Control

i)	OAR 340-35-005	Policy
ii)	OAR 340-35-010	Exceptions
iii)	OAR 340-35-015	Definitions
iv)	OAR 340-35-040	Noise Control Regulations for Motor Sports Vehicles and Facilities
v)	OAR 340-35-100	Variances

Noise Regulations for Motor Sports Vehicles and Facilities. The DEQ Noise Control Regulations for Motor Sports Vehicles and Facilities contain two basic requirements for racing vehicles:

1) Vehicles shall be equipped with a "properly installed and well maintained muffling" system; and

2) Vehicles shall not exceed the maximum allowable noise emission limits for that vehicle.

Facilities located over two miles from the nearest "noise sensitive property" (residences) and/or any Top Fuel Burning Drag race vehicles are exempt from the above requirements due to lack of available control technology.

Penalties. The motor sports facility and racing vehicle owner is subject to penalties set forth by the Environmental Quality Commission in OAR 340-12-052, Noise Control Schedule of Civil Penalties, for violation of the Noise Control Regulations for Motor Sports Vehicles and Facilities. Penalties may be as great as $500 for each violation.

1.5 General Vehicle Inspection Procedure. As stated in the policy section, the facility owner is required to inspect the race vehicles for compliance with the noise regulations. The following general procedures shall be followed when inspecting race vehicles:

1. Prior to a racing event (normally during the technical inspection of the vehicle), the facility owner shall inspect the muffler system to determine if the vehicle has a "properly installed and well maintained muffling" system (see Chapter 3).

2. If the vehicle has failed to meet the muffler requirements during the above inspection, then the race vehicle does not comply with the regulations and must therefore install a "properly installed and well maintained muffling" system.

3. If the vehicle meets the muffler requirements, then the vehicle (except for a drag race vehicle) shall be sound measured to determine if it meets the maximum allowable noise emission limits.

   Vehicles other than motorcycles shall be noise tested while moving around the course (preferably during practice sessions). Open course motorcycles shall be tested while stationary (normally during technical inspection after the muffler inspection). Closed course motorcycles shall be tested while either stationary or moving at the option of the facility owner. (See Chapter 4 and 5).

4. If the vehicle has failed to meet the maximum allowable noise emission limits, then the vehicle does not comply with the regulations and the muffling system must be improved to comply with the emission standards.

5. All vehicles who fail to meet either the muffler requirements or the maximum allowable noise emission limits shall be recorded on Form NPCS-35-1.

CHAPTER 2

TRAINING

Sound Measurement Equipment. Prior to a race event, the person(s) designated to inspect racing vehicles for compliance with the noise control regulations shall become familiar with the sound measurement equipment (this person will be referred to in this procedure manual as the Noise Control Steward or NCS). The Noise Control Steward shall have read the manufacturer's instruction manual for the sound equipment. The NCS also shall have sufficient hands-on experience to feel comfortable operating the equipment.

Noise Control Racing Rules and Procedure Manual. The Noise Control Steward shall have a good working knowledge of the Department of Environmental Quality Noise Control Standards for Motor Sports Vehicles and Facilities (OAR 340-35-040) and its companion document the Sound Measurement Procedure Manual (NPCS-35).

Race Vehicle and Facility. The Noise Control Steward shall have a good working knowledge of the racing vehicles and facility being monitored. This includes:
a) Knowing the driving characteristics of the race vehicles,
b) Knowing the layout of the track, and
c) Knowing the requirements for approved racing muffler systems.

This information will be useful in locating the proper measurement sites and for inspecting vehicles.

CHAPTER 3

MUFFLER SYSTEMS

General. The DEQ regulation requires all types of race vehicles (except Top Fuel Burning Drag vehicles) to be equipped with a "properly installed and well maintained muffling" system. During the vehicle inspection prior to the racing event, the vehicle's muffling system shall be visually inspected by the Noise Control Steward. If the muffling system fails to meet the DEQ muffler requirements, then the vehicle shall not operate at the race facility until the muffling system complies. This chapter describes the procedures for visual inspection of the vehicle's muffling system.

Top Fuel Burning Drag Vehicles. Drag vehicles operating on more than 50% alcohol fuel or on nitromethane are defined as Top Fuel Burning Drag vehicles and are commonly known as Funny cars and Top Fuel cars. Due to the lack of muffler technology needed to quiet this vehicle class, they are not required to have a muffler system under this rule.

"Properly Installed" Mufflers. A properly installed muffling system is:

a) Correctly installed per manufacturer's instructions,
b) Fully functional,
c) Has no leaks or holes in the walls of the exhaust tubing and muffler body, and
d) Has no defect or modifications to reduce its sound reduction capabilities.

"Well Maintained Muffler" Systems. The DEQ noise regulations specifically state what constitutes a "well maintained muffler" system. If "properly installed" and "well maintained," the following systems meet the requirements of the rule. Note that each and every exhaust outlet must have a muffler located upstream from the outlet.

3.4.1 Reverse Flow (Baffle) Mufflers. See Figure 3-1 for examples of reverse flow mufflers. The reverse flow devices incorporate a multitube and baffled design. The exhaust gases do not flow straight through these devices, but take a multipath, back and forth route through the device.

3.4.2 Perforated Straight Core with Sound Absorbing Medium. See Figure 3-2 for examples of the perforated straight core with sound absorbing medium mufflers. In order for a straight core device to comply with the requirements, it must meet all the following criteria:

a) The central core tube shall be perforated,
b) The core shall be fully surrounded from beginning to end with an absorbing medium (e.g., fiberglass, steel wool, etc.).
c) The muffler shall not be installed on a rotary engine, and
d) The muffler shall meet the following length requirements when used on any drag racing vehicle:

(i) For any engine exceeding 1600 cc (96.7 cu. in.) displacement, the muffler shall be at least 20 inches (50.8 cm) in inner core length; or
For any non-motorcycle engine equal to or less than 1600 cc (96.7 cu. in.), the muffler shall be at least 12 inches (30.5 cm) in inner core length; or

(iii) For any four-cycle motorcycle engine, the muffler shall be at least six inches (15.24 cm) in inner core length; or
For any two-cycle motorcycle engine, the muffler shall be at least eight inches (20.32 cm) in inner core length.

Note: The "inner core length" means the length of the main body of the muffler, not including the exhaust tubing leading to and from the main body of the muffler (see Figure 3-2).

3.4.3 Annular Swirl Flow (Auger-Type) Mufflers. See Figure 3.3 for an auger type muffler. The exhaust gases in the annular swirl flow muffler follows a circular path down the length of the muffler. The inner design is like an auger. In order for these devices to comply with the noise requirements, they shall meet the following length requirements when used on any drag race vehicles:

a) For any engine exceeding 1600 cc (96.7 cu. in.), the muffler swirl chamber shall be at least 16 inches (40.64 cm) in length; or

b) For any engine equal to or less than 1600 cc (96.7 cu. in.), the muffler swirl chamber shall be at least 10 inches (25.4 cm) in length.

3.4.4 Stacked 360° Diffuser Disc Mufflers. See Figure 3-4 for an examle of a Diffuser Disc muffler. This type of muffler works by causing the exhaust gases to bend 90° and then flow through the stacked 360° diffuser discs.

3.4.5 Turbocharger. A turbocharger is an exhaust gas driven supercharger. Turbochargers meet the requirements for a "well maintained muffler" system. However, superchargers mechanically driven by the engine are not defined as a "well maintained muffler" system and thus do not meet DEQ muffler requirements.

3.4.6 Go-Kart Mufflers. Go-Karts must be equipped with a muffler as specified by the International Karting Federation. See Figure 3-5 for the specifications on go-kart mufflers.

3.4.7 Original Manufacturers Muffler on a Motorcycle. The original muffling equipment installed on a motorcycle and designated for use on the motorcycle by the manufacturer, meets the DEQ muffler requirements. The original motorcycle mufflers are generally of reverse flow, baffle and perforated straight core designs.

3.4.8 Underwater Exhausted Outboard Boat Motors. Watercraft with motors whose exhaust exits beneath the water

surface during operation are defined as a "well maintained" muffler and meet the DEQ muffler requirements.

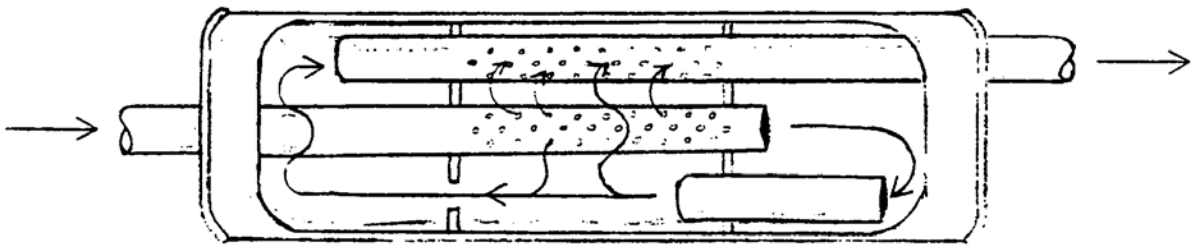
3.4.9 Other Approved Muffling Devices. Any other muffling device demonstrated effective and approved by the Motor Sports Advisory Committee and the Department of Environmental Quality will then by designated a "well maintained muffler" system.

Other Not Approved Devices. Other devices not meeting the criteria outlined in Section 3.1 to 3.4.9 for a "properly installed and well maintained muffling" system are illegal and shall not be used on vehicles operating at any Motor Sports Facility; except where specific exemption, exception and/or variances apply.

Form NPCS-35-1. Form NPCS-35-1 contains a condensed version of the information outlined in this chapter. Also, the form contains space for a description of the muffling system and whether it passed or failed the "properly installed" and "well maintained muffling" system requirements.

Fig. 3 - 1 Reverse Flow, Baffled Mufflers

Typical Baffled Muffler



Other Baffled Muffler Designs

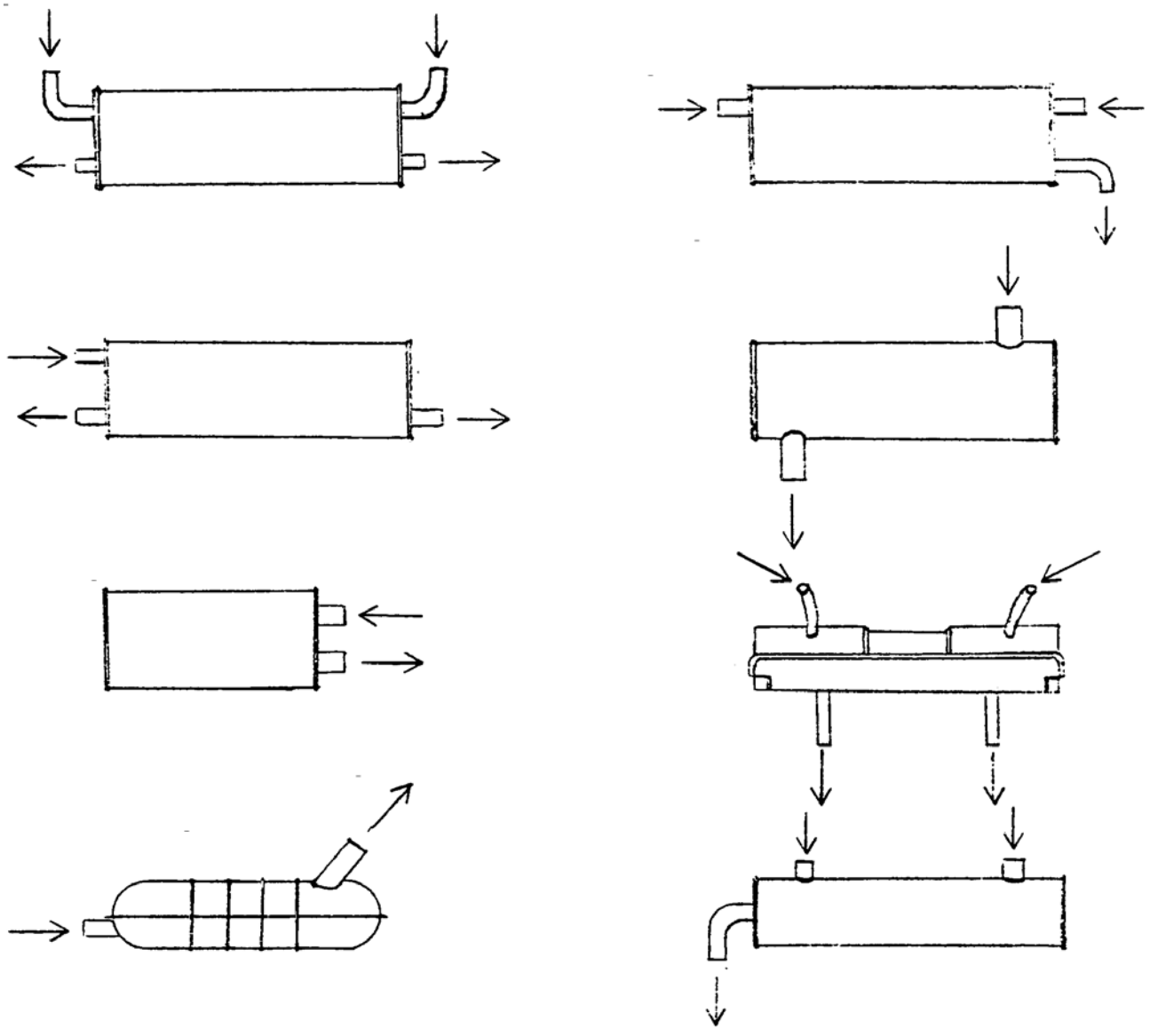
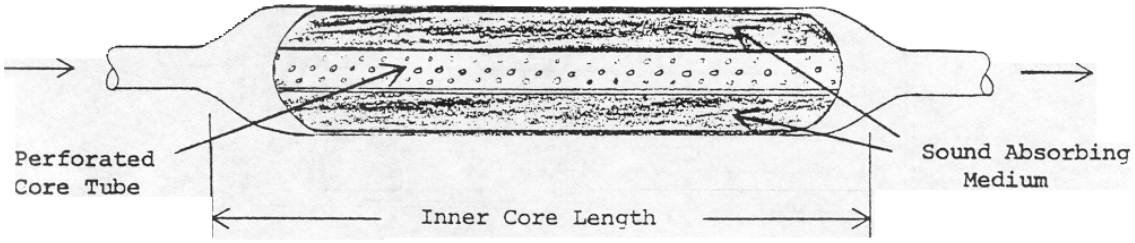


Fig. 3 - 2 Perforated Straight Core Muffler

Typical Straight Core Muffler



Another Type of Straight Core Muffler

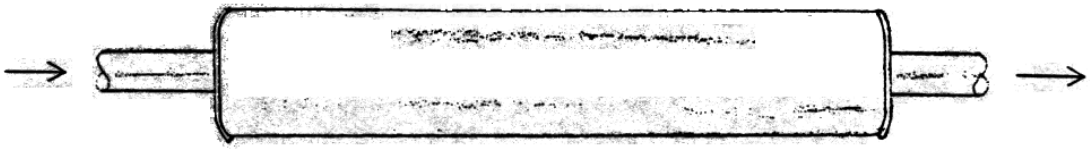


Fig. 3 - 3 Annular Swirl Flow (Auger-Type) Muffler

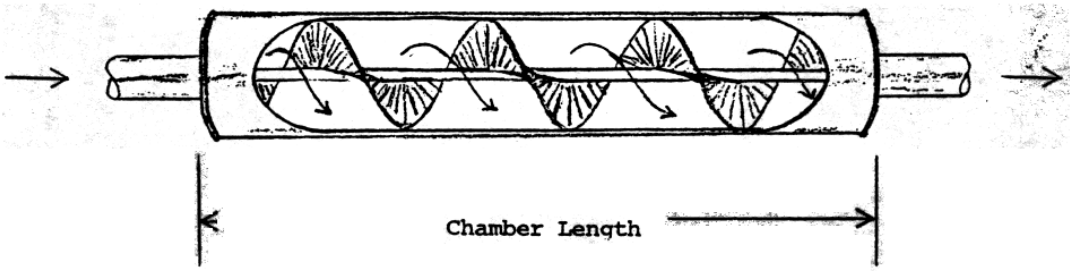


Fig. 3 - 4 Stacked 360° Diffuser Disc Muffler

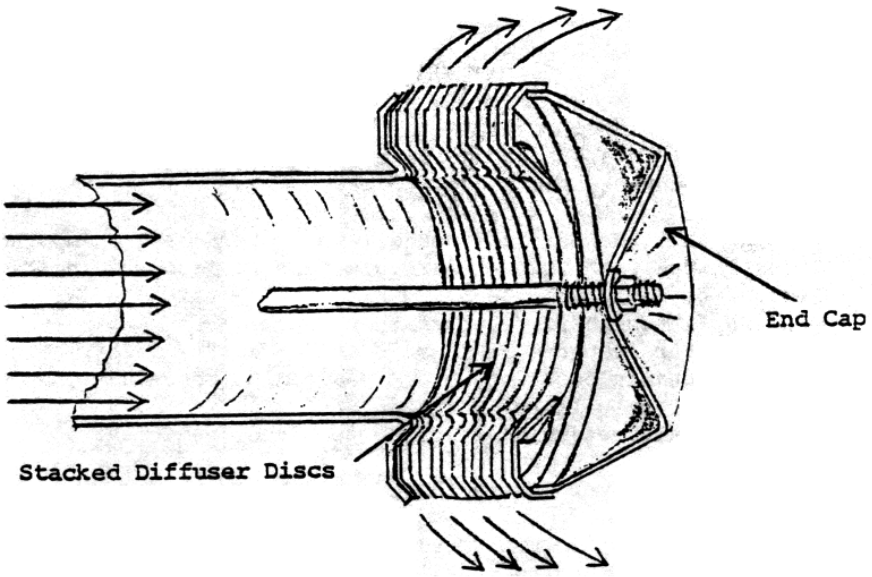
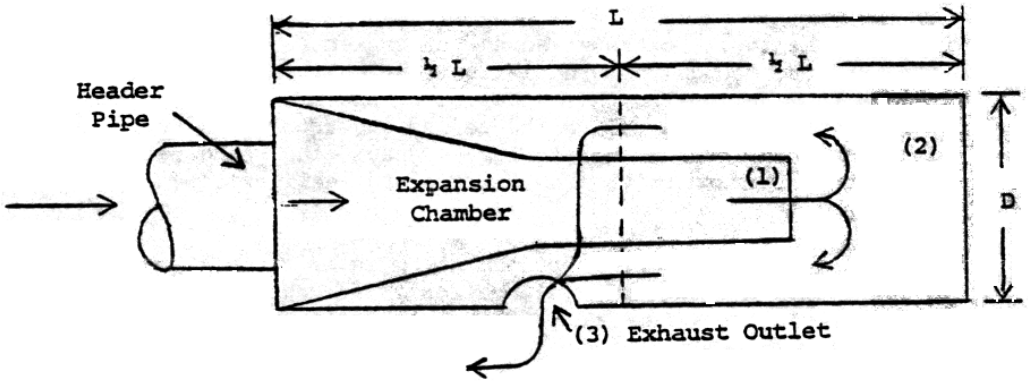


Fig. 3 - 5 Go-Kart Muffler Requirements



All go-kart exhaust systems shall be equipped with a muffler meeting the following specifications:

a) No minimum or maximum muffler length (L) or diameter (D) is required.

b) The expansion chamber must outlet (1) into the rear half of the muffler (2), that portion farthest from the header pipe.

c) The exhaust gas outlet hole to atmostphere (3) may be of any shape, but shall not exceed .7854 sq. inches or the equivalent of a 1-inch diameter circle. Two 1-inch diameter, or smaller, exhaust outlet holes may be used on a single cylinder, 270 cc open class go-kart engine. This applies only to large displacement single cylinder engines in the 270 cc open class. If more than one outlet hole is used on a 270 cc single cylinder engine, no more than two holes may be used, both must be round, and neither hole may exceed 1-inch diameter.

d) Multiple exhaust gas outlet holes to atmosphere are preferred.

e) There may be no physical connection between the expansion chamber outlet (1) and the exhaust gas hole to atmosphere (3).

f) Adjustable pipes <u>are not legal</u> in sprint racing of go-karts.

CHAPTER 4

INSTRUMENTATION

General. This chapter describes the requirements for the sound measurement equipment and its use.

Sound Level Meter. All sound level meters used in monitoring compliance with the noise regulations at motor racing facilities shall be equipped with:

a) An "A" weighting electronic network,
b) A meter response similar to ANSI "Fast" and ANSI "Slow". (Depending on the type of measurement procedure.)
c) A battery voltage indicator, and
d) Adequate measuring range to test race vehicles.

Such sound level meters shall also:

a) Conform to minimum specifications set forth in American National Standard Institute (ANSI) Standards Number S1.4-1971 for type 2 sound level meters, or
b) Shall be an Oregon Department of Environmental Quality approved sound level meter for use in measuring racing vehicles for the purpose of this rule.

Sound Level Meter Calibration.

4.3.1 Field Calibration. To assure sound measurement accuracy in the field, DEQ recommends that the measurement equipment include an acoustical calibrator which couples to the microphone. Sound meters should be field calibrated before and after, and every two hours during vehicle monitoring. Consult the sound meter's manufacturer's instruction manual for proper calibration procedures.

4.3.2 Annual Calibration. Every year the sound meter and calibrator should receive a laboratory calibration in accordance with manufacturer's specifications. This calibration should be traceable to the National Bureau of Standards.

4.4 Accessories. The following accessories are valuable in gathering sound measurements:

a) A microphone wind screen (see Section 4.5)
b) Motor Racing Record Forms (NPCS-35-1)
c) Clipboard
d) Tripod to hold the sound level meter
e) Spare batteries
f) Screwdriver for sound meter calibration
g) A tape measure
h) Ear protectors
i) A tachometer for stationary noise testing

Sound Measurement Precautions.

Wind. Wind blowing on the microphone can create additional noise in the sound meter. To minimize wind noise, a windscreen on the microphone is recommended whenever measurements are taken. The windscreen should be furnished with the meter by the manufacturer and made of open cell polyurethane foam. This type of windscreen will protect the microphone from wind, dust, accidental shocks, and moisture, while not affecting the sound measurements. Consult the sound meter instruction manual for more details.

Precipation. Water can damage microphone diaphragms. Hence, the microphone should be protected from moisture at all times. The wind screen will protect the microphone during all but the heaviest rain showers.

4.5.3 Background Sound Levels. Sounds from other vehicles or activities can affect sound level measurements made during race vehicle monitoring. To avoid this, it is recommended that the sound level of the race vehicle being measured rise at least 6 dBA before and fall at least 6 dBA after the maximum sound level occurs.

Equipment Set Up and Use.

4.6.1 Calibration. The meter should be periodically field calibrated as outlined in section 4.3.1 and following the manufacturer's instruction manual.

4.6.2 Battery Check. The batteries in the sound meter and calibrator are to be checked whenever performing field calibrations.

4.6.3 "A"-Weighting. The "A"-weighting electronic network on the meter is to be engaged and used during vehicle testing (i.e., not the "B", "C", "D", or flat networks).

4.6.4 "Fast" and "Slow". For the moving vehicle test, the fast meter response network is to be engaged and used during testing. For the stationary vehicle test, the slow meter response is to be engaged and used during testing.

4.6.5 Microphone Height. The microphone shall be placed on a tripod if an extension cable is used. If a cable is not used, the sound meter with the microphone attached may be hand held or placed on a tripod. Ideally, the microphone should be positioned 4 $\pm$ 1/2 feet (1.2 $\pm$ .15 meters) above the ground or water for the moving test and at the same height as the exhaust outlet for the stationary test. See Chapter 5 for more details.

4.6.6 Microphone Orientation. Care should be taken to correctly orient the microphone to the race vehicle. Some microphones are designed to be pointed directly at the noise source, while others are designed to be pointed perpendicular to the sound so that

the sound grazes the microphone diaphragm. Consult the sound meter instruction manual for the proper microphone orientation.

4.6.7 Personnel Location. Care should be exercised to prevent interference with sound measurements caused by personnel in the measuring area. No person should stand between the race vehicle and the sound meter. The person taking sound measurements should stand back from the microphone as much as possible and to one side of the sound path. This will minimize sound reflections off the body. Consult the manufacturer's instruction manual for more details. Bystanders should stand behind the test personnel to minimize body reflections.

4.6.8 Range Setting. Set the meter to the appropriate range to measure the anticipated sound level.

CHAPTER 5

SOUND MEASUREMENT SITES AND PROCEDURES

5.1 General. The DEQ noise regulations for motor sports facilities require all race vehicles , except for drag vehicles, to meet specific maximum allowable sound emission limits. Also the noise regulations specify the type of noise test procedures to be followed. The non-motorcycle race vehicle categories are only noise tested while moving about the race course. Open course motorcycles are tested only while stationary. Closed course motorcycles are tested either while moving or while stationary at the option of the Noise Control Steward.

For the moving vehicles noise test, the vehicle is first inspected to determine if it complies with the muffler requirements (See Chapter 3). If the muffler complies, then the vehicle can be allowed to operate on the facility for practice runs prior to the race event. During these practice runs, the Noise Control Steward shall take sound measurements to determine if the vehicle complies with the noise emission limits. If it fails the emission limits, then the vehicle shall not be allowed to operate further on the facility until the emissions are lowered. Section 5.2 describes the moving vehicle sound measurement procedures.

For the stationary vehicle test, the muffler system is first inspected for compliance with the muffler requirements. If it complies, then the vehicle is stationary noise tested, per the test procedures in Section 5.3. If the vehicle fails the muffler requirements and/or the noise emission limits, it shall not be allowed to operate on the race facility until it complies.

5.2 Moving Vehicle Sound Measurement Procedure.

5.2.1 Microphone Height. Ideally, the sound measurement area for the moving vehicle test should be flat and the microphone positioned $4 \pm 1/2$ feet ($1.2 \pm .15$ meters) above the plane of the ground or water surface. In practice, this is sometimes difficult to achieve. Figure 5-1 shows some acceptable microphone heights. In general, the NCS should maintain at least 3-1/2 feet of line-of-site clearance between the microphone and the vehicle above the surrounding ground terrain.

5.2.2 Blockage of the Sound Path. The ideal moving vehicle measurement site is shown in Figure 5-2. The ideal site is flat and is clear of objects within the area between the vehicle path and the microphone position for a distance of 100 feet (30.5 meters) in each direction along the track. Objects located within the measurement area between the vehicle and the microphone can potentially influence the sound level measurements. Any site where an object "significantly" blocks the sound path is not a legitimate test site and shall not be used for monitoring compliance with the noise standards for racing facilities.

At most moving vehicle test sites, there will be something located within the measurement area that may block sound (i.e., Armco safety barriers, hay bales, fences, bleachers, other race vehicles, trees, piles of dirt, etc.). Fortunately, not everything will "significantly" block the sound path. If the following conditions are met, then a moving vehicle test site is not "significantly" blocked and is therefore an acceptable test site:

1) In general, there must be good line-of-sight clearance between the microphone and the vehicle exhaust outlets (excluding shielding by the vehicle body) for most of the vehicle's pass by. More precisely, the line-of-sight view of exhaust outlets must be at least 80% open area during the pass by, and
2) The area immediately in front of the microphone must be clear of obstruction.

If the Noise Control Steward has any doubts about the site, then choose an alternate measurement site.

Reflective Surfaces. Objects with large flat surfaces (excluding the ground or water surface) which are basically parallel to the track and located behind the microphone or on the other side of the track, can increase the measured sound level. The ideal moving vehicle measurement site has no reflective surfaces located in an area less than 100 feet (30.5 meters) from the microphone and the microphone point (see Figure 5.2). Since an ideal site with no reflective surfaces is not always available, then the next best thing is to <u>not</u> measure at sites where reflective surfaces are less than the following distances away from the microphone or the race vehicle:

a) 10 feet (3.0 meters) for the 50 ft. (15.24 m) measurement sites, or
b) 20 feet (6.0 meters) for the 100 ft. (30.5 m) measurement sites.

50 Ft. Trackside Measurement Point. The DEQ noise regulations for racing facilities specifies a moving vehicle sound measurement position (microphone location) at "trackside." "Trackside" is defined as 50 feet (15.24 meters) from the edge race vehicle. For the purpose of this rule, this means the sound measurements shall be made 50 feet (15.24 meters) from the edge of the Driving Groove. The Driving Groove is the path that most race vehicles follow around the race course. In order to determine the driving groove, the Noise Control Steward must draw upon his knowledge of the race vehicles and the race course.

After the driving groove has been located, the NCS shall measure 50 feet (15.24 meters) from the edge and perpendicular to the driving groove. This is the position where sound measurements will be taken.

Note: It is recommended that a mark be placed at the edge of the driving groove, perpendicular to the microphone. This can be used to determine the location of each vehicle with respect to the 50 foot monitoring distance. (See

Section 5.4.2 for more details)

5.2.5 Alternate 100 ft. Trackside Measurement Point. If it is determined that a measurement at 50 ft. (15.24 meters) is unsafe or not feasible, then measurements may be taken at 100 ft. (30.5 meters) for the driving groove. If the 100 foot distance is used a 6 dBA correction shall be added to the observed sound reading or 6 dBA may be subtracted from the required maximum sound emission limits specified in the noise regulations. (The sound emission limits list in form NPCS-35-1 were adjusted.)

5.2.6 Choosing Loudest Moving Vehicle Measurement Location. Given the general test site constraints outlined in Section 5.2.1 to 5.2.5, many possible measurement locations are typically available at racing facilities. The moving vehicle standards require race vehicles not exceed a specified noise emission level under all operating conditions (acceleration, deceleration, cruising, full out, etc.). The Noise Control Steward shall therefore monitor for compliance with the moving vehicle limits at those measurement sites where the vehicle is producing its maximum noise levels.

Comment: The Noise Control Steward must measure at the noisiest site. A non-complying vehicle may pass or fail depending on the ability of the steward to choose the noisiest site. The owner of a vehicle that passes or fails due to improper measurement procedures will lose confidence in the validity and the need for the rules. In such a case, the Steward will have compromised the track, sanctioning organization, and the vehicle owner.

Generally, race vehicles produce their maximum noise levels when they are accelerating near the highest engine RPM. Determining the point of maximum sound emissions takes a knowledge of the vehicle and the race course. Even then, vehicles may need to be tested at several sites before a final test site is selected. Long, straight sections of the track tend to be noisier than the corners. Also, vehicles may be noisier on one side than the other, depending on the location of the exhaust outlet. Measurements shall be made on the noisiest side of the vehicle.

5.3 Stationary Vehicle Sound Measurement Procedure.

5.3.1 Test site. The test site should be relatively flat and free of loose or powdered snow, plowed soil, grass of height greater than 6 inches (.15 meters), brush, trees, or other extraneous material. Also the site should be free of large sound reflective surfaces (other than the ground) such as parked vehicles, sign boards, buildings, or hillsides; located within 15 ft. (4.6 meters) radius of the vehicle being tested.

5.3.2 Microphone Location. The microphone shall be located with respect to the rear most exhaust outlet on either side of the vehicle as follows:

a) 20 inches ± 1/2 in. (0.5 meters ± .01 m) from the exhaust outlet,
b) At a 45-degree angle (± 10 degree), from the axis of the outlet,
c) At the same height as the exhaust outlet, and
d) With its longitudinal axis parallel to the ground.

Figure 5-3 shows the microphone location.

Note: For microphones designed for grazing noise measurement (see Section 4.6.6), point the microphone rearward away from the engine. Further no wire or other means of distance measurement shall be attached to the microphone. This may lead to erroneous readings.

5.3.3 Vehicle Operations. The rider shall sit astride of the motorcycle in a normal riding position with both feet on the ground. The engine shall be operated at the normal operating temperatures with gear box in neutral. If no neutral is provided the motorcycle shall be operated either with the rear wheel clear of the ground, or with the drive chain or belt removed. The sound level measurement shall be made with the engine speed stabilized at one of the following values. (The preferred test procedure is listed first; the least preferred test procedure is last):

a) The engine speed shall be stabilized at 50% (1/2) of the manufacturer's recommend maximum engine speed ("Red Line RPM"), or
b) If no "Red Line RPM" is published for the vehicle, then stabilize the engine speed at 60% of the engine speed at which maximum horsepower is developed, or
c) If neither "Red Line RPM" nor maximum horsepower RPM information is available, then calculate the test RPM from the following formulae:

$$RPM = \frac{306{,}000}{\text{stroke in mm}} \quad \text{or} \quad RPM = \frac{12{,}000}{\text{stroke in inches}}$$

d) If engine test speed cannot be determined from steps a, b, and c above or if a tachometer is not available, then test the motorcycle at 1/2 of full open throttle.

Comment: During stationary noise testing, the Noise Control Steward should make certain the tachometer is accurately measuring the engine speed. Also do not allow the exhaust to impinge on the microphone.

5.4 Sound Measurements

5.4.1 Preliminary Steps. The following steps should be followed before taking sound measurements.

a) Check battery
b) Calibrate sound meter
c) Switch meter to "A" weighting scale.
d) Set meter to correct a range setting
e) Windscreen - on
f) No significant blockage of the sound path
g) No reflective surfaces
h) Test personnel located correctly behind meter
i) No significant background noises.
j) For moving vehicle sound testing:
   * Select the loudest measurement site
   * Determine the Driving Groove
   * Place the meter at 50 (or 100 ft.) from Driving Groove
   * Set meter on "Fast" response
   * Set meter at 4 ± 1/2 ft. above terrain
   * Point microphone correctly
   * Monitor the loudest side of vehicle
k) For stationary vehicle sound testing:
   * Vehicle at normal temperature and in neutral.
   * Vehicle operator in normal riding position.
   * Attach and check tachometer.
   * Determine the engine test speed.
   * Monitor the rear most exhaust outlet for each side.
   * Set the meter to "slow" response
   * Place microphone 20 inches from exhaust outlet.
   * Place microphone 45° from the axis of the outlet.
   * Place microphone at the same height as the outlet.
   * Place longitudinal axis of the microphone parallel to the ground.
   * Point the microphone correctly.
   * Monitor both sides of the vehicle.
   * Stabilize the engine at the engine test speed.

5.4.2 Moving Vehicle Measurements. The measured noise emission level for a moving race vehicle shall be the maximum sound level reading displayed on a meter position 50 or 100 feet (15.2 or 30.5 meters) from the vehicle's driving groove, taken during the vehicle's pass by. To avoid background noise from affecting the sound measurements, the sound level should ideally rise and fall at least 6 dBA from the maximum noise level. Also, the sound meter's "Fast" response should be used.

Ideally, all moving vehicles will follow the driving groove and the sound measurements will be made at the proper measurement distance. However, this may not always be the case. The following comments may be of value to minimize the time it takes for testing vehicles:

Comment: If the moving vehicle is measured on its noisiest side and under its noisiest operating conditions, then the following statements can be considered valid:

a) If the vehicle passes less than 50 (or 100) feet fom the microphone and does not exceed the noise emission limits, then it does not violate the noise limits at 50 (or 100) feet.
b) If the vehicle passes greater than 50 (or 100) feet and exceeds the emission limits, then it does violate the noise limits at 50 (or 100) feet.
c) If the vehicle passes less than 50 (or 100) feet and exceeds the emission limits, then the situation is uncertain and the vehicle shall be remeasured.
d) If the vehicle passes greater than 50 (or 100) feet and does not exceed the emission limits, then the situation is again uncertain and the vehicle shall be remeasured.

5.4.3 Stationary Vehicle Measurements. The reported noise emission level for the stationary vehicle shall be the highest sound level reading displayed on the meter during steady state operation at the proper engine speed. Sound level readings obtained during acceleration or deceleration of the engine are not included. If there are exhaust outlets on both sides of the vehicle, then readings shall be obtained on both sides and the highest reading reported as the vehicle's emission level. The sound meters "Slow" response should be used for stationary testing. Although the "Fast" response is acceptable. Further, to avoid background noise from affecting the sound measurements, the sound level should ideally rise and fall at least 6 dBA from the maximum noise level.

5.4.4 Recording Sound Level Measurements. Noise data for all race vehicles which exceed the maximum allowable noise emissions shall be recorded on form NPCS-35-1. The race facility owner shall keep such recorded noise data for a period of at least one calendar year and, upon request, shall make such data available to the Department. The owner may also submit the data to the Department for storage.

5.5 Form NPCS-35-1. Form NPCS-35-1 is used to record muffler and sound level data on all race vehicles exceeding the DEQ noise standards. Figure 5-4 shows an example of Form NPCS-35-1. Enclosed in this procedure manual is a master form of NPCS-35-1 to be photocopied and used to record race data. The following describes form NPCS-35-1 and the information to be recorded on it:

a) The name and location of the racing facility.
b) The name of the sponsoring organization, if any.
c) Name of the individual who inspected the vehicles for compliance with the noise standards.
d) Mark the type of racing event and the appropriate maximum allowable noise emission limits for the event.
e) Description of the sound level meter (make and model).

f) Location of the measurement site and distance from race vehicle.

g) A check list for use in taking sound level measurements is included on the form.

h) The description of the racing vehicle (type of vehicle, vehicle number, driver's name, etc.).

i) The maximum measured sound level expressed in dBA (decibels measured on an "A" weighted sound meter). This is at 20 inch, 50 ft., or 100 ft. depending on what type of test was performed as indicated in item d and f above. Also include with the sound level, the test RPM for the 20 inch stationary test.

j) A list of muffling systems which meet the requirements for a "Well Maintained Muffling System" is included on the form.

k) Indicate on the form whether the vehicle passed or failed the visual inspection of the muffling system (whether or not the vehicle meets the "properly installed and well maintained muffler" requirements).

l) Describe the muffler system and given the reason(s) for vehicle passing or failing the visual inspection of the muffling system. (See list of "Well Maintained Muffling Systems" included on the form.)

m) Indicate any results or actions taken on the vehicle (i.e. not allowed to race, muffler was fixed and retested, etc.).

Note: Form NPCS-35-1 is designed to provide the user with most of the important information contained in the DEQ race noise standards and procedure manual. However, this form could not contain all the information. Consult the standards and the manual if questions arise.

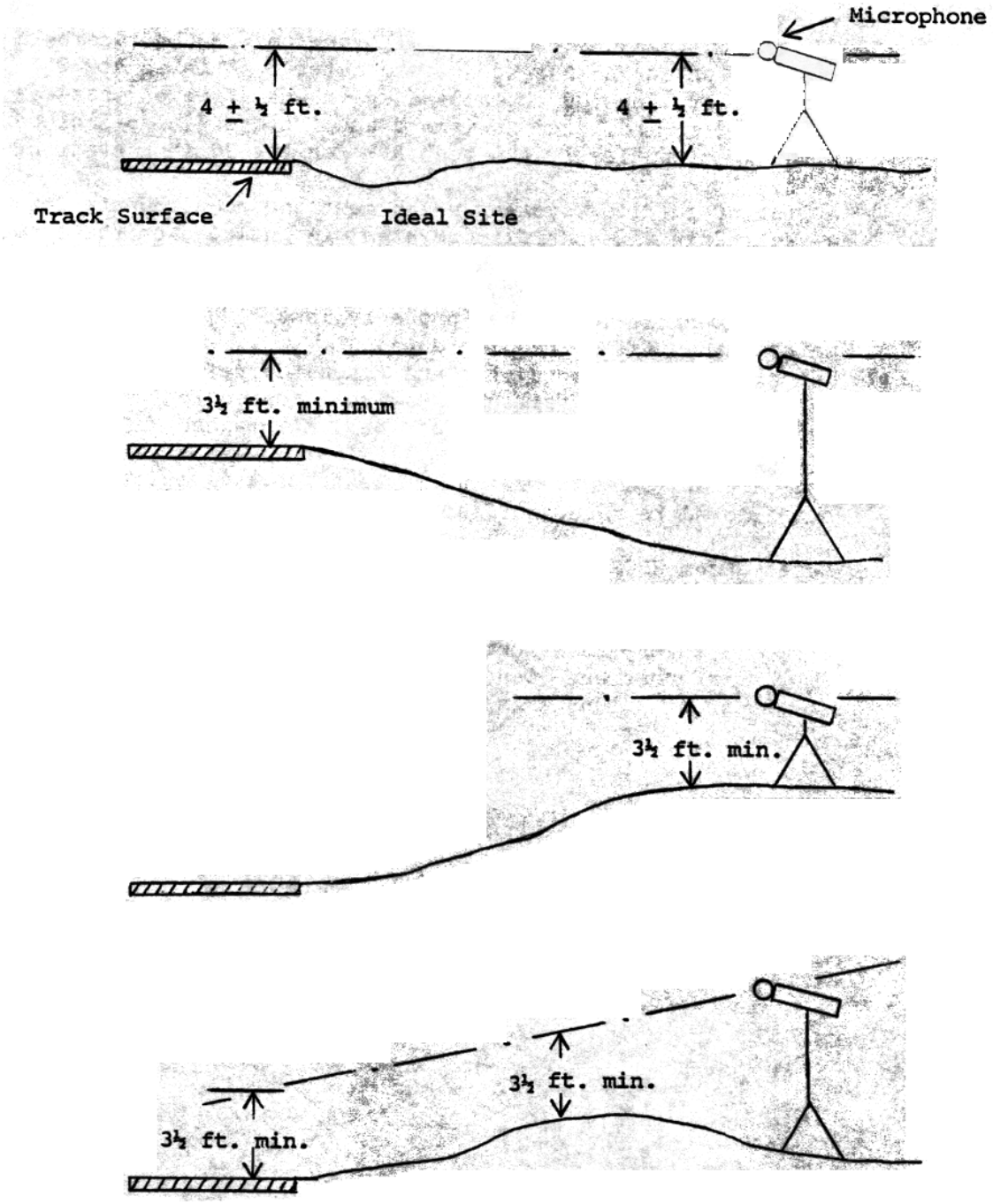


Fig. 5 - 1 Acceptable Microphone Heights

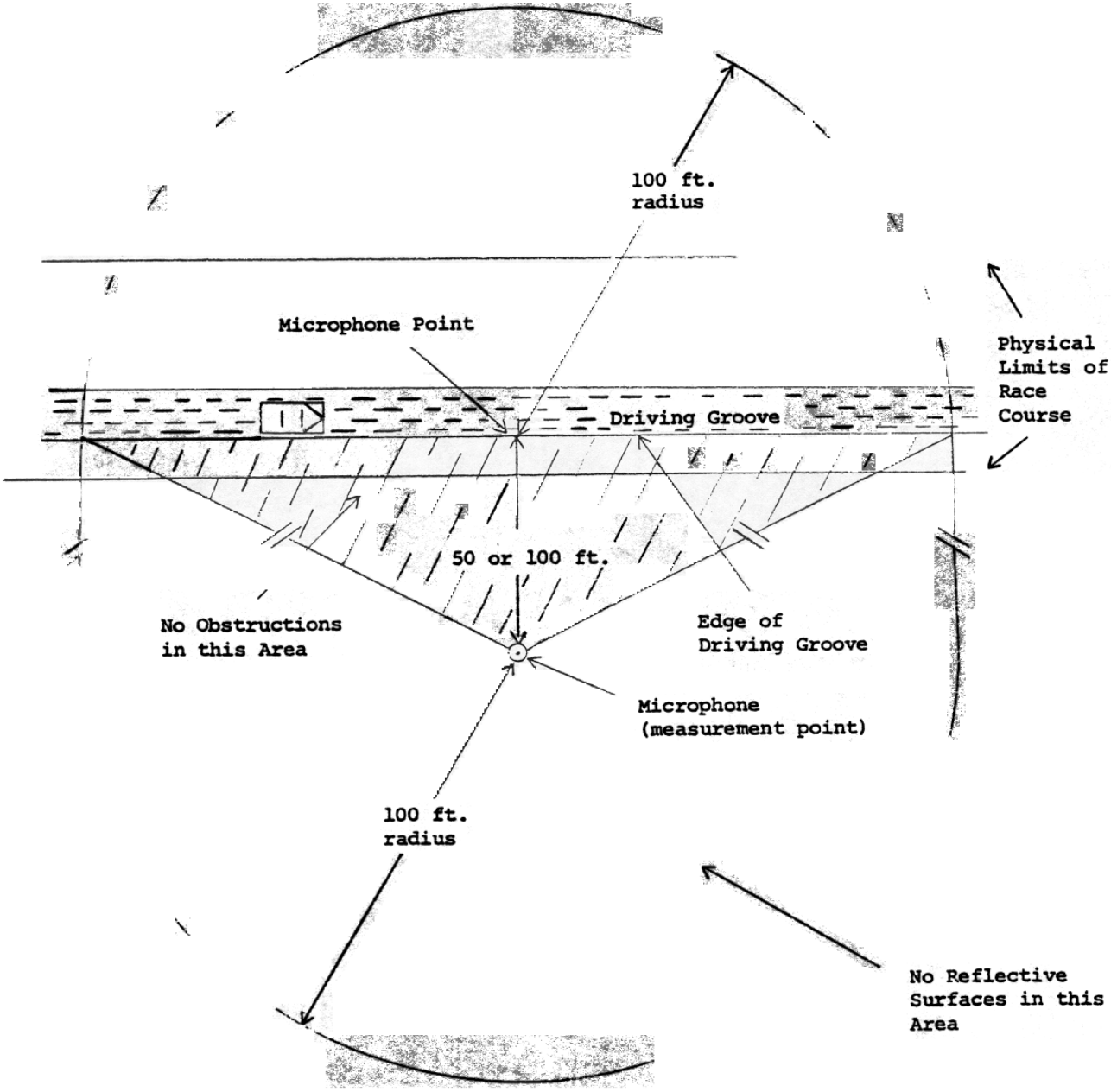
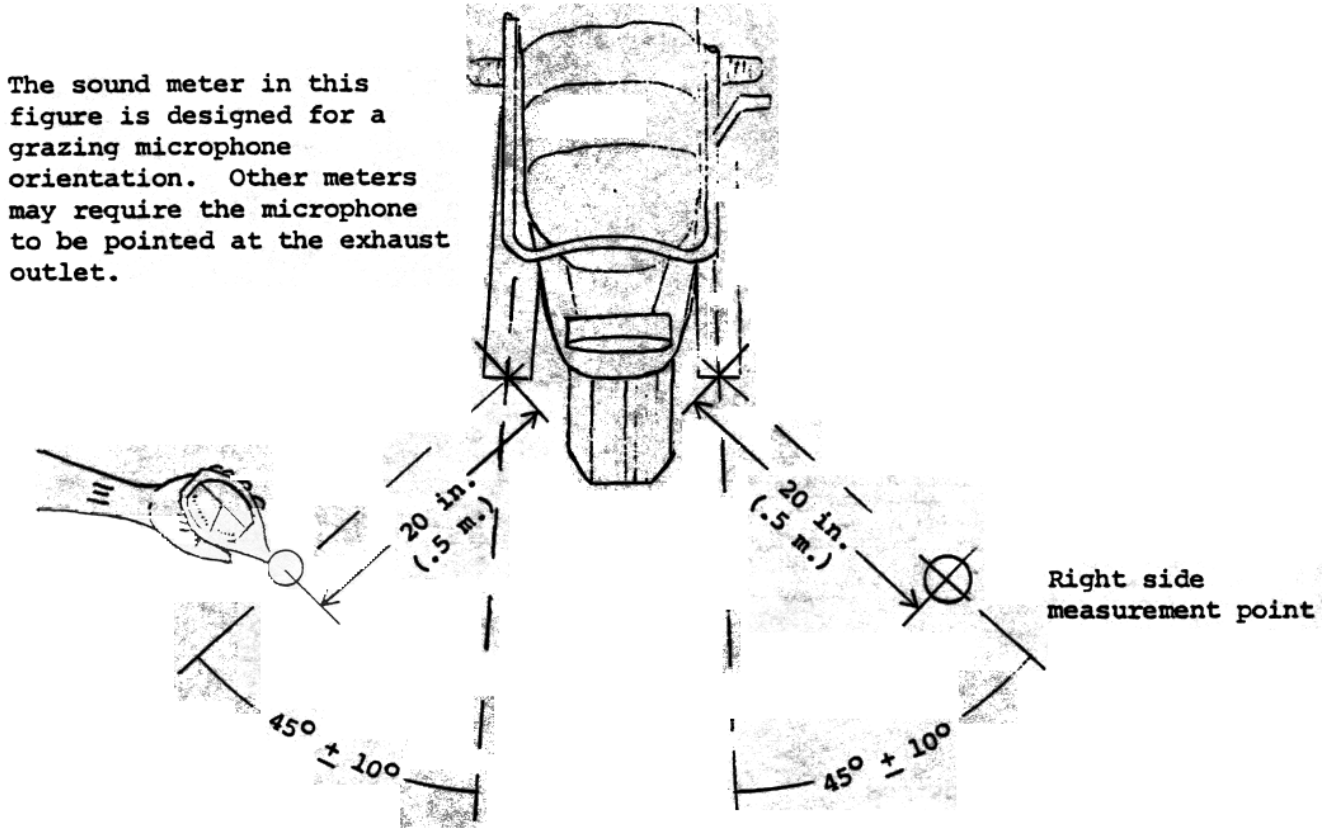
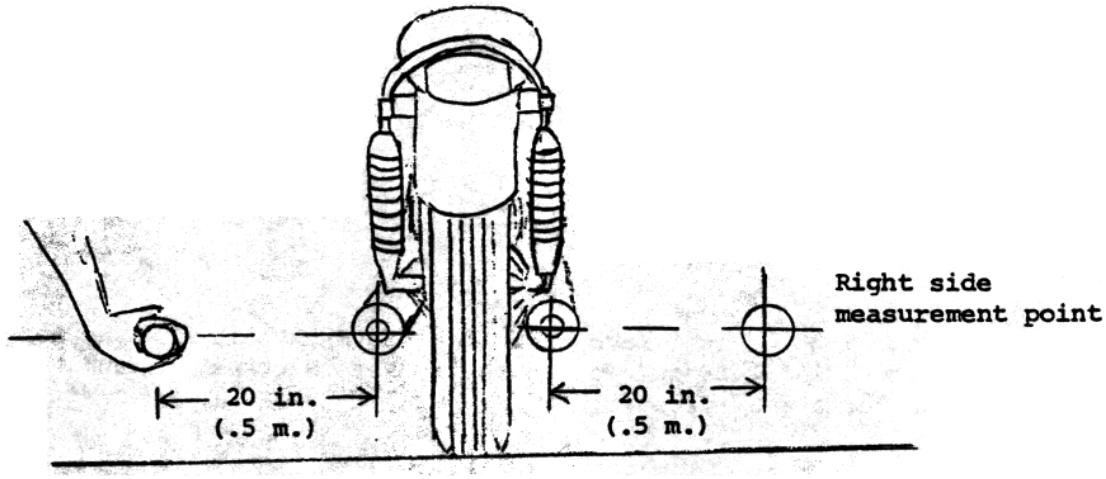


Fig. 5-2 General Layout of Ideal Moving Vehicle Sound Measurement Site (Flat Terrain, No Obstructions to Block the Sound Path, No Reflective Surfaces)

Fig. 5-3 Stationary Test Microphone Location



* Measure from rear most exhaust outlet on each side.
* For exhaust outlets on both sides, measure both.
* Report the highest reading at the test RPM.
* Do not allow exhaust to impinge on the microphone.



DEPARTMENT .VIRONMENTAL QUALITY
MOTOR SPORTS RACING RECORD FORM[1]

Racing Facility Name and Location:
Acme Race Track -- Smallville

Sponsoring Organization:
23rd St. Sports Car Club

Date: Nov. 4 1980

Inspected By: John Doe

Sound Meter Make and Model:
Gen Rad 1983

Sound Measurement Position: ☐ 20 in. ☒ 50 ft. ☐ 100 ft.
North Straight-away

Mark Type of Race and Max. Allowed Noise Emissions:

	-dBA- 20 in.	50 ft.	100 ft.
☐ Dray	-	-	-
☐ Oval	-	105	99
☒ Sports Car	-	105	99
☐ Closed Course Motorcycle	105	105	99
☐ Open Course Motorcycle	105	-	-
☐ 4-Wheel Drive	-	105	99
☐ Water Craft	-	105	99
☐ Autocross	-	90	84
☐ Go-Kart	-	105	99
☐ Other			

Sound Measurement Check List:
☒ Battery and Meter Calibration - OK
☒ "A" Weighting and Windscreen
☒ "Fast" - for Moving, "Slow" - for Stationary
☒ No Reflections or Blockage of Path
☒ Low Background Noise
— MOVING TEST —
☒ Find Loudest Site and Driving Groove
☒ 50 or 100 Ft. from Driving Groove
☒ Microphone Height and Orientation - OK
☒ Test Loud Side of Vehicle
— STATIONARY TEST —
☐ Microphone at 20 in. and 45° from Outlet
☐ Tachometer Working - OK
☐ Test at 50% of Red Line or...(see Manual)
☐ Test Both Sides at Steady State RPM

All non-Top Fuel Burning Drag[2] vehicles must have "Properly Installed and Well Maintained Muffling" system. If properly installed, the following systems meet this requirement. Also, all exhaust outlets must be muffled:

1. Reverse Flow, Baffle Muffler
2. Stacked Diffuser Disc Muffler
3. Exhaust Turbocharged System[3]
4. Muffler Approved for Go-Karts
5. Original Factory Muffler Installed on a Motorcycle
6. Underwater Exhausted Outboard Boat Motor
7. Auger Type Muffler
   a. Minimum 16" muffler for greater than 1600 cc engines, or
   b. Minimum 10" muffler for 1600 cc or less engines.
   } Drag Vehicles Only
8. Perforated Straight Core, Absorbent Lined Muffler; Not Installed on a Rotary Engine
   a. Minimum 20" muffler on any engine exceeding 1600 cc,
   b. Minimum 12" muffleron a non-motorcycle engine 1600 cc or less.
   c. Minimum 6" muffler on any 4-cycle motorcycle engine, or
   d. Minimum 0" muffler on any 2-cycle motorcycle engine.
   } Drag Vehicles Only
9. Any other DEQ approved muffling system.

(1600 cc = 96.7 cu. in)

VEHICLE DESCRIPTION	MEASURED NOISE LEVEL (dBA & RPM)	VISUAL INSPECTION OF THE MUFFLING SYSTEM: Muffler System	Describe Muffler System and Give Reason(s) for Pass/Fail (see list above)	RESULTS AND ACTIONS
J. Smith #19	109	☒ Pass ☐ Fail	Diffuser Disc Muffler	Took some discs out of Muffler; Passed at 102 dBA
Jones #3	—	☐ Pass ☒ Fail	No Muffler; Straight Pipes	Not allowed on track
Brown #12 (Rotary Engine)	—	☐ Pass ☒ Fail	Straight Core muffler on a Rotary Engine Car	Said he would fix it.
Wilson #5 (1400 cc Engine)	111	☒ Pass ☐ Fail	Dual exhaust, 14-inch glass packs on each side	Not allowed to race
Roberts #10 (1200 cc motorcycle engine)	115	☒ Pass ☐ Fail	Stock Motorcycle Mufflers	Not allowed to race
Brown #12 (See above)	97	☒ Pass ☐ Fail	Stock baffled mufflers	Allow
Mc Kay #2	101	☒ Pass ☐ Fail	[illegible]	Just interested when it passed.

(1) Only those race vehicles failing to comply with the "properly installed and well maintained muffler" requirements and/or the maximum allowable noise emission requirements, are required to be recorded on this form.

(2) Top Fuel Burning Drag vehicles are powered by greater than 50% alcohol or by nitromethane and are commonly known as top fuel or funny cars. These vehicles are not required to have a muffler.

(3) An Exhaust Turbocharged system is considered a "well maintained muffling" system.

Fig. 5 - 4

Example of Form NPCS-35-1

DEPARTMENT OF ENVIRONMENTAL QUALITY
MOTOR SPORTS RACING RECORD FORM[1]

Date: | Inspected By:

Racing Facility Name and Location:

Sound Meter Make and Model:

Sponsoring Organization:

Sound Measurement Position: ☐ 20 in. ☐ 50 ft. ☐ 100 ft.

Mark Type of Race and Max. Allowed Noise Emissions:

	-dBA- 20 in.	50 ft.	100 ft.
☐ Drag	-	-	-
☐ Oval	-	105	99
☐ Sports Car	-	105	99
☐ Closed Course Motorcycle	105	105	99
☐ Open Course Motorcycle	105	-	-
☐ 4-Wheel Drive	-	105	99
☐ Water Craft	-	105	99
☐ Autocross	-	90	84
☐ Go-Kart	-	105	99
☐ Other			

Sound Measurement Check List:
- ☐ Battery and Meter Calibration - OK
- ☐ "A" Weighting and Windscreen
- ☐ "Fast" - for Moving, "Slow" - for Stationary
- ☐ No Reflections or Blockage of Path
- ☐ Low Background Noise
- — MOVING TEST —
- ☐ Find Loudest Site and Driving Groove
- ☐ 50 or 100 Ft. from Driving Groove
- ☐ Microphone Height and Orientation - OK
- ☐ Test Loud Side of Vehicle
- — STATIONARY TEST —
- ☐ Microphone at 20 in. and 45° from Outlet
- ☐ Tachometer Working - OK
- ☐ Test at 50% of Red Line or...(see Manual)
- ☐ Test Both Sides at Steady State RPM

All non-Top Fuel Burning Drag[2] vehicles must have a "Properly Installed and Well Maintained Muffling" system. If properly installed, the following systems meet this requirement. Also, all exhaust outlets must be muffled:

1. Reverse Flow, Baffle Muffler
2. Stacked Diffuser Disc Muffler
3. Exhaust Turbocharged System[3]
4. Muffler Approved for Go-Karts
5. Original Factory Muffler Installed on a Motorcycle
6. Underwater Exhausted Outboard Boat Motor
7. Auger Type Muffler
   a. Minimum 16" muffler for greater than 1600 cc engines, or } Drag Vehicles Only
   b. Minimum 10" muffler for 1600 cc or less engines.
8. Perforated Straight Core, Absorbent Lined Muffler; Not Installed on a Rotary Engine
   a. Minimum 20" muffler on any engine exceeding 1600 cc, } Drag Vehicles Only
   b. Minimum 12" muffler on a non-motorcycle engine 1600 cc or less,
   c. Minimum 6" muffler on any 4-cycle motorcycle engine, or
   d. Minimum 8" muffler on any 2-cycle motorcycle engine.
9. Any other DEQ approved muffling system.

(1600 cc = 96.7 cu. in)

VEHICLE DESCRIPTION	MEASURED NOISE LEVEL (dBA & RPM)	VISUAL INSPECTION OF THE MUFFLING SYSTEM: Muffler System	Describe Muffler System and Give Reason(s) for Pass/Fail (see list above)	RESULTS AND ACTIONS
		☐ Pass ☐ Fail		
		☐ Pass ☐ Fail		
		☐ Pass ☐ Fail		
		☐ Pass ☐ Fail		
		☐ Pass ☐ Fail		
		☐ Pass ☐ Fail		
		☐ Pass ☐ Fail		

(1) Only those race vehicles failing to comply with the "properly installed and well maintained muffler" requirements and/or the maximum allowable noise emission requirements, are required to be recorded on this form.

(2) Top Fuel Burning Drag vehicles are powered by greater than 50% alcohol or by nitromethane and are commonly known as or funny cars. These vehicles are not required to have a muffler.

(3) considered a "well maintained muffling" system

CHAPTER 6

NOISE IMPACT BOUNDARIES

6.1 General. Prior to the construction or operation of any permanent new motor sports facility, the owner shall submit for Department approval the projected daily Noise Impact Boundaries for the facility representing an estimate of maximum projected use. The data and analysis used for determining the boundary shall also be submitted for Department evaluation. The Noise Impact Boundary is a map of the area around the facility with the maximum daily operation Ldn - 55 dBA noise contour drawn on it. The information needed by the Department to evaluate the project are such things as:

a) Maps giving the physical layout of the facility; the terrain of the land around the facility; the location and type of noise sensitive property nearby; and the local land use zoning.
b) Data about the type of events and vehicles using the facility including the days and hours of operation.
c) Information about practice sessions.
d) Information about recreation use at the facility.
e) Information on how the impact contours were predicted.
f) Information on the facility's public address system.

The facility owner should coordinate the development of the Noise Impact Boundaries for new facilities with the DEQ Noise Control Section.

NPCS35

AMEND: 340-035-0045

RULE TITLE: Noise Control Regulations for Airports

NOTICE FILED DATE: 04/13/2016

RULE SUMMARY: Existing tables and publications included in the rule.

RULE TEXT:

(1) Statement of Purpose:

(a) The Commission finds that noise pollution caused by Oregon airports threatens the public health and welfare of citizens residing in the vicinity of airports. To mitigate airport noise impacts a coordinated statewide program is desirable to ensure that effective Airport Noise Abatement Programs are developed and implemented where needed. An abatement program includes measures to prevent the creation of new noise impacts or the expansion of existing noise impacts to the extent necessary and practicable. Each abatement program will primarily focus on airport operational measures to prevent increased, and to lessen existing, noise levels. The program will also analyze the effects of aircraft noise emission regulations and land use controls;

(b) The principal goal of an airport proprietor who may be required to develop an Airport Noise Abatement program under this rule should be to reduce noise impacts caused by aircraft operations, and to address in an appropriate manner the conflicts which occur within the higher noise contours;

(c) The Airport Noise Criterion is established to define a perimeter for study and for noise sensitive use planning purposes. It is recognized that some or many means of addressing aircraft/airport noise at the Airport Noise Criterion Level may be beyond the control of the airport proprietor. It is therefore necessary that abatement programs be developed, whenever possible, with the cooperation of federal, state and local governments to ensure that all potential noise abatement measures are fully evaluated;

(d) This rule is designed to encourage the airport proprietor, aircraft operator, and government at all levels to cooperate to prevent and diminish noise and its impacts. These ends may be accomplished by encouraging compatible land uses and controlling and reducing the airport/aircraft noise impacts on communities in the vicinity of airports to acceptable levels.

(2) Airport Noise Criterion. The criterion for airport noise is an Annual Average Day-Night Airport Noise Level of 55 dBA. The Airport Noise Criterion is not designed to be a standard for imposing liability or any other legal obligation except as specifically designated within this section.

(3) Airport Noise Impact Boundary:

(a) Air Carrier Airports. Within 12 months of designation, the proprietor of any Air Carrier Airport shall submit for Department approval, the existing airport Noise Impact Boundary. The data and analysis used to determine the boundary shall also be submitted to the Department for evaluation;

(b) Existing Non-Air Carrier Airports. After an unsuccessful effort to resolve a noise problem pursuant to section (5) of this rule, the Director may require the proprietor of any existing non-air carrier airport to submit for Department approval, all information reasonably necessary for the calculation of the existing airport Noise Impact Boundary. This information is specified in the Department's Airport Noise Control Procedure Manual (NPCS-37), as approved by the Commission. The proprietor shall submit the required information within twelve months of receipt of the Director's written notification;

(c) New Airports. Prior to the construction or operation and any required local government land-use approval of any New Airport, the proprietor shall submit for Department approval the projected airport Noise Impact Boundary for the first full calendar year of operation. The data and analysis used to determine the boundary shall also be submitted to the Department for evaluation. The Department shall notify the appropriate local planning unit of the results of their evaluation;

(d) Airport Master Planning. Any airport proprietor who obtains funding to develop an airport Master Plan shall submit for Department approval an existing noise impact boundary and projected noise impact boundaries at five, ten, and twenty years into the future. The data and analysis used to determine the boundaries shall also be submitted to the

Department for evaluation;
(e) Impact Boundary Approval. Within 60 days of the receipt of a completed airport noise impact boundary, the Department shall either consider the boundary approved or provide written notification to the airport proprietor of deficiencies in the analysis.
(4) Airport Noise Abatement Program and Methodology:
(a) Abatement Program. The proprietor of an existing or new airport whose airport Noise Impact Boundary includes Noise Sensitive Property, or may include Noise Sensitive Property, shall submit a proposed Airport Noise Abatement Program for Commission approval within 12 months of notification, in writing, by the Director. The Director shall give such notification when the Commission has reasonable cause to believe that an abatement program is necessary to protect the health, safety or welfare of the public following a public informational hearing on the question of such necessity. Reasonable cause shall be based upon a determination that:
(A) Present or planned airport operations cause or may cause noise impacts that interfere with noise sensitive use activities such as communication and sleep to the extent that the public health, safety or welfare is threatened;
(B) These noise impacts will occur on property presently used for noise sensitive purposes, or where noise sensitive use is permitted by zone or comprehensive plan; and
(C) It appears likely that a feasible noise abatement program may be developed.
(b) Program Elements. An Airport Noise Abatement Program shall consist of all of the following elements, but if it is determined by the Department that any element will not aid the development of the program, it may be excluded:
(A) Maps of the airport and its environs, and supplemental information, providing:
(i) Projected airport noise contours from the Noise Impact Boundary to the airport property line in 5 dBA increments under current year of operations and at periods of five, ten, and twenty years into the future with proposed operational noise control measures designated in paragraph (4)(b)(B);
(ii) All existing Noise Sensitive Property within the airport Noise Impact Boundary;
(iii) Present zoning and comprehensive land use plan permitted uses and related policies;
(iv) Physical layout of the airport including the size and location of the runways, taxiways, maintenance and parking areas;
(v) Location of present and proposed future flight tracks;
(vi) Number of aircraft flight operations used in the calculation of the airport noise levels. This information shall be characterized by flight track, aircraft type, flight operation, number of daytime and nighttime operations, and takeoff weight of commercial jet transports.
(B) An airport operational plan designed to reduce airport noise impacts at Noise Sensitive Property to the Airport Noise Criterion to the greatest extent practicable. The plan shall include an evaluation of the appropriateness and effectiveness of the following noise abatement operations by estimating potential reductions in the airport Noise Impact Boundary and numbers of Noise Sensitive Properties impacted within the boundary, incorporating such options to the fullest extent practicable into any proposed Airport Noise Abatement Program:
(i) Takeoff and landing noise abatement procedures such as thrust reduction or maximum climb on takeoff;
(ii) Preferential and priority runway use systems;
(iii) Modification in approach and departure flight tracks;
(iv) Rotational runway use systems;
(v) Higher glide slope angles and glide slope intercept altitudes on approach;
(vi) Dispaced runway thresholds;
(vii) Limitations on the operation of a particular type or class of aircraft, based upon aircraft noise emission characteristics;
(viii) Limitations on operations at certain hours of the day;
(ix) Limitations on the number of operations per day or year;
(x) Establishment of landing fees based on aircraft noise emission characteristics or time of day;
(xi) Rescheduling of operations by aircraft type or time of day;

(xii) Shifting operations to neighboring airports;
(xiii) Location of engine run-up areas;
(xiv) Times when engine run-up for maintenance can be done;
(xv) Acquisition of noise suppressing equipment and construction of physical barriers for the purpose of reducing aircraft noise impact;
(xvi) Development of new runways or extended runways that would shift noise away from populated areas or reduce the noise impact within the Airport Noise Impact Boundary.
(C) A proposed land use and development control plan, and evidence of good faith efforts by the proprietor to obtain its approval, to protect the area within the airport Noise Impact Boundary from encroachment by non-compatible noise sensitive uses and to resolve conflicts with existing unprotected noise sensitive uses within the boundary. The Plan is not intended to be a community-wide comprehensive plan; it should be airport-specific, and should be of a scope appropriate to the size of the airport facility and the nature of the land uses in the immediate area. Affected local governments shall have an opportunity to participate in the development of the plan, and any written comments offered by an affected local government shall be made available to the Commission. The Department shall review the comprehensive land use plan of the affected local governments to ensure that reasonable policies have been adopted recognizing the local government's responsibility to support the proprietor's efforts to protect the public from excessive airport noise. The plan may include, but not be limited to, the following actions within the specified noise impact zones:
(i) Changes in land use through non-noise sensitive zoning and revision of comprehensive plans, within the Noise Impact Boundary (55 dBA);
(ii) Influencing land use through the programing of public improvement projects within the Noise Impact Boundary (55 dBA);
(iii) Purchase assurance programs within the 65 dBA boundary;
(iv) Voluntary relocation programs within the 65 dBA boundary;
(v) Soundproofing programs within the 65 dBA boundary, or within the Noise Impact Boundary (55 dBA) if the governmental entity with land use planning responsibility desires, and will play a major role in implementation.
(vi) Purchase of land for airport use within the 65 dBA boundary;
(vii) Purchase of land for airport related uses within the 65 dBA boundary;
(viii) Purchase of land for non-noise sensitive public use within the Noise Impact Boundary (55 dBA);
(ix) Purchase of land for resale for airport noise compatible purposes within the 65 dBA boundary;
(x) Noise impact disclosure to purchaser within the Noise Impact Boundary (55 dBA);
(xi) Modifications to Uniform State Building Code for areas of airport noise impact within the Noise Impact Boundary (55 dBA).
(c) Federal Aviation Administration Concurrence. The proprietor shall use good faith efforts to obtain concurrence or approval for any portions of the proposed Airport Noise Abatement Program for which the airport proprietor believes that Federal Aviation Administration concurrence or approval is required. Documentation of each such effort and a written statement from FAA containing its response shall be made available to the Commission;
(d) Commission Approval. Not later than twelve months after notification by the Director pursuant to subsection (4)(a) of this rule, the proprietor shall submit a proposed Airport Noise Abatement Program to the Commission for approval. Upon approval, the abatement program shall have the force and effect of an order of the Commission. The Commission may direct the Department to distribute copies of the approved abatement program to interested federal, state and local governments, and to other interested persons, and may direct the Department to undertake such monitoring or compliance assurance work as the Commission deems necessary to ensure compliance with the terms of its order. The Commission shall base its approval or disapproval of a proposed Noise Abatement Program upon:
(A) The completeness of the information provided;
(B) The comprehensiveness and reasonableness of the proprietor's evaluation of the operational plan elements listed under paragraph (4)(b)(B) of this rule;

(C) The presence of an implementation scheme for the operational plan elements, to the extent feasible;
(D) The comprehensiveness and reasonableness of the proprietor's evaluation of land use and development plan elements listed under paragraph (4)(b)(C) of this rule;
(E) Evidence of good faith efforts to adopt the land use and development plan, or obtain its adoption by the responsible governmental body, to the extent feasible;
(F) The nature and magnitude of existing and potential noise impacts;
(G) Testimony of interested and affected persons; and
(H) Any other relevant factors.
(e) Program Renewal. No later than six months prior to the end of a five-year period following the Commission's approval, each current airport Noise Abatement Program shall be reviewed and revised by the proprietor, as necessary, and submitted to the Commission for consideration for renewal.
(f) Program Revisions. If the Director determines that circumstances warrant a program revision prior to the scheduled five year review, the Airport Proprietor shall submit to the Commission a revised program within 12 months of written notification by the Director. The Director shall make such determination based upon an expansion of airport capacity, increase in use, change in the types or mix of various aircraft utilizing the airport, or changes in land use and development in the impact area that were unforeseen in earlier abatement plans. Any program revision is subject to all requirements of this rule.
(5) Consultation. The Director shall consult with the airport proprietor, members of the public, the Oregon Departments of Transportation, Land Conservation and Development and any affected local government in an effort to resolve informally a noise problem prior to issuing a notification under subsections (3)(b), (4)(a) and (4)(f) of this rule.
(6) Noise Sensitive Use Deviations. The airport noise criterion is designed to provide adequate protection of noise sensitive uses based upon out-of-doors airport noise levels. Certain noise sensitive use classes may be acceptable within the airport Noise Impact Boundary if all measures necessary to protect interior activities are taken.
(7) Airport Noise Monitoring. The Department may request certification of the airport Noise Impact Boundary by actual noise monitoring, where it is deemed necessary to approve the boundary pursuant to subsection (3)(e) of this rule.
(8) Exceptions. Upon written request from the Airport Proprietor, the Department may authorize exceptions to this rule, pursuant to OAR 340-035-0010, for:
(a) Unusual or infrequent events;
(b) Noise sensitive property owned or controlled by the airport;
(c) Noise sensitive property located on land zoned exclusively for industrial or commercial use.
[Ed. Note: You can view a PDF of publications by clicking on this link]

STATUTORY/OTHER AUTHORITY: ORS 467

STATUTES/OTHER IMPLEMENTED: ORS 467.030

Airport Noise Control Procedure Manual

NPCS - 37

Approved November 1979

State of Oregon
Department of
Environmental
Quality

TABLE OF CONTENTS

CHAPTER 1

INTRODUCTION

Policy

1.1.1 This manual contains the procedural information required for compliance with OAR 340-35-045, Noise Control Regulations for Airports.

1.1.2 Chapter 2 describes the information required by the Department for calculating a Noise Impact Boundary for non air carrier airports. The chapter identifies the amount and nature of information that will normally be needed by the Department for making accurate calculations. In unusual circumstances additional information may be required. It is the Department's policy to perform the Noise Impact Boundary calculations to avoid placing an onerous burden upon smaller airport facilities or proprietors, and any additional information will be requested with cognizance of this policy.

1.2 Authority

.2.1 This procedure manual is to be used pursuant to ORS chapter 467 and OAR 340-35-045.

CHAPTER 2

AIRPORT NOISE CONTOURS

2. Scope. This Chapter describes the information needed by the Department for calculating an airport noise impact boundary pursuant to OAR 340-35-045(3)(b). The Chapter applies to general aviation airports that have the following characteristics:

1. Primarily used by small single and twin engine propeller aircraft;

2. May have small numbers of business jets using the airport;

3. May have occasional large propeller or jet aircraft operating at the airport;

4. No helicopter or military aircraft activity.

2.1.1 For complex airport situations that differ from the above description, it may be necessary to use alternate programs to predict airport noise levels. The information needed for these programs may be in addition to the information discussed in this Chapter.

Definition of Terms.

2.2.1 Day Time Hours - 7 am to 10 pm local time.

Flight Operation - A takeoff or landing.

2.2.3 Flight Track - An aircraft flight pattern projected onto the ground. A runway may have one or more flight tracks which may vary with the type of aircraft.

2.2.4 Night Time Hours - 10 pm to 7 am local time.

2.2.5 Runway Landing Threshold - The first point on the runway available or suitable for landings. For most runways the landing threshold coincides with the physical beginning of the runway.

2.2.6 Start of Takeoff Roll - The point on the runway from which an aircraft starts its departure down the runway for takeoff, sometimes called the brake release point.

2.3 Maps. Airport maps containing the following information are needed:

2.3.1 The physical layout of the airport including the lengths of the runways and location of taxi-ways, maintenance and parking areas. Maps should be accurately scaled.

2.3.2 The location of all Start of Take Off Roll points and Runway Landing Thresholds.

Terrain contours for all major features (i.e., mountains, hills, canyons) within 1 mile radius of ends of runways.

Location of al flight tracks.

2.3.5 Location and type of all noise sensitive properties within 1 mile radius of ends of runways.

2.3.6 Location and type of land use zones within 1 mile radius of ends of runways.

Flight Operational Data. **The number of existing flight operations averaged on a yearly basis shall be provided, broken down by the following characteristics:**

2.4.1 Flight track;

Aircraft type;

2.4.3 Type of flight operation;

2.4.4 The average number of daytime operations per day;

2.4.5 The average number of nighttime operations per day.

Special Information. Depending on the complexity of the airport, additional special information may be needed, such as:

2.5.1 For take off of large commercial jet transports, the average distance to next aircraft fuel stop (this will relate to take off weight);

2.5.2 Description of special take off or landing procedures;

The ratio of turbo jet to turbo fan business jets.

Sources of Information. The following sources of information may help in locating the needed airport data:

2.6. Maps:

a. FAA Form 5010 or replacement "FAA Airport Master Record".

b. Instrument approach procedures published by National Ocean Survey C 44, Riverdale, MD 20840, and by Jeppesen and Company, 8025 E. 40th Ave., Denver, Colorado 80207.

c. U.S. Coast and Geodetic Survey Maps.

2.6.2 Flight Tracks (For the typical light aircraft flight pattern see the FAA model.)

2.6.3. Aircraft Operations:

a. FAA tower records;

b. "Official Airline Guide" published by Reubin H. Donnelly Corp., 2000 Clearwater Drive, Oak Brook, Illinois 60521.