

**INFORMATION TO BE SUBMITTED FOR
APPROVAL OF STATIONARY SOURCES
OF SOUND**

PUBLICATION NPC-233

OCTOBER 1995



**Ministry
of the
Environment**

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Information to be Submitted for Approval of Stationary Sources of Sound Publication NPC-233

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This Publication supplements the Guide to Applying for Approval (Air): Noise and Vibration and specifies information that is to be submitted for approval and/or audit of stationary noise or vibration sources. It replaces Publication NPC-133 "Guidelines on Information Required for the Assessment of Planned Stationary Sources of Sound" of the "Model Municipal Noise Control By-Law, Final Report, August 1978".

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1. SCOPE

This Publication is a comprehensive document that specifies technical information to be submitted for approval to operate sources of sound and vibration. It has been developed in order to provide consistency in the submissions and to streamline the review and approval process. The specified information is required for the assessment of sound and vibration impact, in compliance with the provisions of Section 9 of the Environmental Protection Act. The requirements apply to new sources as well as expansion, alteration or conversion of existing sources. Publication NPC-233 does not specify sound and vibration limits; however, proponents are required to demonstrate compliance with the sound and vibration limits, contained in other Publications, References 5, 9 and 11.

Publication NPC-233 also specifies the information to be included in acoustic and vibration audit reports that may be required as part of the approval process.

2. REFERENCES

Reference is made to the following publications:

- [1] NPC-101 - Technical Definitions
- [2] NPC-102 - Instrumentation
- [3] NPC-103 - Procedures

- [4] NPC-104 - Sound Level Adjustments
- [5] NPC-205 - Sound Level Limits for Stationary Sources in Class 1 & 2 Areas (Urban)
- [6] NPC-206 - Sound Levels due to Road Traffic
- [9] NPC-232 - Sound Level Limits for Stationary Sources in Class 3 Areas (Rural)
- [11] NPC-207 - Impulse Vibration in Residential Buildings (draft)
- [12] ORNAMENT, Ontario Road Noise Analysis Method for Environment and Transportation, Technical Document, Ontario Ministry of the Environment, ISBN 0-7729-6376, 1989

References 1 to 4 can be found in the
Model Municipal Noise Control By-Law, Ontario Ministry of the Environment, Final Report, August 1978.

3. TECHNICAL DEFINITIONS

"Ambient sound level"
means Background sound level.

"Background sound level"
is the sound level that is present in the environment, produced by noise sources other than the source under impact assessment. Highly intrusive short duration noise caused by a source such as an aircraft fly-over or a train pass-by is excluded from the determination of the background sound level.

"Class 1 Area"
means an area with an acoustical environment typical of a major population centre, where the background sound level is dominated by the urban hum.

"Class 2 Area"
means an area with an acoustical environment that has qualities representative of both Class 1 and Class 3 Areas, and in which a low background sound level, normally occurring only between 23:00 and 07:00 hours in Class 1 Areas, will typically be realized as early as 19:00 hours.

Other characteristics which may indicate the presence of a Class 2 Area include:

- absence of urban hum between 19:00 and 23:00 hours;
- evening background sound level defined by natural environment and infrequent human activity; and
- no clearly audible sound from stationary sources other than from those under impact assessment.

"Class 3 Area"
means a rural area with an acoustical environment that is dominated by natural sounds having little or no road traffic, such as the following:

- a small community with less than 1000 population;
- agricultural area;
- a rural recreational area such as a cottage or a resort area; or
- a wilderness area.

"Point of Reception"

"Point of reception" means any point on the premises of a person where sound or vibration originating from other than those premises is received.

For the purpose of approval of new sources, including verifying compliance with Section 9 of the Environmental Protection Act, the point of reception may be located on any of the following existing or zoned for future use premises: permanent or seasonal residences, hotels/motels, nursing/retirement homes, rental residences, hospitals, camp grounds, and noise sensitive buildings such as schools and places of worship.

For equipment/facilities proposed on premises such as nursing/retirement homes, rental residences, hospitals, and schools, the point of reception may be located on the same premises.

"Urban Hum"

means aggregate sound of many unidentifiable, mostly road traffic related noise sources.

Other technical terms are defined in Reference 1.

4. MEASUREMENT AND CALCULATION PROCEDURES

References 3 and 9 contain the applicable measurement procedures. References 6 and 12 contain the required road traffic noise measurement and calculation procedures. Reference 11 contains the applicable procedure for the measurement of impulse vibration.

5. LIMITS

The applicable sound level limits are contained in References 5 and 9. Reference 11 contains the applicable limits for impulse vibration. Continuous vibration is assessed using state-of-the-art criteria.

6. INFORMATION TO BE PROVIDED

The following sections detail the required information. For simple noise sources, the mandatory information specified in Section [7] is usually sufficient. For complex or multiple noise sources, the mandatory information must be supplemented by acoustical information contained in Section [8]. The information for the complex and multiple noise sources should be submitted in the form of an acoustical report prepared by a qualified acoustical consultant.

Section [9] details the required information for vibration sources. In the majority of cases, vibration information should be submitted in the form of a report prepared by a qualified vibration consultant.

7. MANDATORY INFORMATION

The mandatory information, that must be supplied in all cases, is expected to describe the basic physical and operational characteristics of the noise/vibration source, as well as its relationship to the closest points of reception. The purpose of this information is to allow the determination of the potential noise or vibration impact.

The mandatory information should consist of data such as the description of the equipment/facility and operation, operating hours, land use zoning designation of the surrounding area, area location plan, location and distance to points of reception, relevant architectural and mechanical drawings and details of any noise and vibration control measures.

Details of mandatory information requirements are contained in the Guide to Applying for Approval (Air): Noise and Vibration¹.

8. ACOUSTICAL REPORTS

The following list contains items that should be included in acoustical reports, in addition to the mandatory information:

(1) Source

The following information relating to the source or combination of sources is required:

- Time varying characteristics of generated sound (steady or intermittent);
- Tonal characteristics;
- Impulsive characteristics;
- Directivity pattern of proposed source;
- Measurement techniques and equipment used for evaluation of source emission;
- Octave or 1/3 octave sound power levels for the sources where available; or
- Octave or 1/3 octave sound pressure levels generated by the sources including measurement conditions, procedure and location of measurement points.

(2) Receptor

The following information is required at critical points of reception:

- One Hour Equivalent Sound Level (L_{eq}) of the source. For multiple sources or sources generating intermittent or time-varying sound, the hourly L_{eq} over a minimum period of 24 hours or for the operating cycle of the source, whichever is shorter, should be provided;
- Logarithmic Mean Impulse Sound Level (L_{LM}) of the source, if applicable;
- Prevailing meteorological conditions such as wind direction and speed, temperature inversion, etc.;
- For a location in a Class 3 Area, the existing One Hour Ninetieth Percentile Sound Level (L_{90}) of the background sound level at points of reception, obtained through monitoring over a minimum period of 48 hours. The monitoring should be conducted during times when the background sound level is at its lowest level. The lowest hourly L_{90} value should be selected to represent the background sound level;
- For all Areas, the existing One Hour Equivalent Sound Level (L_{eq}) of the background sound level obtained either by prediction or through monitoring over a minimum period of 48 hours. The monitoring should be conducted during times when the background sound level is at its lowest level. The lowest hourly L_{eq} value should be selected to represent the background sound level;
- Sound level using other specialized descriptors.

(3) Mitigation Measures

The following information is required when noise mitigation measures are used:

- Where sound sources are silenced, enclosed or shielded by barriers, the location, dimensions, structural details and material used;
- The specification of abatement equipment and materials such as, transmission loss, insertion loss and noise reduction;
- If the devices are standard catalogue items, indication of the manufacturer's make and model number;
- If alternative measures for noise abatement are proposed, a full description of the alternatives, administrative steps, changes in operational procedure or structural alterations, should be provided.

¹ Guide to Applying for Approval (Air): Noise and Vibration, Ministry of Environment and Energy, 1995

(4) Acoustic Mapping

Proposals for large manufacturing and/or process plants or industrial complexes where a multitude of sources exist require acoustical reports containing elaborate analysis of the noise impact. The impact reports should include sound level mapping in addition to the information specified in Section [6].

The sound level mapping should include the existing level of road traffic in the vicinity of the proposed installation and the increase in such traffic due to the plant's operation, projected for a period of at least ten years into the future.

(5) Calculations

All necessary supporting calculations.

9. VIBRATION REPORTS

The following list contains items that should be included in vibration reports, in addition to the mandatory information:

(1) Source

The following information relating to the source or combination of sources is required:

- Relevant specification of the proposed vibration source(s) including type, model number, weight and weight distribution, dimensions relative to centre of gravity and number of mounting points;
- Operating characteristics of the source(s) such as RPM or strokes per minute;
- Type and description of surface upon which the source(s) is to be mounted;
- Sub-soil conditions, if known.

(2) Receptor

The following information is required at critical point(s) of reception:

- Physical and topographical description of the ground between the source(s) and point(s) of reception;
- Structural description of the buildings considered as a point of reception;
- Peak or RMS Vibration Velocity in millimetres per second, as applicable, including information on location of vibration transducer, using a sketch if necessary.

(3) Mitigation Measures

The following information is required when vibration mitigation measures are used:

- The description and specification of vibration isolation equipment and materials such as dynamic natural frequency, stiffness, damping factor and static deflection;
- If the vibration control equipment are standard catalogue items, manufacturer's make and model number;
- If alternative measures for vibration control are proposed, a full description of all alternatives, administrative steps, changes in operational procedure or structural alterations, should be provided.

(4) Calculations

- All necessary supporting calculations

10. REPORT FORMAT

The report must contain the required information, organized in a clear and concise manner. The report should include the following sections in the given sequence:

- Introduction (Background Information)
such as description of the site, acoustic environment, sound/vibration sources, etc;
- Impact Assessment
including applicable criteria, and results of pre- and post-abatement assessment at the critical points of reception due to individual as well as combined sources;
- Mitigation Measures
description and assessment of acoustic performance;
- Conclusions and Recommendations
summary of impacts, verification of compliance with limits and control measures;
- Appendices, etc.
details of measurements and calculations, specifications, plans, engineering drawings, etc.

11. APPROVAL OF ABATEMENT MEASURES

Abatement (mitigation) measures planned to alleviate existing noise/vibration problems are also subject to approval under Section 9 of the Environmental Protection Act.

12. ACOUSTIC AUDIT

The following represents the information which must be provided in an acoustic audit report:

(1) Acoustic Environment

- Location and description of sound sources in the equipment/facility subject to the acoustic audit;
- Dimensioned sketch including the location of equipment/facility and point(s) of reception showing all buildings and structures as well as physical and topographical description of the ground surface between the source and the measurement location(s);
- A brief description of the acoustic environment on the site, listing all significant sound sources including equipment/facility and other extraneous sources. Details of operating conditions of sound sources in the equipment/facility must be provided;
- Details of meteorological conditions at the site during the acoustic audit measurements, including wind speed, wind direction, temperature and relative humidity.

(2) Instrumentation

Details of all equipment used for acoustic audit measurements, including:

- Type and model of sound level meter, microphone, acoustic calibrator or any frequency analyzer or recording device, if used;
- Extension cables and additional amplifier, if used.

(3) Acoustical Data

Details of the sound level measurements including:

- Location of the microphone, using a sketch if necessary;
- Date and time period of measurements;
- Details of measurement procedure;
- Results of background sound level measurements in terms of the Hourly equivalent sound level L_{eq} and/or L_{90} , as applicable, carried out at points of reception, preferably listed in a tabular form, referencing location on a sketch;
- Results of sound level measurements due to individual sources, preferably summarized in a table;

- Results of sound level measurements due to operation of equipment/facility carried out at points of reception in terms of relevant acoustical descriptors;
- Adjustments made for special quality of sound;
- All necessary supporting calculations.

(4) Assessment of Compliance

- Comparison between the measured (adjusted, if applicable) sound levels and the applicable limits;
- Assessment of effectiveness of noise control measures included in the equipment/facility in reducing noise to applicable limits;
- Details of analysis of the effect of meteorological conditions on results of the acoustic audit measurements, if applicable.

13. VIBRATION AUDIT

The following represents the information which must be provided in a vibration audit report:

(1) Vibration Environment

- Location and description of vibration source(s) in the equipment/facility subject to the audit;
- Dimensioned sketch including the location of equipment/facility and point(s) of reception including the description of the ground between the source(s) and measurement location(s). Details of operating conditions of vibration source(s) in the equipment/facility must be provided;
- Structural description, including photographs if necessary, of the interior and exterior of the residential buildings where measurements were carried out;
- Details of meteorological conditions at the site during the vibration audit measurements, including the condition of the ground, such as moisture content, snow coverage, etc.

(2) Instrumentation

Details of all equipment used for vibration audit measurements, including:

- Type and model of vibration meter, transducer, vibration calibrator or any frequency analyzer or recording device, if used;
- Extension cables and additional amplifier, if used.

(3) Vibration Data

Details of vibration of vibration measurements including:

- Location of vibration transducer, using a sketch if necessary;
- Date and time period of measurements;
- Details of measurement procedure;
- Results of measurement in terms of the Peak or RMS, as applicable, Vibration Velocity in millimetres per second carried out at point(s) of reception, preferably listed in a tabular form referencing location on a sketch;
- All necessary supporting calculations.

(4) Assessment of Compliance

- Comparison between the measured vibration levels and the applicable limit;
- Assessment of effectiveness of vibration control measures included in the equipment/facility in reducing vibration to applicable limits.