

GUIDELINE

**Professional Engineers
Providing Acoustical
Engineering Services
in Land-Use Planning**

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CONTENTS

	PAGE
1. INTRODUCTION	3
2. SCOPE OF WORK	3
2.1 Responsibilities	3
2.2 Administration	3
3. TECHNICAL SERVICES DURING DESIGN AND CONSTRUCTION	3
3.1 Noise and Vibration Effects	4
3.2 Types of Services	4
3.2.1 Approvals Services	4
3.2.1.1 Land-Use Items	4
3.2.1.2 Services during Approval Stage	4
3.2.2 Design Services	5
3.2.3 Implementation Services	5
3.2.3.1 Review Before construction.....	5
3.2.3.2 Field Review of Installation/Acoustical Measurements	5
3.2.3.3 Acoustical Audits	5
3.2.3.4 Project Management.....	6
3.2.4 Advisory and Special Services	6
4. STANDARDS AND GUIDELINES	6
APPENDIX 1. DEFINITIONS	7

1. INTRODUCTION

This Professional Engineers Ontario (PEO) guideline covers acoustical engineering services related to land use planning, which may include approval, design, implementation and advisory services. Engineers providing acoustical engineering services should have demonstrated experience and/or training in acoustical engineering.

This guideline is to be read in conjunction with the Foreword common to PEO guidelines.

2. SCOPE OF WORK

The scope of work covered by this guideline is the professional practice of all engineers who consult, design, implement and administer acoustical engineering in land-use planning. Specific areas of acoustical engineering covered by this guideline are:

- u noise and vibration in the land-use planning process;
- u architectural acoustics, building acoustics, building vibration, as related to land development;
- u field review of installation; and
- u acoustical audits.

Professional activities in other areas of acoustics are not addressed by this guideline.

2.1 Responsibilities

The engineer intending to provide acoustical engineering services in land-use planning should:

- u identify the client's requirements and objectives, including the specific area(s) within the land-use planning process requiring attention;
- u become fully familiar with the details of the project, and the responsibilities of the other design professionals involved;
- u determine the extent of engineering services to be provided;
- u work with the client to develop mutually-agreed-upon terms of reference for acoustical engineering services; and
- u prepare and document design objectives, in consultation with the owner and/or design team, as appropriate.

2.2 Administration

In all areas in which services are provided, acoustical engineers may be required to attend project meetings, and to coordinate their work with other design professionals affected by acoustical/vibration requirements and recommendations. Acoustical engineers may also be required to prepare and submit reports and/or documentation, including:

- u reports to clients, when needed;
- u formal reports for various agencies and authorities, as required;
- u test reports; and
- u documentation of design, as required.

3. TECHNICAL SERVICES DURING DESIGN AND CONSTRUCTION

3.1 Noise and Vibration Effects

In land-use planning, noise and vibration assessment typically includes assessing the:

- u existing noise and vibration environment on the proposed land use;
- u noise and vibration the proposed land use would be expected to create in the existing environment; and
- u noise and vibration the proposed land use would be expected to create on itself.

3.2 Types of Services

The four main types of services in the design and construction of noise and vibration control are approvals, design, implementation, and advisory and special services.

3.2.1 Approvals Services

Noise and vibration assessments of proposed land use must be conducted according to the relevant planning authority's noise/vibration criteria. Engineers should therefore identify the applicable criteria of acceptability before beginning the assessment process.

3.2.1.1 Land-Use Items

Engineers are responsible for preparing formal reports or other submissions to relevant approval authorities for such items as:

- u official plans;
- u rezoning applications;
- u draft approval of subdivisions;
- u site plan control;
- u clearance of conditions in such agreements as subdivision, servicing, site plan control, statutory tribunal decisions and Certificates of Approval;
- u condominium registration;
- u Final approvals for plans of subdivision registration;
- u building permit applications; and
- u occupancy permits.

3.2.1.2 Services during Approval Stage

During the approval stage, engineers may be required to perform at least one of the following services.

(a) Prepare preliminary/feasibility studies, including:

- u evaluating proposed and alternative sites and layouts of land use;
- u determining potential acoustical impacts, through the use of measurements and/or predictions; and
- u identifying any further alternatives that may be considered.

(b) Prepare detailed studies of requirements. This would generally involve formulating detailed solutions to mitigate effects, taking into consideration more detail on the site layout and associated engineering information, including grading, traffic, adjacent land uses, future conditions and similar relevant items.

(c) Conduct detailed reviews of such project documents as:

- u architectural, engineering, landscape, shop and mechanical drawings;
- u site plans;
- u subdivision/servicing agreements; and
- u tender documents.

(d) Carry out observations and report "as built" conditions.

3.2.2 Design Services

Design services may include at least one of the following steps, which are ordered sequentially.

1. Establish design guidelines/criteria.
2. Identify to the client and other design professionals the design and implementation alternatives that would meet the design and performance objectives.
3. Evaluate the design and implementation alternatives according to the specific technical requirements.

4. Document design alternatives and evaluations through text, sketches and specifications, as appropriate.
5. Recommend at least one alternative suitable for achieving the defined objectives. Generally, the design of measures to mitigate excessive noise impacts should be governed by technical and economical feasibility. The desirable order of priority for mitigation measures is:
 - u engineered mitigation measures to eliminate, or reduce, offending or disturbing noise and vibration sources;
 - u separation of sources and receivers; and
 - u engineered mitigation measures applied to the receivers.
6. Assist the design team in incorporating the selected design alternatives in the design documents.
7. Review working drawings and specifications for proper implementation of recommendations. Confirm their acceptability or recommend changes to the construction documents.
8. Prepare the necessary technical sections of Request For Proposals and review bidders submissions.

3.2.3. Implementation Services

Acoustical engineers may be asked to verify the construction of noise and/or vibration control installations. Such requirements often exist in draft plans of subdivisions, as conditions of approval. The verification process can take different forms, either to demonstrate proof of performance with set requirements, or to identify performance with set acoustics/vibration emission controls.

Before providing implementation services, acoustical engineers should establish in detail with the owner or design team the full extent of implementation services to be provided. These may include such services as:

- u reviewing design information before construction;
- u field review of installation and acoustical measurements;
- u acoustical audits; and
- u project management.

3.2.3.1 Review Before Construction

To ensure compliance with the approved recommendations or requirements, acoustical engineers may be required to do the following before construction:

- u review bids, shop drawings, maps, graphs and reports prepared by others that contain information affecting the acoustical and vibration concepts in the terms of reference; and
- u stamp/sign the required documents to indicate acceptance of the proposed mitigation. This is often required before building permits are issued.

3.2.3.2 Field Review of Installation/Acoustical Measurements

Field review of installation/acoustical measurements may involve:

- u construction review, to check and verify whether acoustical details comply with design and construction documents;
- u site visits, and possibly acoustical and/or vibration tests, as well as visual observations; and
- u advice on remedial work to correct deficiencies.

3.2.3.3 Acoustical Audits

An acoustical audit may be required in cases where sufficient information to ensure compliance can not be obtained through the services outlined in Section 3.2. 1. It may also be required by regulatory authorities. To perform an acoustical audit, the engineer will be required to:

- a) identify the noise/vibration limits set out for, or applicable to, the project;
 - b) test an installed project, to identify and quantify the emission of noise/vibration. These tests may include, but are not necessarily limited to: exterior sound levels from building services;
- u exterior sound levels from building services;

- u sound isolation between interior spaces and the exterior;
 - u insertion loss of enclosures, berms or barriers;
 - u sound and vibration levels;
 - u vibration levels in building elements, machinery or the ground; and
 - u ambient sound levels.
- c) provide analysis of the results, to compare the deviations to applicable standards, guidelines or regulations and applicable emission limits.

3.2.3.4 Project Management

Acoustical engineers who are asked to provide project management services should follow the *Guideline for Professional Engineers Providing Project Management Services*, published by PEO.

3.2.4 Advisory and Special Services

Advisory and special services may include:

- u presenting expert testimony at technical, regulatory, environmental and judicial proceedings (refer to the PEO publication *The Professional Engineer as an Expert Witness*);
- u preparing proof of performance verifications and attestations;
- u assisting clients in obtaining equipment certification or Certificates of Approval under the Environmental Protection Act;
- u reviewing other professionals' work (refer to PEO's *Guideline to Professional Practice*);
- u computer engineering or software services;
- u training and educational services;
- u research and development services;
- u appraisals of existing facilities for upgrading;
- u investigating complaints and making recommendations for corrective action; and
- u preparing proposals and response letters to tender or design competitions.

4. STANDARDS AND GUIDELINES

The following documents are relevant to acoustical engineering in land-use planning. This list is not comprehensive and is current only at the date of writing of this guideline.

- u National Building Code
- u Ontario Building Code
- u Ontario Model Municipal Noise Control Bylaw (Ontario Ministry of the Environment and Energy [MOEE])
- u Noise Assessment Criteria in Land Use Planning LU-131 u
- u Noise Assessment Criteria in Land Use Planning: Requirements, Procedures and Implementation (MOEE)
- u Policy Guidelines, Series D-1 to D-6 (MOEE)
- u Provincial Policy Statement 1996, the Planning Act, Section 1.1.3.g
- u Applicable OPs, OPAs and zoning bylaws
- u ORNAMENT, Ontario Road Noise Analysis Method for Environment And Transportation, Technical Document (MOEE)
- u STEAM, Sounds from Trains Environmental Analysis Method (MOEE)
- u Canada Mortgage and Housing Corporation Guidelines
- u Protocols by the MOEE on environmental assessment, regarding projects by the Ministry of

- Transportation, Ontario Hydro and the Toronto Transit Commission
- u CSA Standards, Series Z 107
 - u ISO Standards on Acoustics
 - u ANSI Acoustical Standards
 - u TP 124 7, Land Use in the Vicinity of Airports (Transport Canada)
 - u Regional and local guidelines, policies and bylaws on land-use planning

APPENDIX 1. DEFINITIONS

Acoustical engineer(s)

For the purposes of this guideline, acoustical engineers are defined as licensed professional engineers (members of Professional Engineers Ontario), or partnerships or corporations holding Certificates of Authorization granted under the Professional Engineers Act, R.S.O. 1990, Chapter P28- who have had several years of demonstrated experience in acoustical engineering related to land-use planning.

Architectural (building) acoustics

Architectural (and building) acoustics is the applied science of generation, propagation, transmission and control of sound and vibration in and about rooms, dwellings and other buildings.

Certificate of Approval

A Certificate of Approval is a document issued according to requirements spelled out in the Environmental Protection Act, RES. 1990.

Owner/client

The owner, or client, is the person, or organization acting on behalf of the owner, who commissioned the work.



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