

# AERCOUSTICS - ACOUSTIC, NOISE, AND VIBRATION DESIGN CONSULTANTS

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## Résumé

Aercoustics Engineering Limited est la plus grande purement acoustique firme d'ingénieurs-conseils en Amérique du Nord avec une expertise en acoustique, bruit et vibrations. Situé à Toronto, en Ontario, le Aercoustics a été fondée en 1974 et a participé à de nombreux projets de profil haut dans le monde entier. Provenant des fosses d'orchestre à gravières, nous sommes les aller-à ingénieurs acoustiques qui résoudre problèmes acoustiques, de bruit et de vibration à l'intérieur ou à l'extérieur, aériennes ou souterraines. C'est notre unique profondeur de compréhension de la science de l'acoustique qui nous permet d'aborder les projets les plus difficiles.

Mots clés : Ingénierie acoustique, bruit dans l'environnement et les vibrations, le vent bruit de turbine, de conception de transit, de bruit et de surveillance des vibrations, construction isolation vibratoire, TMD.

## Abstract

Aercoustics Engineering Limited is the largest purely acoustical consulting engineering firm in North America with expertise in acoustics, noise, and vibration. Located in Toronto, ON, Aercoustics was founded in 1974 and has been involved in many high profile projects over the years, all around the world. From orchestra pits to gravel pits, Aercoustics is the go-to acoustic engineering firm to solve acoustic, noise and vibration problems indoors or outdoors, overhead or underground. It's Aercoustics' unique depth of understanding of the science of acoustics that allows us to tackle the most challenging projects.

**Keywords:** acoustic engineering, environmental noise and vibration, wind turbine noise, transit design, noise and vibration monitoring, building vibration isolation, TMD

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## 1. Introduction

Aercoustics is a knowledge-based company, with engineering and technical resources that enable us to respond to shifting regulatory environments, industrial landscapes, and the ever evolving needs of our clients in the area of acoustics, noise, and vibration.

Our services range from planning to post-construction across multiple industries including energy, transportation, planning, architecture, tunnelling, and more. A sample of this experience follows.

## 2. Transit Operations & Maintenance / Transit Design

Aercoustics has been the Toronto Transit Commission's primary noise and vibration consultant through contracts it has held with the Subway Infrastructure department since the early 1990s. Over the past 20+ years, Aercoustics has gained extensive experience in the measurement and analysis of vibration and sound generated from the TTC subway and streetcar transit systems. Our work with the TTC includes executing community noise evaluation campaigns, evaluating how different rail components and streetcar models affect the noise and vibration levels experienced in the community, and developing noise and vibration controls.

Aercoustics has provided these services, and more, to support transit systems across North America.

- Long term noise and vibration monitoring
- Wheel condition detection
- Complaint investigation
- Public meetings and presentations
- Maintenance evaluation services
- Best practice management
- Track design
- Station design
- Environmental compliance
- Noise and vibration prediction for sensitive uses
- Fastener selection
- Speech intelligibility
- FTA transfer mobility
- Building isolation
- Component evaluation

## 3. IEC 61400-11 Standard – Wind Turbine Noise Measurements

Aercoustics is an ISO 17025:2005 accredited lab; and is also accredited to conduct wind turbine noise testing as per IEC 61400-11 test procedures.

Aercoustics has been involved in the wind industry since its commercial inception in Ontario over 10 years ago. Aercoustics has pioneered various methods and procedures used in the industry today and have worked with government agencies, developers, manufacturers, operators and residents.

Having completed acoustic assessment and sound modelling studies for over 1GW of wind energy, and having

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logged more than 15,000 hours of post construction noise measurements from wind turbine facilities, Aercoustics is the most experienced company in Canada in the area of Renewable Wind Energy.

Payam Ashtiani, a principal with the company, is a Canadian representative on the working group MT 11 of IEC Standards Technical Committee 88. The Technical Committee reviews and sets electrical standards for wind turbines and MT 11 focuses on wind turbine noise measurement techniques.



**Figure 1** On site noise measurement system

Aercoustics carried out a three phase project in order to develop a new protocol for measuring and quantifying noise from wind turbines in a way that was applicable to the sound level limits already in place. The process involved a jurisdiction scan and scientific literature review; a draft protocol development, which included public consultation sessions; and a field verification protocol which involved measurements on candidate wind farms to validate and fine tune the protocol. The final protocol was also peer reviewed as part of the contract. The new protocol was issued by Ontario Ministry of the Environment and Climate Change in mid-2011 and has been carried out as a part of the post construction monitoring requirements since that time.

#### **4. Noise and Vibration Monitoring**

Our firm has unique instrumentation capabilities for conducting multi-channel sound and vibration measurements, including four (4) multichannel vibration measurement systems, including a state-of-the-art LMS data acquisition and real-time analyzer allowing for recording capability with simultaneous analysis including real time octave filtering, frequency spectrums, coherence, transfer function processing among many others processing techniques for up to 44 channels and further expandable for specific project requirements.

Aercoustics has developed a fully remote, purpose built noise and vibration monitoring system, with customizable metrics. The monitoring system can be scaled to support a single monitor or multiple locations and is a fully managed service that includes real-time monitoring, as well as reporting services.

Aercoustics' monitoring system was employed to support the OHL/FCC JV Team for the delivery of the construction monitoring program required by the **TTC York Spadina Subway Extension (TYSSE)** Contract. As part of the services provided, Aercoustics developed a noise and vibration monitoring plan for each of the four identified sites as specified by the TYSSE Contract to record noise and vibration levels during the progression of the four (4) year construction period. Aercoustics developed the appropriate protocols and equipment requirements for monitors, the applicable noise/vibration limits, and exceedance event and complaint protocols. At its peak, Aercoustics installed, maintained and operated fourteen (14) noise and vibration monitors that had automated upload capabilities to an in house server with ease of data viewing, logging and reporting.



**Figure 2** Rail vibration measurements

Aercoustics has provided similar services tailored to the needs of the following projects:

- Ryerson Student Learning Centre
- Ryerson Church Street Development
- 500 Lakeshore West Development
- 2131 Yonge Street
- Highway 50 Construction Monitoring