

AN ANALYSIS OF TWO CITIES AND A STATE WHERE CONSTRUCTION NOISE AND VIBRATION ARE UNIQUELY REGULATED

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1 Introduction

In Canada and the United States, there are three places where construction noise and/or vibration are uniquely regulated by government authorities. These include the City of Toronto (Ontario), the City of New York, and the State of California. The regulations require studies prior to construction activity and/or monitoring of noise and vibration during construction. The underlying objective of these regulations represents either a commitment to avoidance of damage to structures that are in proximity to a construction site, or the reduced probability of public annoyance.

To be clear, this isn't just about the nuisance factor of industrial noise/ vibration. Current regulations do not consider the potential for significant and adverse effects on the operations of healthcare facilities and research laboratories, where sensitive instrumentation and equipment may be in use. In these cases, the requirements for control of noise and/or vibration can often be much more restrictive.

2 Overview of regulations

City of Toronto

Toronto municipal code, chapter 363, building construction and demolition, by-law 514-2008, construction vibrations

Uniquely among comparable jurisdictions in Canada and the USA, Toronto has had a vibration bylaw since May 27, 2008. There are no stated restrictions on the times of day when construction vibration may be created. There are no descriptions within the bylaw of exemptions for different types of construction activity and/or allowable vibration.

The construction equipment is assessed for vibration concerns within a "zone of influence" (ZOI) which is defined by a radius away from construction activity where the vibration amplitudes are excessive. Within this ZOI, the bylaw defines "prohibited construction vibrations" to be those that exceed a stipulated peak particle velocity of 8 mm/s below a frequency of 4 Hz, 15 mm/s from 4 to 10 Hz, and 25 mm/s for a frequency range above 10 Hz. An applicant for a permit must submit a vibration control form that relies upon a preliminary study, prepared by a professional engineer. The vibration control form identifies the places where the ZOI extends beyond the boundaries of the construction site and identifies any buildings that are designated under the Ontario Heritage Act. Where necessary, mitigation is recommended.

The bylaw requires a monitoring program in order to document compliance. Both the mitigation and the monitoring program must be described in the documentation submitted for permitting of the construction work. Complaints must be investigated by a professional engineer.

City of New York

Local laws of the city of New York for the year 2005, No.113, noise control code and construction rule of January 18, 2007

The City of New York has enacted a "local law" whose objective is citywide mitigation of construction noise [2]. To comply, every construction site with activity must submit a Construction Noise Mitigation Plan (CNMP) to the Department of Environmental Protection (DEP). The permit holder for construction work is expected to offer a formal noise mitigation training program to benefit supervisors.

The contents of the CNMP include a self-certification that the construction equipment have noise emissions that achieve normal manufacturer's operating specifications at peak loading. The DEP itself makes use of a stipulated software for assessing noise complaints, the Federal Highway Administration (FHWA) Roadway Construction Noise Model (RCNM), as published January 2006. The RCNM and the contents of the Construction Rule make use of a defined set of noise emissions for a wide range of construction equipment. Within the Construction Rule, authorized work hours range from 7 AM to 6 PM on weekdays, with the possibility for securing after hours times through a permit. The DEP has the power to require additional noise mitigation. The contractor is expected to coordinate hours of work to minimize the expected noise impact to schools, hospitals, places of worship and homes for the aging.

The Construction Rule provides a set of stipulations for noise mitigation in conjunction with the presence of any of five defined classes of construction equipment:

- Impact Equipment: Pile Drivers, Jackhammers, Hoe Rams, Blasting.
- Earth Moving Devices: Vacuum Excavators.
- Construction Trucks: Dump Trucks.
- Stationary Devices: Cranes, Auger Drills, Street Plates, Backup Alarms.
- Manual Devices: Concrete Saws.

For each of these classes of construction equipment, the stipulations include: source controls, such as quieter models, mufflers and/or silencers; noise pathway controls, such as noise barriers, enclosures and/or curtains. Noise barriers,

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both permanent and temporary, must be built to achieve a sound transmission class (STC) rating of 30 or greater with a general expectation that noise levels at sensitive receptors will be reduced by 5 dB or more. The Construction Rule even recommends specific makes and models of construction equipment as the preferred options.

State of California

California environmental quality act (CEQA) 1970

The CEQA [3] is a legislation that defines “Environment” [as meaning] the physical conditions that exist within the area which will be affected by a proposed project, including land, air, water, minerals, flora, fauna, noise, or objects of historic or aesthetic significance [CEQA 21060.5]. It defines “noise” as a part of the environment. Both the long-term operations of projects and short-term construction activity are subjected to study before a project begins through the preparation of a comprehensive environmental impact report (EIR) that is subject to review by a lead agency, such as a state, county, or city agency; along with opportunity for public input.

A “project” within an EIR is defined by a range of feasible alternatives, each potentially requiring different mitigation. One of these is designated as the preferred alternative. In the case of construction noise and vibration, the objectives of an EIR are to document whether or not there is a “significant effect on the environment” when considering a quantitative “threshold of significance”. Where there is a significant effect (i.e., “impact”), mitigation will be developed to prevent or minimize damage to the environment. The resulting project is then defined to include the entirety of the required mitigation and a “mitigation monitoring plan” will also be implemented during construction.

The following excerpt from a CEQA checklist is typically applied when assessing whether or not project noise or vibration would result in either “no impact”, “less than significant impact”, “less than significant impact with mitigation”, or a “potentially significant impact” by asking whether or not the project would result in:

- Exposure of persons to or generation of noise levels in excess of standards established in the local general plan or noise ordinance, or applicable standards of other agencies?
- Exposure of persons to or generation of excessive ground borne vibration or ground borne noise levels?
- A substantial temporary or periodic increase in ambient noise levels in the project vicinity, above levels existing without the project?

From the aforementioned, although CEQA is very comprehensive in terms of required analysis of construction noise and vibration prior to short-term construction and long-term operation, the lead agency would need to stipulate any and all thresholds of significance that are acceptable for determinations of impact due to construction activity. Similarly, the development of mitigation by the project sponsor will rely upon the defined thresholds of impact. The

extent to which the definition of a threshold of impact can rely upon a noise ordinance would vary with jurisdiction.

3 Lessons learned

To summarize, the following can be learned by considering the regulations in places for these two cities and a state:

- Construction Vibration is subject to quantitative limits in the City of Toronto, whereas, construction noise is addressed within a bylaw in less strict terms;
- Construction Noise is subject to very extensive mitigation requirements in the City of New York, but there is no comparable regulation of construction vibration;
- Construction Noise and Vibration, both, are subject to environmental study prior to project approval and permitting in the State of California. Quantitative thresholds of significance for construction noise and vibration are developed on a case-by-case basis by the project sponsor, with the lead CEQA agency having to agree to them; and
- Documentation of the possible environmental effects prior to project construction is as follows for these three places:
 - City of Toronto: preliminary study and vibration control form.
 - City of New York: Construction Noise Mitigation Plan.
 - State of California: Environmental Impact Report.

4 Conclusion

In the three cases cited in this article, the expectation is for construction contractors to comply with the regulations and/or bylaws and produce documentation both before and during periods of work at a site. (The time to start complying with regulations is long before the actual building process begins.) The engineering expertise required to generate such documentation is generally outside the scope of a construction contractor – to deliver quality projects, on time and on budget – which is why outside assistance is generally required and highly recommended.

Distilled to its simplest message, our best solutions going forward include better equipment, better processes and better barriers for noise and vibration. Specialists maintain an inventory of state-of-the-art instrumentation that is used to measure construction noise and vibration, as well as experienced, professional staff to help clients achieve regulatory compliance. Such instrumentation for monitoring may be prudent in situations not explicitly considered by regulations, including, for example, healthcare facilities, research laboratories and microelectronics manufacturing.

References

- [1] <http://www.toronto.ca/legdocs/bylaws/2008/law0514.pdf>
- [2] <http://www.nyc.gov/html/dep/html/noise/index.shtml>
- [3] <https://oag.ca.gov/environment/ceqa>