

**HALIFAX REGIONAL MUNICIPALITY
BY-LAW NUMBER B-600
RESPECTING BLASTING**

GENERAL

Number and Short Title

1. This By-law shall be known as By-law Number B-600 and shall be cited as the “Blasting By-law.”

Appendices

2. Appendix “A” and Appendix “B” form part of the By-law.

Definitions

3. In this By-law:
 - (a) **“Affected Community”** means all properties within a distance from the Blasting Area as the Inspector may specify, but in no cases shall the distance be less than 300 metres from the Blasting Area;
 - (b) **“Air Blast”** means the airborne shock wave which results from Blasting, which may or may not be audible, measured in decibels;
 - (c) **“Applicant”** means a person who has applied for a Blasting Permit under this By-law;
 - (d) **“Blaster”** means a person named on a valid Blasting Certificate issued by the Province of Nova Scotia;
 - (e) **“Blasting”** means the handling, preparation and use of explosives, but does not include delivery or storage by a properly qualified person in accordance with Federal and Provincial law;
 - (f) **“Blasting Area”** means a zone extending 50 metres in all directions from the place in which explosives are being handled, prepared, or used, or in which unexploded charges exist or are believed to exist;
 - (g) **“Charge Weight per Delay”** means the weight of explosives which is detonated per delay period of less than 8 milliseconds;

- (h) **"Engineer"** means a Professional Engineer licensed to practice in the Province of Nova Scotia under the Engineering Profession Act, R.S.N.S. 1989, c. 148, as amended from time to time;
- (i) **"Geoscientist"** means a Professional Geoscientist licensed to practice in the Province of Nova Scotia under the Geoscience Profession Act, S.N.S. 2002, c.7, as amended from time to time;
- (j) **"Inspector"** means the person appointed by the Chief Administrative Officer of the Municipality to be the Inspector of Blasting or their designate;
- (k) **"Municipality"** means the Halifax Regional Municipality;
- (l) **"Particle Velocity"** means the measure of the intensity of ground vibration, measured in millimetres per second;
- (m) **"Qualified Monitor"** means a person who is:
 - (i) an Engineer, a Geoscientist, or a person working under the supervision of an Engineer or a Geoscientist;
 - (ii) trained on the proper use of the monitoring instruments by a representative of the manufacturer or distributor of the monitoring instruments or other competent individual, and;
 - (iii) approved annually by the Municipality, but;
 - (iv) shall not be the Blaster or the Applicant, or an employee of the Blaster or the Applicant;
- (n) **"Scaled Distance"** means the actual distance from a Blasting hole measured in a horizontal line, divided by the square root of the maximum Charge Weight per Delay in that hole;
- (o) **"Utility"** means a water, sewer, power, telecommunication, or natural gas system, and includes all pipes, conduits, ducts, reservoirs, manholes, towers, and other structures and appurtenances which are integral to the system.

Blasting Permit

4. (1) No person shall carry out or cause to be carried out Blasting in the Municipality without a Blasting Permit first having been obtained from the Inspector.
- (2) A Blasting Permit shall not be issued to an Applicant unless the Applicant is a Blaster, the Applicant has a Blaster in his employ, or the Applicant has a contract with a Blaster in respect of the work for which the Blasting Permit is intended.
- (3) Notwithstanding subsection (1), the Inspector may give permission for Blasting without a Blasting Permit in an emergency situation.

Hours of Blasting

5. (1) No person shall carry out or cause to be carried out Blasting on a Saturday, a Sunday, Remembrance Day, or a holiday as defined in the Interpretation Act, R.S.N.S. 1989,c.35, as amended from time to time.
- (2) No person shall carry out or cause to be carried out Blasting after 6:00 p.m. or before 8:00 a.m., Monday to Friday inclusive.
- (3) No person shall carry out or cause to be carried out Blasting after official sunset.
- (4) Notwithstanding subsections (1), (2) , and (3), the Council of the Municipality may allow the Inspector to issue a Blasting Permit to carry out Blasting on weekends or holidays if such operation is in the interest of public convenience. In such cases the hours of Blasting shall be limited to 10:00 a.m. to 6:00 p.m. and before official sunset.

LIMITS

Maximum Particle Velocity

6. No person shall carry out or cause to be carried out Blasting which results in a Particle Velocity which exceeds the limits set out in Table 1.

Table 1.

Frequency of Ground Vibration in Hertz	Maximum Allowable Peak Particle Velocity in millimetres per second
15 or less	12.5
16 to 20	19.0

21 to 25	23.0
26 to 30	30.5
31 to 35	33.0
36 to 40	38.0
40 or greater	50

Maximum Air Blast

7. No person shall carry out or cause to be carried out Blasting which results in an Air Blast which exceeds 128 (one hundred and twenty-eight) decibels as measured on the linear scale.

Explosive Charge

8. (1) No person shall carry out or cause to be carried out Blasting where the Scaled Distance to the nearest structure or Utility is less than the minimum Scaled Distance indicated on the Blasting Permit.
- (2) The Inspector may allow a smaller Scaled Distance than the minimum Scaled Distance indicated on the Blasting Permit if monitoring reports indicate that Particle Velocity and Air Blast limits are not exceeded.

ACTIVITIES DURING BLASTING

Pre-Blast Survey

9. (1) No person shall carry out or cause to be carried out Blasting unless a pre-blast survey is completed on every structure within a Scaled Distance in all directions from the Blasting Area of $32 \text{ m/kg}^{1/2}$, and which meets the following requirements:
- (a) a letter of introduction containing a project description, the blasting contractor's name, the name of the firm conducting the survey, and an approximate start and completion date for the project is distributed to all property owners in the area to be surveyed;
 - (b) appointments are made and the survey is carried out in a timely manner;
 - (c) each property owner is contacted in person and if the homeowner cannot be contacted, notification is to be sent via registered mail, advising the owner who to contact to schedule an appointment;

- (d) the survey consists of high quality video photography of the exterior of the structure, in reproducible format, and which shows an overview of every side of the structure, and includes details of any deficiencies noted at any location on the exterior;
 - (e) the survey shows fences, sidewalks, trees, and other similar features if the structure is within 15 metres of the construction site;
 - (f) video surveys are carried out on the interior of the structure with the owner's consent, or in sketch format if the owner does not consent to video;
 - (g) the survey is carried out under normal lighting conditions from a distance of 1 -2 metres, objects such as furniture are not moved during the survey, all deficiencies are noted, and the video record is supplied for review to the property owner upon request;
 - (h) a written report which includes still photographs of all existing deficiencies is compiled for each structure and is delivered to the property owner;
 - (i) if the structure is connected to a well, a report on the age and condition of the well; and
 - (j) if the structure is connected to an on-site sewage disposal system, a report on the age and condition of the on-site sewage disposal system.
- (2) If a structure within a Scaled Distance in all directions from the Blasting Area of $32 \text{ m/kg}^{1/2}$ is connected to a well, the Blaster shall ensure that bacteriological and general chemical analyses are performed on water from the well before Blasting has commenced and after Blasting has been completed.
- (3) Notwithstanding subsections (1) and (2), the Inspector may require other structures to be surveyed and in addition other water tests to be performed.
- (4) Notwithstanding subsection (1) a pre-blast survey shall not be required before a Blasting Permit is issued in the event the property owner cannot be contacted or refuses entry to the structure.

Notification

10. (1) No person shall carry out or cause to be carried out Blasting unless notice is delivered by hand after the Blasting Permit is issued and at least four (4) days prior to the commencement of Blasting, to every property owner or business within the Affected

Community which shall contain:

- (a) the name of the person or company responsible for the Blasting, including a contact person and telephone number;
 - (b) the intended date and time when Blasting shall commence and its expected duration period, and;
 - (c) the location of the Blasting.
- (2) No person shall carry out or cause to be carried out Blasting unless a public information meeting is held if such a meeting is required by the Inspector as a condition of the Blasting Permit.
- (3) No person shall carry out or cause to be carried out Blasting within 300 metres of a school, hospital, or other health care facility unless:
- (a) such notice as required in subsection (1) has been given to the senior administrator of the school, hospital or other health care facility, and;
 - (b) the senior administrator is also informed at least 2 hours prior to each blast.

Blaster Required

11. No person shall carry out or cause to be carried out Blasting unless:
- (a) the Blasting is under the care and control of a Blaster, and;
 - (b) a Blaster is on the work site and wears visual identification at all times while the site is deemed a Blasting Area.

Drilling Dust Control

12. No person shall carry out or cause to be carried out Blasting without the use of an acceptable dust collection system as part of the drill machine.

Blast Monitoring

13. (1) No person shall carry out or cause to be carried out Blasting unless:
- (a) a Qualified Monitor monitors every blast, and;
 - (b) blast monitoring equipment and procedures meet the standards of Appendix “A”.

- (2) The Qualified Monitor shall monitor each blast with a Particle Velocity meter and Air Blast sensor which are located outside of the property on which Blasting is being carried out and are:
 - (a) at the structure which is located nearest to the blast hole, and;
 - (b) any other structure or Utility required by the Inspector.
- (3) Notwithstanding subsections (1) and (2), no monitoring is required where the Scaled Distance between the blasting hole and the nearest structure or Utility is greater than $45 \text{ m/kg}^{1/2}$.

Submit Records

14. (1) A Qualified Monitor shall compile the monitoring data into Air Blast and Particle Velocity monitoring reports and Air Blast and Particle Velocity monitoring records as described in Appendix "A".
- (2) The Qualified Monitor shall submit the Air Blast and Particle Velocity monitoring reports to the Inspector along with either:
 - (a) a certificate in the form of Appendix "B" stating that the results meet the requirements of this By-law; or
 - (b) if a blast exceeds an allowable limit for Air Blast and Particle Velocity as set in this by-law the Qualified Monitor shall submit the Air Blast and Particle Velocity monitoring reports within 24 hours of the blast and these monitoring reports shall be accompanied by a written explanation for the excessive Air Blast and Particle Velocity level(s) as well as a recommendation for corrective action.

ADMINISTRATION

Performance Security

15. (1) Where the volume of rock which is Blasted exceeds a volume of 50 cubic meters, the application shall include a security deposit in a form acceptable to the Inspector in the amount of \$5,000.00.
- (2) The security deposit shall be retained by the Municipality for the duration of the Blasting Permit as a guarantee that the blast monitoring and reporting meet the standards set out in Appendix "A".
- (3) If after considering a report of a Qualified Monitor the Inspector has reasonable grounds

to believe that the blast monitoring and reporting are not meeting the standards set out in Appendix “A”, the Inspector may perform such blast monitoring and reporting the Inspector considers necessary and the cost of such blast monitoring and reporting shall be deducted from the security deposit and the balance, if any, returned upon expiry of the Blasting Permit.

- (4) If the cost of such blast monitoring and reporting referred to in subsection (3) exceeds the security deposit, the balance is a first lien on the property for the benefit of which the blast monitoring and reporting was done, and if there is more than one property the cost shall be divided equally between the properties and each amount shall be a first lien on the respective property.

Blasting Permit Application

16. The Applicant for a Blasting Permit shall make written application on a form provided by the Inspector.
17. The application shall contain the following information:
 - (a) the Applicant’s name, address, telephone number, and type of business;
 - (b) a contact person’s name, title, and telephone number;
 - (c) a description of the scope of the work, including the purpose for which Blasting is required;
 - (d) a blasting plan prepared by the Blaster which consists of:
 - (i) a sketch showing the location of the work site, all structures and Utilities surrounding the work site, and;
 - (ii) the blasting pattern, the depth to which it is proposed to drill or Blast, the maximum Charge Weight per Delay, the minimum Scaled Distance which will be used, and the distance to the nearest structure, Utility, railway, road, street, lane, driveway, or walkway;
 - (e) the date upon which work is proposed to commence and the probable duration;
 - (f) the name, address, telephone number, Province of Nova Scotia Blaster Certificate Number, and employer of each Blaster in charge of the Blasting;

- (g) the name, address and telephone number of the Qualified Monitor engaged to conduct ground vibration and Air Blast monitoring;
- (h) the name, address and telephone number of the firm engaged to conduct the pre-blast survey;
- (i) a certificate of insurance on a form acceptable to the Inspector which provides a policy of commercial general liability for bodily injury and property damage in the amount of \$2,000,000.00 per occurrence which includes the Halifax Regional Municipality as an additional insured, a cross liability clause and a Blasting endorsement for the full limits of the policy; and
- (j) such other information as the Inspector may require.

Duration

18. A Blasting Permit shall expire on the expiry date indicated on the Blasting Permit, to a maximum of six months.

Blasting Permit Fee

19. The application shall be accompanied by a Blasting Permit fee in an amount prescribed by Administrative Order Number 15.

Issuance of Blasting Permit

20. The Inspector shall issue a Blasting Permit to the Applicant where:
- (a) all the requirements for an application set out in Section 17 have been met;
 - (b) a statutory declaration confirming a pre-blast survey has been completed on all structures within a Scaled Distance, listing the structures, is submitted and approved by the Inspector, and that records be kept for a minimum of 10 years.
 - (c) the proposed work set out in the application conforms with this By-law and all other applicable laws, including the applicable Land Use By-law, and;
 - (d) the proposed work set out in the application conforms with any term or condition imposed by the Inspector pursuant to this By-law.

Terms and Conditions

21. (1) The Inspector may impose terms and conditions on a Blasting Permit.

- (2) No person shall carry out or cause to be carried out Blasting which contravenes any term or condition imposed under subsection (1).

RIGHTS AND REMEDIES

Automatic Revocation

22. (1) A Blasting Permit shall be automatically revoked if the Applicant ceases to be a Blaster, the Applicant ceases to have a Blaster in their employ, or the Applicant no longer has a valid contract with a Blaster in respect of the work for which the Blasting Permit is issued.
- (2) Blasting Permits issued under this By-law are not transferable.
- (3) No person shall carry out or cause to be carried out Blasting unless the name, address, telephone number, Province of Nova Scotia Blaster Certificate number, and employer of the Blaster have been provided in writing to the Inspector.

Stop Work Order or Revocation

23. (1) The Inspector may issue a stop work order or revoke a Blasting Permit where there is a violation of this By-law or a failure to comply with any of the terms and conditions subject to which a Blasting Permit is issued.
- (2) No person shall carry out or cause to be carried out Blasting while a stop work order is in effect or a when Blasting Permit has been revoked.
- (3) A stop work order may be appealed in the same manner as a refusal to issue a Blasting Permit.

Appeal

24. If the Inspector refuses to grant a Blasting Permit, or revokes a Blasting Permit, or if the Applicant is aggrieved by the terms and conditions imposed, the Applicant may appeal the Inspector's decision to the Appeals Committee of the Municipality within fifteen (15) days of being notified of the decision.

Violations

25. Every person who contravenes or fails to comply with any provision of this By-law is guilty of an offence and is liable on summary conviction to a penalty not less than Five Hundred Dollars (\$500) and not more than Ten Thousand Dollars (\$10,000) and in default of payment to imprisonment for

a period not exceeding ninety (90) days.

Exclusions

- 26. This by-law does not apply to Blasting in a quarry where Blasting is regulated by the Province of Nova Scotia, or blasting in a cemetery, or blasting for underground mining.

Repeal

- 27. The Halifax Regional Municipality By-Law Number B-300 Respecting Blasting, passed on October 27, 1998 and effective December 2, 1998, is hereby repealed.

Done and passed in Council this 18th day of November, 2003

MAYOR

ACTING MUNICIPAL CLERK

I, Jan Gibson, Acting Municipal Clerk for the Halifax Regional Municipality, hereby certify that the above-noted by-law was passed at a meeting of the Halifax Regional Council held on November 18, 2003.

Jan Gibson, Acting Municipal Clerk

Notice of Motion:	September 23 2003
First Reading:	October 21, 2003
“Notice of Public Hearing” Publication:	November 1, 2003
Second Reading:	November 18, 2003
Approval of Service Nova Scotia and Municipal Relations:	N/A
Effective Date:	November 22, 2003

Appendix "A"
**Standards and Requirements for Monitoring and Reporting of
Air Blast and Particle Velocity from Blasting**

Scope

- A-1. (1) This Appendix details the required standards and requirements for measuring and reporting Air Blast and Particle Velocity from Blasting within the Municipality. The standards and requirements contained in this Appendix are minimum standards and are intended to cover the more common conditions encountered in the Municipality. In the event that these standards need to be expanded, Blasters should consult with the following reference standards:
- (a) ISEE Blasters Handbook, 1998 Appendix K, pp 731-734, International Society of Explosives Engineers;
 - (b) CSA Standard Z107.2, 1984;
 - (c) ANSI Standard S1.4, 1983; and
 - (d) IEC Publication 651, 1979.
- (2) The standards and requirements contained in this Appendix shall apply in the event of a conflict between these standards and requirements and the reference standards.

Definitions

A-2. In this By-law:

- (a) “Anchored” means the device is bolted, glued or attached with doubled sided tape to the bedrock surface;
- (b) “Buried” means the soil is firmly compacted around and over the device;
- (c) “Field Calibration” means an on-site calibration through the use of:
 - (i) an acoustical calibration check of the sound level measuring system for an Air Blast sensor, and;
 - (ii) an electrical reference signal of known voltage and frequency for a Particle Velocity meter;
- (c) “Laboratory Calibration” means a calibration conducted by the manufacturer of the device or an independent laboratory through the use of:
 - (i) a reference sound pressure source for an Air Blast sensor, and;
 - (ii) a reference vibration source for a Particle Velocity meter;
- (d) “Sandbagging” means the sod is removed with minimal disturbance to the soil and the device is placed on the bare soil with a sandbag that is loosely filled with 5kg of sand placed over the device with the sandbag profile as low and wide as possible with a

maximum amount of firm contact with the ground;

- (e) “Spiked to the Ground” means the sod is removed with minimal disturbance of the soil and the device is firmly pressed into ground with the attached spike or spikes.

Air Blast

A-3. The Air Blast sensor shall meet the following standards:

- (a) the peak pressure level detector (sound level metre) shall meet or exceed the Type 1 requirements of ANSI Standard S1.4 or IEC Publication 651;
- (b) the microphone windscreen shall conform with the requirements of ANSI Standard S1.4 or IEC Publication 651 and any optional accessories shall also conform with the Type 1 requirements of this standard, and;
- (c) the acoustic calibrator shall be capable of checking the calibration of the measurement system at one or more frequencies with an accuracy of ± 0.5 dB.

A-4. The placement of the Air Blast sensor shall meet the following standards:

- (a) the location for measurement of Air Blast shall be out-of-doors and at least 7 m from any large reflecting surface;
- (b) the microphone shall be located at least 1.2 m above the ground plane;
- (c) the microphone shall be oriented in accordance with the manufacturer’s specifications to obtain the flattest free field frequency response to the incident sound from the blast;
- (d) the microphone shall be mounted near the geophone with the manufacturer’s windscreen attached, and;
- (e) the microphone shall not be shielded from the blast by nearby buildings, other large barriers, vehicles, or people unless such shielding cannot be avoided in which case the horizontal distance between the microphone and shielding object shall be greater than the height of the object above the microphone.

A-5. The calibration of the Air Blast sensor and the measurement of Air Blast shall meet the following standards:

- (a) the record time shall be set for at least 2 seconds longer than the blast duration plus 1 second for each 350 m between the blast hole and the monitoring location;
- (b) the trigger level shall be programmed low enough to trigger the unit from blast vibrations, high enough to minimize the occurrence of false events and slightly above the expected

background noise at the location of the microphone;

- (c) Field Calibration of the Air Blast sensor shall be performed immediately before and after each measurement;
- (d) Laboratory Calibration of the Air Blast sensor shall be carried out once per year, and;
- (e) if the measuring device is battery powered the battery condition shall be within the range for proper operation during measurements and the battery condition shall be checked after the device has been allowed to warm up and stabilize and after each measurement.

Particle Velocity

A-6. The Particle Velocity meter shall meet the following standards:

- (a) the geophone shall include three transducers that have their axes of maximum sensitivity mutually orthogonal;
- (b) the response of each transducer in the plane normal to its axis of maximum sensitivity shall be less than 10% of its response along its axis of maximum sensitivity;
- (c) the output of each transducer shall indicate the peak axial velocity along its axis of maximum sensitivity in the frequency range of 5-200 Hz over a range of peak particle velocity of 2.5-100 mm/s with a tolerance of $\pm 10\%$, and;
- (d) the continuous recording option available on some portable Particle Velocity meters shall not be used for monitoring blast-generated vibrations.

A-7. The placement and mounting of the geophone used for measurement of Particle Velocity shall meet the following standards:

- (a) the geophone shall be affixed according to the manufacturer's recommendations for the conditions at the measurement location;
- (b) geophone placement shall ensure that the data obtained adequately represents the vibration levels received at the structure, the geophone shall be placed on or in the ground on the side of the structure towards the blast hole and the geophone shall be placed no more than 10 % of the distance between the blast hole and the structure and no more than 3 metres from the structure;
- (c) where access to the structure is not possible the geophone shall be placed between the blast hole and the structure;

- (d) the geophone shall be nearly level in accordance with the manufacturer's recommendations;
- (e) the longitudinal transducer should be pointing directly at the blast hole;
- (f) the geophone should be located on or in soil with a density greater than or equal to the geophone density;
- (g) the geophone shall be Buried, Spiked to the Ground, Sandbagged or Anchored unless the Particle Velocity is expected to exceed the values in Table 2 in which case the geophone shall be Buried or Anchored;

Table 2

Particle Velocity Requiring Geophone Burial or Anchoring

<u>Frequency, Hz</u>	<u>Particle Velocity - mm/s</u>
20	19
30	15
50	10
100	5
200	3

- (h) if the geophone cannot be Buried, Spiked to the Ground or Anchored due to frozen ground or other conditions, the geophone shall be attached to the foundation of the structure within 300 mm of ground level.

A-8. The calibration of the Particle Velocity meter and the measurement of Particle Velocity shall meet the following standards:

- (a) the trigger level shall be programmed low enough to trigger the unit from blast vibrations, high enough to minimize the occurrence of false events and slightly above the expected background vibrations at the location of the geophone;
- (b) Field Calibration shall be carried out immediately before and after each measurement;
- (c) Laboratory Calibration of the Particle Velocity meter shall be carried out once a year, and;
- (d) Field and Laboratory Calibration shall be carried out to an accuracy of $\pm 5\%$.

Reporting

A-9. (1) The Air Blast and Particle Velocity monitoring reports shall be submitted to the Inspector

at least once per week.

- (2) The Air Blast and Particle Velocity monitoring reports shall include at least the following:
 - (a) Blasting Permit number;
 - (b) Blaster and the Blaster's employer;
 - (c) date and time of each blast;
 - (d) locations of Particle Velocity meters and distances, accurate to within 5 percent, from each blast hole;
 - (e) blast design details including total charge and Charge Weight per Delay;
 - (f) source used by the Qualified Monitor to obtain the blast design details;
 - (g) the Particle Velocity reported shall be the maximum of the longitudinal, transverse or vertical component of vibration along with the associated frequency;
 - (h) the Particle Velocity reported shall be the velocity which is the greatest percentage of the allowable limit at the associated frequency;
 - (i) the Particle Velocity shall be reported to the nearest mm/second and as the percentage of the allowable Particle Velocity at the associated frequency; and;
 - (j) the maximum Air Blast shall be reported to the nearest decibel on the linear weighting scale.

Records

- A-10. (1) The Air Blast and Particle Velocity monitoring records shall be maintained by the Qualified Monitor for two years and submitted to the Inspector upon request.
- (2) The Air Blast and Particle Velocity monitoring record shall include at least the following for the project:
 - (a) Blasting Permit number;
 - (b) Blaster and the Blaster's employer;
 - (c) evidence of the most recent Laboratory Calibration of the Air Blast sensor and the Particle Velocity meter;

- (3) The Air Blast and Particle Velocity monitoring record shall include at least the following for each blast:
- (a) a plot of the Particle Velocity wave form and a plot of the Air Blast wave form;
 - (b) plots of Particle Velocity values versus frequency for each vibration cycle together with the specified velocity limits detailed in Table 2 of this Appendix;
 - (c) the orientation and mounting details of the vibration transducers;
 - (d) a description of the Air Blast sensor and Particle Velocity meter;
 - (e) proof of Field Calibration for the Air Blast sensor and the Particle Velocity meter;
 - (f) a plan, to scale, of the blasting site and surrounding area showing locations of shots and locations of Particle Velocity and Air Blast monitoring stations, and;
 - (g) meteorological conditions at the time of firing of each blast, including temperature, wind speed and direction.

Appendix "B"
Certificate of Compliance for Blast Monitoring Reports

Halifax Regional Municipality

**Certificate of Compliance
for
Blast Monitoring Reports**

Project: _____

Blasting Permit No. _____

I certify that the Blast Monitoring Reports referenced below comply in all respects with By-law B-600, Respecting Blasting, and for greater clarity that:

- (i) all Blasts have been monitored and recorded in accordance with the By-law, and;
- (ii) no results exceed the limits for Air Blast and Particle Velocity as stipulated in the By-law.

<List of Reports>

Signature of Qualified Monitor

Date

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- (3) Notwithstanding subsection (1), the Inspector may give permission for Blasting without a Blasting Permit in an emergency situation.

Hours of Blasting

5. (1) No person shall carry out or cause to be carried out Blasting on a Saturday, a Sunday, Remembrance Day, or a holiday as defined in the Interpretation Act, R.S.N.S. 1989,c.35, as amended from time to time.
- (2) No person shall carry out or cause to be carried out Blasting after 6:00 p.m. or before 8:00 a.m., Monday to Friday inclusive.
- (3) No person shall carry out or cause to be carried out Blasting after official sunset.
- (4) Notwithstanding subsections (1), (2) , and (3), the Council of the Municipality may allow the Inspector to issue a Blasting Permit to carry out Blasting on weekends or holidays if such operation is in the interest of public convenience. In such cases the hours of Blasting shall be limited to 10:00 a.m. to 6:00 p.m. and before official sunset.

LIMITS

Maximum Particle Velocity

6. No person shall carry out or cause to be carried out Blasting which results in a Particle Velocity which exceeds the limits set out in Table 1.

Table 1.

Frequency of Ground Vibration in Hertz	Maximum Allowable Peak Particle Velocity in millimetres per second
15 or less	12.5
16 to 20	19.0

21 to 25	23.0
26 to 30	30.5
31 to 35	33.0
36 to 40	38.0
40 or greater	50

Maximum Air Blast

7. No person shall carry out or cause to be carried out Blasting which results in an Air Blast which exceeds 128 (one hundred and twenty-eight) decibels as measured on the linear scale.

Explosive Charge

8. (1) No person shall carry out or cause to be carried out Blasting where the Scaled Distance to the nearest structure or Utility is less than the minimum Scaled Distance indicated on the Blasting Permit.
- (2) The Inspector may allow a smaller Scaled Distance than the minimum Scaled Distance indicated on the Blasting Permit if monitoring reports indicate that Particle Velocity and Air Blast limits are not exceeded.

ACTIVITIES DURING BLASTING

Pre-Blast Survey

9. (1) No person shall carry out or cause to be carried out Blasting unless a pre-blast survey is completed on every structure within a Scaled Distance in all directions from the Blasting Area of $32 \text{ m/kg}^{1/2}$, and which meets the following requirements:
- (a) a letter of introduction containing a project description, the blasting contractor's name, the name of the firm conducting the survey, and an approximate start and completion date for the project is distributed to all property owners in the area to be surveyed;
 - (b) appointments are made and the survey is carried out in a timely manner;
 - (c) each property owner is contacted in person and if the homeowner cannot be contacted, notification is to be sent via registered mail, advising the owner who to contact to schedule an appointment;

- (d) the survey consists of high quality video photography of the exterior of the structure, in reproducible format, and which shows an overview of every side of the structure, and includes details of any deficiencies noted at any location on the exterior;
 - (e) the survey shows fences, sidewalks, trees, and other similar features if the structure is within 15 metres of the construction site;
 - (f) video surveys are carried out on the interior of the structure with the owner's consent, or in sketch format if the owner does not consent to video;
 - (g) the survey is carried out under normal lighting conditions from a distance of 1 -2 metres, objects such as furniture are not moved during the survey, all deficiencies are noted, and the video record is supplied for review to the property owner upon request;
 - (h) a written report which includes still photographs of all existing deficiencies is compiled for each structure and is delivered to the property owner;
 - (i) if the structure is connected to a well, a report on the age and condition of the well; and
 - (j) if the structure is connected to an on-site sewage disposal system, a report on the age and condition of the on-site sewage disposal system.
- (2) If a structure within a Scaled Distance in all directions from the Blasting Area of $32 \text{ m/kg}^{1/2}$ is connected to a well, the Blaster shall ensure that bacteriological and general chemical analyses are performed on water from the well before Blasting has commenced and after Blasting has been completed.
- (3) Notwithstanding subsections (1) and (2), the Inspector may require other structures to be surveyed and in addition other water tests to be performed.
- (4) Notwithstanding subsection (1) a pre-blast survey shall not be required before a Blasting Permit is issued in the event the property owner cannot be contacted or refuses entry to the structure.

Notification

10. (1) No person shall carry out or cause to be carried out Blasting unless notice is delivered by hand after the Blasting Permit is issued and at least four (4) days prior to the commencement of Blasting, to every property owner or business within the Affected

Community which shall contain:

- (a) the name of the person or company responsible for the Blasting, including a contact person and telephone number;
 - (b) the intended date and time when Blasting shall commence and its expected duration period, and;
 - (c) the location of the Blasting.
- (2) No person shall carry out or cause to be carried out Blasting unless a public information meeting is held if such a meeting is required by the Inspector as a condition of the Blasting Permit.
- (3) No person shall carry out or cause to be carried out Blasting within 300 metres of a school, hospital, or other health care facility unless:
- (a) such notice as required in subsection (1) has been given to the senior administrator of the school, hospital or other health care facility, and;
 - (b) the senior administrator is also informed at least 2 hours prior to each blast.

Blaster Required

11. No person shall carry out or cause to be carried out Blasting unless:
- (a) the Blasting is under the care and control of a Blaster, and;
 - (b) a Blaster is on the work site and wears visual identification at all times while the site is deemed a Blasting Area.

Drilling Dust Control

12. No person shall carry out or cause to be carried out Blasting without the use of an acceptable dust collection system as part of the drill machine.

Blast Monitoring

13. (1) No person shall carry out or cause to be carried out Blasting unless:
- (a) a Qualified Monitor monitors every blast, and;
 - (b) blast monitoring equipment and procedures meet the standards of Appendix “A”.

- (2) The Qualified Monitor shall monitor each blast with a Particle Velocity meter and Air Blast sensor which are located outside of the property on which Blasting is being carried out and are:
 - (a) at the structure which is located nearest to the blast hole, and;
 - (b) any other structure or Utility required by the Inspector.
- (3) Notwithstanding subsections (1) and (2), no monitoring is required where the Scaled Distance between the blasting hole and the nearest structure or Utility is greater than $45 \text{ m/kg}^{1/2}$.

Submit Records

14. (1) A Qualified Monitor shall compile the monitoring data into Air Blast and Particle Velocity monitoring reports and Air Blast and Particle Velocity monitoring records as described in Appendix "A".
- (2) The Qualified Monitor shall submit the Air Blast and Particle Velocity monitoring reports to the Inspector along with either:
 - (a) a certificate in the form of Appendix "B" stating that the results meet the requirements of this By-law; or
 - (b) if a blast exceeds an allowable limit for Air Blast and Particle Velocity as set in this by-law the Qualified Monitor shall submit the Air Blast and Particle Velocity monitoring reports within 24 hours of the blast and these monitoring reports shall be accompanied by a written explanation for the excessive Air Blast and Particle Velocity level(s) as well as a recommendation for corrective action.

ADMINISTRATION

Performance Security

15. (1) Where the volume of rock which is Blasted exceeds a volume of 50 cubic meters, the application shall include a security deposit in a form acceptable to the Inspector in the amount of \$5,000.00.
- (2) The security deposit shall be retained by the Municipality for the duration of the Blasting Permit as a guarantee that the blast monitoring and reporting meet the standards set out in Appendix "A".
- (3) If after considering a report of a Qualified Monitor the Inspector has reasonable grounds

to believe that the blast monitoring and reporting are not meeting the standards set out in Appendix “A”, the Inspector may perform such blast monitoring and reporting the Inspector considers necessary and the cost of such blast monitoring and reporting shall be deducted from the security deposit and the balance, if any, returned upon expiry of the Blasting Permit.

- (4) If the cost of such blast monitoring and reporting referred to in subsection (3) exceeds the security deposit, the balance is a first lien on the property for the benefit of which the blast monitoring and reporting was done, and if there is more than one property the cost shall be divided equally between the properties and each amount shall be a first lien on the respective property.

Blasting Permit Application

16. The Applicant for a Blasting Permit shall make written application on a form provided by the Inspector.
17. The application shall contain the following information:
 - (a) the Applicant’s name, address, telephone number, and type of business;
 - (b) a contact person’s name, title, and telephone number;
 - (c) a description of the scope of the work, including the purpose for which Blasting is required;
 - (d) a blasting plan prepared by the Blaster which consists of:
 - (i) a sketch showing the location of the work site, all structures and Utilities surrounding the work site, and;
 - (ii) the blasting pattern, the depth to which it is proposed to drill or Blast, the maximum Charge Weight per Delay, the minimum Scaled Distance which will be used, and the distance to the nearest structure, Utility, railway, road, street, lane, driveway, or walkway;
 - (e) the date upon which work is proposed to commence and the probable duration;
 - (f) the name, address, telephone number, Province of Nova Scotia Blaster Certificate Number, and employer of each Blaster in charge of the Blasting;

- (g) the name, address and telephone number of the Qualified Monitor engaged to conduct ground vibration and Air Blast monitoring;
- (h) the name, address and telephone number of the firm engaged to conduct the pre-blast survey;
- (i) a certificate of insurance on a form acceptable to the Inspector which provides a policy of commercial general liability for bodily injury and property damage in the amount of \$2,000,000.00 per occurrence which includes the Halifax Regional Municipality as an additional insured, a cross liability clause and a Blasting endorsement for the full limits of the policy; and
- (j) such other information as the Inspector may require.

Duration

18. A Blasting Permit shall expire on the expiry date indicated on the Blasting Permit, to a maximum of six months.

Blasting Permit Fee

19. The application shall be accompanied by a Blasting Permit fee in an amount prescribed by Administrative Order Number 15.

Issuance of Blasting Permit

20. The Inspector shall issue a Blasting Permit to the Applicant where:
- (a) all the requirements for an application set out in Section 17 have been met;
 - (b) a statutory declaration confirming a pre-blast survey has been completed on all structures within a Scaled Distance, listing the structures, is submitted and approved by the Inspector, and that records be kept for a minimum of 10 years.
 - (c) the proposed work set out in the application conforms with this By-law and all other applicable laws, including the applicable Land Use By-law, and;
 - (d) the proposed work set out in the application conforms with any term or condition imposed by the Inspector pursuant to this By-law.

Terms and Conditions

21. (1) The Inspector may impose terms and conditions on a Blasting Permit.

- (2) No person shall carry out or cause to be carried out Blasting which contravenes any term or condition imposed under subsection (1).

RIGHTS AND REMEDIES

Automatic Revocation

22. (1) A Blasting Permit shall be automatically revoked if the Applicant ceases to be a Blaster, the Applicant ceases to have a Blaster in their employ, or the Applicant no longer has a valid contract with a Blaster in respect of the work for which the Blasting Permit is issued.
- (2) Blasting Permits issued under this By-law are not transferable.
- (3) No person shall carry out or cause to be carried out Blasting unless the name, address, telephone number, Province of Nova Scotia Blaster Certificate number, and employer of the Blaster have been provided in writing to the Inspector.

Stop Work Order or Revocation

23. (1) The Inspector may issue a stop work order or revoke a Blasting Permit where there is a violation of this By-law or a failure to comply with any of the terms and conditions subject to which a Blasting Permit is issued.
- (2) No person shall carry out or cause to be carried out Blasting while a stop work order is in effect or a when Blasting Permit has been revoked.
- (3) A stop work order may be appealed in the same manner as a refusal to issue a Blasting Permit.

Appeal

24. If the Inspector refuses to grant a Blasting Permit, or revokes a Blasting Permit, or if the Applicant is aggrieved by the terms and conditions imposed, the Applicant may appeal the Inspector's decision to the Appeals Committee of the Municipality within fifteen (15) days of being notified of the decision.

Violations

25. Every person who contravenes or fails to comply with any provision of this By-law is guilty of an offence and is liable on summary conviction to a penalty not less than Five Hundred Dollars (\$500) and not more than Ten Thousand Dollars (\$10,000) and in default of payment to imprisonment for

a period not exceeding ninety (90) days.

Exclusions

- 26. This by-law does not apply to Blasting in a quarry where Blasting is regulated by the Province of Nova Scotia, or blasting in a cemetery, or blasting for underground mining.

Repeal

- 27. The Halifax Regional Municipality By-Law Number B-300 Respecting Blasting, passed on October 27, 1998 and effective December 2, 1998, is hereby repealed.

Done and passed in Council this 18th day of November, 2003

MAYOR

ACTING MUNICIPAL CLERK

I, Jan Gibson, Acting Municipal Clerk for the Halifax Regional Municipality, hereby certify that the above-noted by-law was passed at a meeting of the Halifax Regional Council held on November 18, 2003.

Jan Gibson, Acting Municipal Clerk

Notice of Motion:	September 23 2003
First Reading:	October 21, 2003
“Notice of Public Hearing” Publication:	November 1, 2003
Second Reading:	November 18, 2003
Approval of Service Nova Scotia and Municipal Relations:	N/A
Effective Date:	November 22, 2003

Appendix “A”
Standards and Requirements for Monitoring and Reporting of
Air Blast and Particle Velocity from Blasting

Scope

- A-1. (1) This Appendix details the required standards and requirements for measuring and reporting Air Blast and Particle Velocity from Blasting within the Municipality. The standards and requirements contained in this Appendix are minimum standards and are intended to cover the more common conditions encountered in the Municipality. In the event that these standards need to be expanded, Blasters should consult with the following reference standards:
- (a) ISEE Blasters Handbook, 1998 Appendix K, pp 731-734, International Society of Explosives Engineers;
 - (b) CSA Standard Z107.2, 1984;
 - (c) ANSI Standard S1.4, 1983; and
 - (d) IEC Publication 651, 1979.
- (2) The standards and requirements contained in this Appendix shall apply in the event of a conflict between these standards and requirements and the reference standards.

Definitions

A-2. In this By-law:

- (a) “Anchored” means the device is bolted, glued or attached with doubled sided tape to the bedrock surface;
- (b) “Buried” means the soil is firmly compacted around and over the device;
- (c) “Field Calibration” means an on-site calibration through the use of:
 - (i) an acoustical calibration check of the sound level measuring system for an Air Blast sensor, and;
 - (ii) an electrical reference signal of known voltage and frequency for a Particle Velocity meter;
- (c) “Laboratory Calibration” means a calibration conducted by the manufacturer of the device or an independent laboratory through the use of:
 - (i) a reference sound pressure source for an Air Blast sensor, and;
 - (ii) a reference vibration source for a Particle Velocity meter;
- (d) “Sandbagging” means the sod is removed with minimal disturbance to the soil and the device is placed on the bare soil with a sandbag that is loosely filled with 5kg of sand placed over the device with the sandbag profile as low and wide as possible with a

maximum amount of firm contact with the ground;

- (e) “Spiked to the Ground” means the sod is removed with minimal disturbance of the soil and the device is firmly pressed into ground with the attached spike or spikes.

Air Blast

A-3. The Air Blast sensor shall meet the following standards:

- (a) the peak pressure level detector (sound level metre) shall meet or exceed the Type 1 requirements of ANSI Standard S1.4 or IEC Publication 651;
- (b) the microphone windscreen shall conform with the requirements of ANSI Standard S1.4 or IEC Publication 651 and any optional accessories shall also conform with the Type 1 requirements of this standard, and;
- (c) the acoustic calibrator shall be capable of checking the calibration of the measurement system at one or more frequencies with an accuracy of ± 0.5 dB.

A-4. The placement of the Air Blast sensor shall meet the following standards:

- (a) the location for measurement of Air Blast shall be out-of-doors and at least 7 m from any large reflecting surface;
- (b) the microphone shall be located at least 1.2 m above the ground plane;
- (c) the microphone shall be oriented in accordance with the manufacturer’s specifications to obtain the flattest free field frequency response to the incident sound from the blast;
- (d) the microphone shall be mounted near the geophone with the manufacturer’s windscreen attached, and;
- (e) the microphone shall not be shielded from the blast by nearby buildings, other large barriers, vehicles, or people unless such shielding cannot be avoided in which case the horizontal distance between the microphone and shielding object shall be greater than the height of the object above the microphone.

A-5. The calibration of the Air Blast sensor and the measurement of Air Blast shall meet the following standards:

- (a) the record time shall be set for at least 2 seconds longer than the blast duration plus 1 second for each 350 m between the blast hole and the monitoring location;
- (b) the trigger level shall be programmed low enough to trigger the unit from blast vibrations, high enough to minimize the occurrence of false events and slightly above the expected

background noise at the location of the microphone;

- (c) Field Calibration of the Air Blast sensor shall be performed immediately before and after each measurement;
- (d) Laboratory Calibration of the Air Blast sensor shall be carried out once per year, and;
- (e) if the measuring device is battery powered the battery condition shall be within the range for proper operation during measurements and the battery condition shall be checked after the device has been allowed to warm up and stabilize and after each measurement.

Particle Velocity

A-6. The Particle Velocity meter shall meet the following standards:

- (a) the geophone shall include three transducers that have their axes of maximum sensitivity mutually orthogonal;
- (b) the response of each transducer in the plane normal to its axis of maximum sensitivity shall be less than 10% of its response along its axis of maximum sensitivity;
- (c) the output of each transducer shall indicate the peak axial velocity along its axis of maximum sensitivity in the frequency range of 5-200 Hz over a range of peak particle velocity of 2.5-100 mm/s with a tolerance of $\pm 10\%$, and;
- (d) the continuous recording option available on some portable Particle Velocity meters shall not be used for monitoring blast-generated vibrations.

A-7. The placement and mounting of the geophone used for measurement of Particle Velocity shall meet the following standards:

- (a) the geophone shall be affixed according to the manufacturer's recommendations for the conditions at the measurement location;
- (b) geophone placement shall ensure that the data obtained adequately represents the vibration levels received at the structure, the geophone shall be placed on or in the ground on the side of the structure towards the blast hole and the geophone shall be placed no more than 10 % of the distance between the blast hole and the structure and no more than 3 metres from the structure;
- (c) where access to the structure is not possible the geophone shall be placed between the blast hole and the structure;

- (d) the geophone shall be nearly level in accordance with the manufacturer's recommendations;
- (e) the longitudinal transducer should be pointing directly at the blast hole;
- (f) the geophone should be located on or in soil with a density greater than or equal to the geophone density;
- (g) the geophone shall be Buried, Spiked to the Ground, Sandbagged or Anchored unless the Particle Velocity is expected to exceed the values in Table 2 in which case the geophone shall be Buried or Anchored;

Table 2

Particle Velocity Requiring Geophone Burial or Anchoring

<u>Frequency, Hz</u>	<u>Particle Velocity - mm/s</u>
20	19
30	15
50	10
100	5
200	3

- (h) if the geophone cannot be Buried, Spiked to the Ground or Anchored due to frozen ground or other conditions, the geophone shall be attached to the foundation of the structure within 300 mm of ground level.

A-8. The calibration of the Particle Velocity meter and the measurement of Particle Velocity shall meet the following standards:

- (a) the trigger level shall be programmed low enough to trigger the unit from blast vibrations, high enough to minimize the occurrence of false events and slightly above the expected background vibrations at the location of the geophone;
- (b) Field Calibration shall be carried out immediately before and after each measurement;
- (c) Laboratory Calibration of the Particle Velocity meter shall be carried out once a year, and;
- (d) Field and Laboratory Calibration shall be carried out to an accuracy of $\pm 5\%$.

Reporting

A-9. (1) The Air Blast and Particle Velocity monitoring reports shall be submitted to the Inspector

at least once per week.

- (2) The Air Blast and Particle Velocity monitoring reports shall include at least the following:
 - (a) Blasting Permit number;
 - (b) Blaster and the Blaster's employer;
 - (c) date and time of each blast;
 - (d) locations of Particle Velocity meters and distances, accurate to within 5 percent, from each blast hole;
 - (e) blast design details including total charge and Charge Weight per Delay;
 - (f) source used by the Qualified Monitor to obtain the blast design details;
 - (g) the Particle Velocity reported shall be the maximum of the longitudinal, transverse or vertical component of vibration along with the associated frequency;
 - (h) the Particle Velocity reported shall be the velocity which is the greatest percentage of the allowable limit at the associated frequency;
 - (i) the Particle Velocity shall be reported to the nearest mm/second and as the percentage of the allowable Particle Velocity at the associated frequency; and;
 - (j) the maximum Air Blast shall be reported to the nearest decibel on the linear weighting scale.

Records

- A-10. (1) The Air Blast and Particle Velocity monitoring records shall be maintained by the Qualified Monitor for two years and submitted to the Inspector upon request.
- (2) The Air Blast and Particle Velocity monitoring record shall include at least the following for the project:
 - (a) Blasting Permit number;
 - (b) Blaster and the Blaster's employer;
 - (c) evidence of the most recent Laboratory Calibration of the Air Blast sensor and the Particle Velocity meter;

- (3) The Air Blast and Particle Velocity monitoring record shall include at least the following for each blast:
- (a) a plot of the Particle Velocity wave form and a plot of the Air Blast wave form;
 - (b) plots of Particle Velocity values versus frequency for each vibration cycle together with the specified velocity limits detailed in Table 2 of this Appendix;
 - (c) the orientation and mounting details of the vibration transducers;
 - (d) a description of the Air Blast sensor and Particle Velocity meter;
 - (e) proof of Field Calibration for the Air Blast sensor and the Particle Velocity meter;
 - (f) a plan, to scale, of the blasting site and surrounding area showing locations of shots and locations of Particle Velocity and Air Blast monitoring stations, and;
 - (g) meteorological conditions at the time of firing of each blast, including temperature, wind speed and direction.

Appendix "B"
Certificate of Compliance for Blast Monitoring Reports

Halifax Regional Municipality

**Certificate of Compliance
for
Blast Monitoring Reports**

Project: _____

Blasting Permit No. _____

I certify that the Blast Monitoring Reports referenced below comply in all respects with By-law B-600, Respecting Blasting, and for greater clarity that:

- (i) all Blasts have been monitored and recorded in accordance with the By-law, and;
- (ii) no results exceed the limits for Air Blast and Particle Velocity as stipulated in the By-law.

<List of Reports>

Signature of Qualified Monitor

Date