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HALIFAX
REGIONAL MUNICIPALITY

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Halifax Regional Council
October 21, 2003

TO: Mayor Kelly and Members of Halifax Regional Council

SUBMITTED BY: George McLellan, Chief Administrative Officer

Dan English, Deputy Chief Administrative Officer

DATE: September 16, 2003

SUBJECT: **By-Law B-600, Respecting Blasting**

ORIGIN

- Halifax Regional Council initiated a review of the By-law B-300, Respecting Blasting - November, 2002.
- Staff presentation to Committee of the Whole - September 23, 2003.

RECOMMENDATION

It is recommended that :

1. Regional Council give First Reading to By-law B-600, Respecting Blasting; and set a Public Hearing Date for Adoption of By-law B-600, Respecting Blasting for Tuesday, November 18, 2003.

2. Subject to the adoption of By-law B-600, Respecting Blasting, Regional Council amend Administrative Order Number 15 by adopting fees as outlined in Attachment 2.

BACKGROUND

The Province regulates quarries and mines, therefore, the Municipality's Blasting By-law does not apply to quarries and mines.

The current Blasting By-law was approved by Council in 1998, and replaced blasting by-laws which were in place with all four of the predecessor municipalities. Concerns were raised in the summer of 2002 with blasting practices in Fairmont Subdivision, which prompted Council to identify a number of issues dealing with the effectiveness of the current by-law.

The main concerns which were identified were:

- limits for peak particle velocity and air blast may be too lenient;
- lack of confidence in the monitoring reports for peak particle velocity and air blast;
- no minimum standards for the pre-blast survey, and the result of the survey is difficult for the homeowner to access;
- the pre-blast survey area is arbitrary and is not related to the nature and type of blasting being carried out;
- ineffective notification and education of the public;
- lack of on-going communication with the public.

In addition, there were a number of other issues which included dust control provisions, reduced limits for proximity to schools and hospitals, effects on wells and septic systems, hours of operation, fines, level of insurance coverage, and the ability to use monitoring reports as evidence.

The review of the by-law included research and analysis of other jurisdictions across North America, as well as extensive consultations with Stakeholders (which included a citizens' focus group, the Chamber of Mineral Resources of Nova Scotia, the Construction Association of Nova Scotia, the Nova Scotia Road Builders Association, the Nova Scotia Home Builders Association, the Urban Development Institute, the Nova Scotia Department of Environment and Labour, the Nova Scotia Department of Transportation and Public Works, and the Explosive Regulatory Division of Natural Resources Canada). In addition, Jacques Whitford & Associates were retained as subject experts and advisors to staff, and also conducted an audit of blast monitoring practises.

Staff made a presentation to Committee of the Whole on September 23, 2003 at which time the proposed by-law was approved in principle. Pursuant to the staff presentation and discussion at the Committee of the Whole meeting, the following amendments have been made to the proposed by-law:

- additional requirements for assessing the condition of wells;
- requirement for a performance security to ensure proper monitoring practises are followed.

DISCUSSION

Some of the recommendations presented below have been put in practise over the last year. For example, holding public meetings, using the scaled distance method, as well as enhanced monitoring practices have all been used to some degree on certain projects and have produced positive results.

The existing by-law did not specifically require these things but there were clauses that gave discretion to staff to ask for these things. The proposed by-law will more clearly specify these things so that there is consistency.

Key Conclusions

- Prior to reviewing the by-law, it was unclear if large explosive charges were being used, and if the limits were being accurately measured. An audit of monitoring practises was carried out, and blast design information for previous projects was supplied by industry stakeholders and jointly reviewed with staff.

- The main conclusions of this audit and review are:

  - ground vibration and air blast levels are not being accurately recorded all the time;
  - a broad range of explosive charges are used for blasting projects; and
  - larger than usual charge weights are being used on occasion.

Key Recommendations

- The key recommendations to address the above conclusions are:

  - maintain current limits for Particle Velocity and Air Blast;
  - introduce standards for blast monitoring and reporting; and
  - record and regulate the weight of the explosive charge used prior to issuing a permit;

Particle Velocity and Air Blast Limits

- The proposed by-law maintains the current limits for particle velocity (ground vibration) and air blast.

- The limit for particle velocity is the safe damage threshold for plaster walls. It is based on frequency and is accepted as the most accurate limit in use today.

- The limit for air blast (128 decibels) is well below the damage threshold for windows or plaster. The limit is based on nuisance, and is one of the more stringent levels in North America.

Weight of Explosive Charge ("scaled distance")

- The proposed by-law attempts to predict the outcome of blasting by obtaining the blast design information prior to issuing a permit. Regulating the weight of the explosive charge is a new concept which is being introduced to HRM, but is in place in other municipalities.

- The level of review of the blast design would be similar to the review conducted on information submitted in support of development applications such as subdivision and building permit approvals.

- It is not intended for HRM to be prescriptive and design the blast, but rather to allow the municipality to withhold a permit if there is a significant change in blasting practises which may adversely effect the surrounding properties.

- Reviewing a blast design ensures that the blaster's past experience is used when considering the type of rock and the requirements of each project.

- The weight of the explosive charge is also used to determine the area which is subject to the pre-blast survey. A description of the scaled distance method and a table which describes the effect of using this method to determine the pre-blast survey area is included as an attachment to this report.

Blast Monitoring and Reporting

- It is recommended to adopt standards for monitoring and reporting. This makes the reports much more reliable, and will also allow the reports to be used as evidence in a prosecution under the By-law.

- There are two options for Council to consider when deciding who should conduct the Blast Monitoring:

  - HRM conduct all blast monitoring; or
  - rely on blast monitoring consultants hired by the blaster.

- When a blast hole, or series of holes are loaded with explosives, they are generally required by Provincial law to be detonated on the same day. If HRM were to conduct blast monitoring, a very high level of service regarding response times would need to be provided.

- There are over 2,500 blasts detonated on construction sites annually in HRM. Administering a program where HRM conducts all the monitoring would place HRM at risk of contributing to unsafe conditions in the workplace if the response for service is not timely.

- Rather than HRM conducting all the blast monitoring, the proposed by-law relies on blast monitoring reports submitted by a consultant hired by the blaster. To ensure accuracy in the reports, the by-law provides for the following:

  - blast monitors must now be either a Professional Engineer or a Professional Geoscientist ;
  - a security deposit is required which covers the cost of monitoring in the event that HRM needs to conduct monitoring for any particular project.

Other Recommendations

Community Based Notification Program

- The proposed by-law requires hand delivered notification to be carried out on the entire "community", subject to a minimum distance of 1,000 feet from the blast site.
- The inspector has the ability to require a Public Information meeting prior to blasting.
- The by-law has special notification provisions for schools and hospitals, including advising the senior administrator of a school or hospital two (2) hours before each blast.

Pre-blast Survey Standards

- The proposed by-law contains standards for the pre-blast survey, including a requirement for a report on the age and condition of wells and septic systems.
- When considering condition assessments of wells, staff considered methods of establishing both well water quality and quantity before and after blasting.
- The proposed by-law requires water quality to be measured if a home being surveyed is connected to a well. Water samples will be subject to routine laboratory tests, at a cost of approximately $200.00 per well.
- Well water quantity is established by a pumped "draw down" test, and the cost of this test varies significantly depending on site conditions. A simple draw down test on a new well (without a professional interpreting the results) is less than $500 if the well casing extends to the surface. This amount can increase to several thousand dollars if the location of the well is not known or if the well casing needs to be extended.
- Blasting in the majority of new subdivisions in rural areas will be next to relatively new wells. Well yield information on these newer wells is obtained by the well driller, and does not need to be duplicated prior to blasting. Older wells, however, may need to be pump tested if there is a concern identified during review of the blast design information and pre-blast survey.
- Due to the uncertainty of the cost of a pump test, as well as the emphasis which will be placed on approving blast designs prior to blasting, the bylaw does not require pump tests on all wells within the survey area. A draw down test can be requested by the Inspector on a case-by-case basis if it is reasonable and necessary.

Fines & Prosecutions

- The maximum fine is the maximum allowed under the Municipal Government Act, and there are more offences which can be prosecuted. There is also a minimum fine and a provision for summary offences.

Fee Structure

- As presented to Council in the 2003 Business Plan, the fee for a blasting permit will be increased to fund a full time inspector. A new full-time Engineering Technician position will be created which is dedicated solely to administering the blasting by-law. The technician will report to a Development Engineer, and will be responsible for permit review and approval, responding to inquiries, and coordinating and performing site inspections with other Engineering Technicians.

Insurance

- The level of the blaster's insurance has been raised from $1,000,000. to $2,000,000.

Hours of Blasting

- The proposed by-law gives Council the discretion to allow blasting on week-ends and holidays. The public information meeting could be used to assess the need to allow blasting on week-ends and holidays.

BUDGET IMPLICATIONS

The 2003 Business Plan identified one additional staff position to administer the Blasting By-law. The additional costs will be funded by increased revenue from the Blasting Permit Application Fee.

FINANCIAL MANAGEMENT POLICIES / BUSINESS PLAN

This report complies with the Municipality's Multi-Year Financial Strategy, the approved Operating, Capital and Reserve budgets, policies and procedures regarding withdrawals from the utilization of Capital and Operating reserves, as well as any relevant legislation.

ALTERNATIVES

1. Adopt the By-law and permit fee as presented.

2. Amend the by-law to stipulate that HRM conduct the blast monitoring, and approve an alternative fee based on level of service and cost. This option is not recommended for the reasons outlined in this report.

3. Amend the proposed by-law to require well draw down tests if requested by a property owner. This option is not recommended for the reasons outlined in this report.

ATTACHMENTS

1. By-law B-600, Respecting Blasting

2. Amendments to Administrative Order Number 15, Respecting Licenses, Permits and Processing Fees

3. Explanation of Scaled Distance Methodology

Additional copies of this report, and information on its status, can be obtained by contacting the Office of the Municipal Clerk at 490-4210, or Fax 490-4208.

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Report Approved by:

Paul Dunphy, Director of Planning & Development Services

(Attachment 1)
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 $m/kg^{1/2}$, 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 $m/kg^{1/2}$ 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.

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 $m/kg^{1/2}$.

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 copy of a pre-blast survey is submitted and approved by the Inspector;

(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.

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 ±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

Frequency, Hz	Particle Velocity - mm/s
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 ±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

(Attachment 2)
HALIFAX REGIONAL MUNICIPALITY
ADMINISTRATIVE ORDER NUMBER 15
Respecting Licenses, Permits and Processing Fees

BE IT RESOLVED as an Administrative Order of the Council of the Halifax Regional Municpality as follows:

1. Schedule "A" of Administrative Order 15 is amended by adding a new Section 10 as follows:

10.	**By-law #**	**Short Title**	**Section**	**Fee**
	B-600	Blasting By-law	s.(18)	
	For Blasting less than 50 cubic metres of rock			$100.00
	All other applications			$600.00

Done and passed this 18th day of November, 2003.

_____
Mayor

_____
Municipal Clerk

(Attachment 3)
Scaled Distance Method

The main factors which determine the vibration of a building due to blasting are:

1. the distance of the building from the location of the blast; and
2. the weight of the explosive charge used.

The Scaled distance is a value which combines both of these factors and is used by Blasters to predict what the ground vibration (particle velocity) will be.

The Scaled Distance is the actual distance (in feet or metres) divided by the square root of the weight of explosive used. Mathematically it is written as:

$$SD = \frac{D}{\sqrt{W}}$$

Where:

- **"SD"** *is the Scaled Distance;*
- **"D"** *is the distance between the building and blast; and*
- **"W"** *is the weight of the explosive charge*

<u>Using the Scaled Distance Method to Determine the Pre-blast Survey Area:</u>

To determine a safe distance from a blast, the scaled distance is multiplied by the square root of the explosive charge, as follows:

$$D = SD \times \sqrt{W}$$

Where:

- **"D"** is the pre-blast survey area;
- **"SD"** is the Scaled Distance; and
- **"W"** is the maximum weight of explosive charge which will be used on a project.

In the proposed by-law the pre-blast survey area is based on a scaled distance of 32 $m/kg^{1/2}$, so the survey area is :

$$D = 32\sqrt{W}.$$

The following table compares the preblast survey areas for actual projects in HRM.

Project	Current Pre-Blast Survey Area	Proposed Pre-Blast Survey Aea
Fairmount Subdivision **Urban, mass and trench excavation in Haifax Formation (Slate)**	150 m	200 m
Parkland Drive **Urban, mass & trench excavation in Goldenville Formation (Greywacke)**	150 m	170 m
Confederation Drive **Rural,mass excavation with shallow cuts in Granite Formation**	150 m	130 m