

Chapter ILHR 7

EXPLOSIVE MATERIALS

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Note: Chapter Ind 5 as it existed on April 30, 1985 was repealed and a new chapter ILHR 7 was created effective May 1, 1985.

Subchapter I
General Requirements

ILHR 7.01 Purpose. The purpose of this chapter is to establish minimum safeguards to life, health and property by the adoption of reasonable and effective standards relating to explosive materials.

History: Cr. Register, April, 1985, No. 352, eff. 5-1-85.

ILHR 7.02 Scope. (1) **APPLICATION.** Except as provided in sub. (2), the provisions of this chapter shall apply to the manufacture, use, storage, handling and intrastate transportation of explosive materials.

(2) **EXEMPTIONS.** The provisions of this chapter shall not apply to:

(a) Explosive materials while in the course of transportation via railroad, water, highway or air when the explosive materials are moving under the jurisdiction of, and in conformity with, regulations adopted by any federal department or agency;

(b) The laboratories of schools, colleges and similar institutions when confined to the purpose of instruction or research, or to explosive materials in the forms prescribed by the official United States Pharmacopeia or the National Formulary and used in medicines and medicinal agents;

(c) The emergency operations of any government including all departments, agencies and divisions thereof, if they are acting in their official capacity and in the proper performance of their duties or functions;

(d) Pyrotechnics commonly known as fireworks, including signaling devices such as flares and torpedoes;

(e) Small arms ammunition; and

(f) Gasoline, fertilizers and propellant-actuated power devices or tools.

History: Cr. Register, April, 1985, No. 352, eff. 5-1-85.

ILHR 7.04 Definitions. The following definitions shall apply in this chapter. Terms not herein defined shall be understood to have their usual and ordinary dictionary meaning.

(1) "Airblast" means an airborne shock wave resulting from the detonation of explosives.

(1m) "Approved" means approval granted by the department.

(2) "Barricade" means natural features of the ground, such as hills, or timber of sufficient density that the surrounding exposures can not be seen when the trees are bare of leaves, or an artificial mound or revetted wall of earth, wood, concrete or other suitable materials a minimum thickness of 3 feet at the top.

(3) "Blaster" means any individual holding a valid blaster's license issued by the department.

(4) "Blasting" means any method of loosening, moving or shattering masses of solid matter by use of an explosive.

(5) "Blasting agent" means any explosive material or mixture, consisting of a fuel and oxidizer, intended for blasting, not otherwise classified. Register, May, 1987, No. 377

fied as an explosive, if the material or mixture cannot be detonated by a No. 8 test detonator when unconfined.

(6) "Blasting cap" means a metallic capsule containing an initiating explosive and a base charge, open at the upper end to accept a section of safety fuse and used for initiating the primer or main charge.

(7) "Blasting mat" means a heavy mat of woven rope, steel wire, or chain, or a mat improvised from timber, poles, rubber tires or other approved materials, placed over loaded holes to minimize the amount of rock and other debris that might be thrown into the air.

(8) "Blasting operation" means any operation, enterprise or activity involving the use of blasting.

(8m) "Blasting resultants" means the physical manifestations of forces released by blasting, including but not limited to projectile matter, vibration and concussion, which might cause injury, damage or unreasonable annoyance to persons or property located outside the controlled blasting site area.

(9) "Cap-sensitive explosive material" means any explosive material that can be detonated by means of a No. 8 test detonator when unconfined.

(10) "Community" means a city, village or built-up inhabited area.

(10m) "Controlled blasting site area" means the area that surrounds a blasting site and:

(a) Is owned by the operator; or

(b) With respect to which, because of property ownership, an employment relationship or an agreement with the property owner, the operator can take reasonably adequate measures to exclude or to assure the safety of persons and property.

(11) "Crosscut" means a small passageway driven at right angles to the main entry to connect it with a parallel entry or air course.

(12) "Delay electric blasting cap" means an electric blasting cap with a timing element interposed between the ignition head and the detonating compound.

(13) "Department" means the department of industry, labor and human relations.

(14) "Detonator" means any device containing a detonating charge that is used for initiating detonation in an explosive. The term includes, but is not limited to, electric blasting caps of instantaneous and delay types, blasting caps for use with safety fuses, detonating cord delay connectors, and nonelectric instantaneous and delay blasting caps.

(15) "Drift" means a horizontal passage underground which follows the vein, as distinguished from a crosscut, which intersects it.

(16) "Electric blasting cap" means a blasting cap designed for, and capable of, initiation by means of an electric current.

(17) "Explosion" means the substantially instantaneous release of both gas and heat.

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(18) "Explosive" means any chemical compound, mixture or device, the primary or common purpose of which is to function by explosion unless the compound, mixture or device is otherwise classified by the department by rule.

(19) "Explosive materials" means explosives, blasting agents and detonators. The term includes, but is not limited to, dynamite and other high explosives, slurries, emulsions, water gels, blasting agents, black powder, pellet powder, initiating explosives, detonators, safety fuses, squibs, detonating cord, igniter cord and igniters.

(19h) "Flyrock" means rock that is propelled through the air from a blast.

(19r) "Ground vibration" means a shaking of the ground caused by the elastic wave emanating from a blast.

(20) "High explosives" means explosive materials which are characterized by a very high rate of reaction, high pressure development, and the presence of a detonation wave in the explosion.

(21) "Highway" means any public street, public alley or public road.

(22) "Inhabited building" means a building regularly occupied in whole or in part as a habitation for human beings, or any church, schoolhouse, railroad station, store or other structure where people are accustomed to assemble, except any building or structure occupied in connection with the manufacture, transportation, storage or use of explosive materials.

(23) "Low explosives" means explosive materials which are characterized by deflagration or a low rate of reaction and the development of low pressures. The term includes, but is not limited to black powder, safety fuses, igniters, igniter cords and fuse lighters.

(24) "Magazine" means any building, container or structure other than an explosives manufacturing building, of approved construction used for the storage of explosive materials.

(25) "No. 8 test detonator" means a detonator with 0.40 to 0.45 grams pentaerythritol tetranitrate (PETN) base charge pressed to a specific gravity of 1.4 grams/cubic centimeter (g/cc) and primed with standard weights of primer.

(26) "Non-electric delay blasting cap" means a detonator with an integral delay element used in conjunction with, and capable of being initiated by, a detonating impulse.

(27) "Operator" means the person who is responsible for a blasting operation at a blasting site.

(27m) "Particle velocity" means any measure of ground vibration describing the velocity at which a particle of ground vibrates when excited by a seismic wave.

(28) "Person" means any individual, corporation, company, association, firm, partnership, society or joint stock company.

(28m) "Powder factor" means any ratio between the amount of powder loaded and the amount of rock broken.

(29) "Primer" means a capped fuse, electric detonator or any other detonating device inserted in or attached to a cartridge of explosive.

(30) "Railway" means any steam, electric, diesel-electric or other rail track system which carries passengers for hire.

(31) "Stemming" means the inert material, such as drill cuttings, used in the collar portion or elsewhere of a blast hole to confine the gaseous products of detonation.

(32) "Unreasonable annoyance" means an excessive, repeated noise, action or other disturbance that is not justified by reason.

History: Cr. Register, April, 1985, No. 352, eff. 5-1-85; renum. (1) to be (1m), cr. (intro.), (1), (8m), (10m), (19h), (19r), (27m), (28m) and (32), Register, May, 1987, No. 377, eff. 6-1-87.

ILHR 7.05 Inspections. (1) **GENERAL REQUIREMENTS.** The authorized inspectors of the department, upon presenting appropriate credentials to the owner, operator or agent in charge, may:

(a) Enter without delay and at reasonable times any factory, plant, establishment, construction site or other area, workplace or environment where work is performed by an employe of an employer; and

(b) Inspect and investigate during regular working hours and at other reasonable times, and within reasonable limits and in a reasonable manner, any place of employment and all pertinent conditions, structures, machines, apparatus, devices, equipment and materials therein, and to question privately any employer, owner, operator, agent or employe.

(2) **REPRESENTATION.** The inspector, before making an inspection, shall contact the employer or employer's representative who shall be given an opportunity to accompany the inspector during the physical inspection of any workplace under sub. (1).

Note: The department policy is not to give advance notice, but in the scheduling and in the act of inspecting it may not always be possible to avoid advance notice or to obtain accompaniment, but otherwise these rules will be diligently observed.

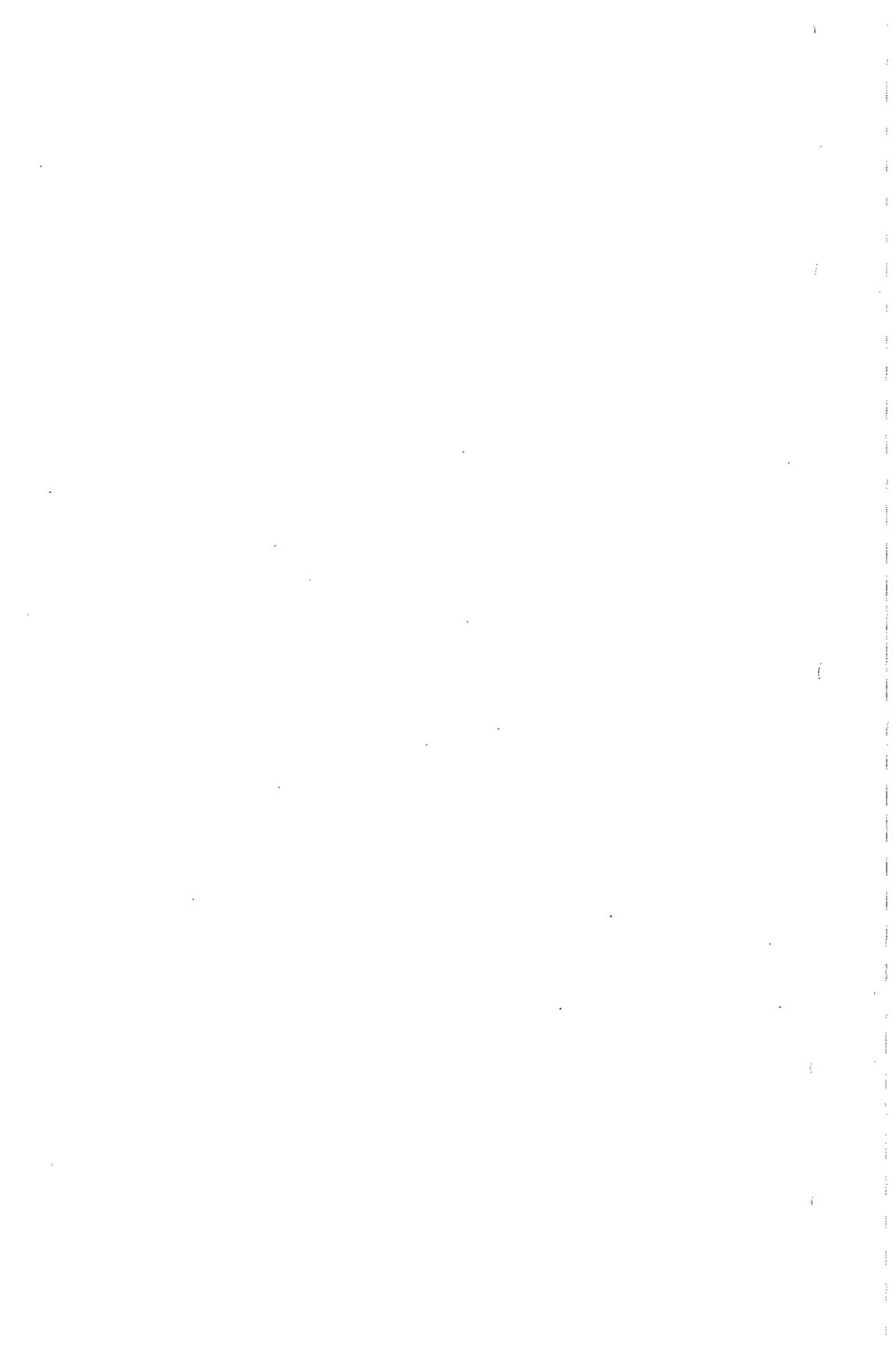
History: Cr. Register, April, 1985, No. 352, eff. 5-1-85.

ILHR 7.06 Fees. Fees for the registration of blasters, safety inspections and petitions for variance shall be submitted as specified in ch. Ind 69.

History: Cr. Register, April, 1985, No. 352, eff. 5-1-85.

ILHR 7.07 Enforcement. The provisions of this chapter shall be enforced by the department, or by municipal officials or other local officials

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(d) Before resuming operations, the blaster shall examine the area for misfired shots and unexploded or burning explosive materials. In case burning explosive materials are observed, no attempt may be made to extinguish them and persons shall retire to a safe place and remain there at least one hour.

(3) **HANDLING MISFIRES.** The handling of misfires shall be attempted only by blasters thoroughly experienced with this work. Whenever a blaster experienced with handling misfires is not available, the manufacturer shall be consulted for further advice.

History: Cr. Register, April, 1985, No. 352, eff. 5-1-85.

ILHR 7.37 Blasting log. (1) **GENERAL.** A blasting log shall be required for each blast fired.

(2) **FILING AND AVAILABILITY.** All blasting logs shall be kept on file by the blaster for a minimum period of 3 years, and shall be made available to the department upon request.

(3) **INFORMATION.** Each blasting log shall contain at a minimum the following items of information:

- (a) Name and license number of blaster in charge of the blast;
- (b) Blast location;
- (c) Date and time of blast;
- (d) Weather conditions at time of blast;
- (e) Diagram of blast layout;
- (f) Number of holes;
- (g) Hole depth and diameter;
- (h) Spacing;
- (i) Burden;
- (j) Maximum holes per delay;
- (k) Maximum pounds of explosives per delay;
- (l) Depth of stemming used;
- (m) Total pounds of explosives used;
- (n) Distance to nearest inhabited building not owned by operator;
- (o) Type of initiation used;
- (p) Powder factor; and
- (q) Seismographic and airblast records, if required, which shall include:
 - 1. Type of instrument and last laboratory calibration date;
 - 2. Exact location of instrument and the date, time, and distance from the blast;
 - 3. Name of the person and firm taking the reading;

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4. Name of the person and firm analyzing the seismographic record; and

5. The vibration and airblast levels recorded.

History: Cr. Register, April, 1985, No. 352, eff. 5-1-85; cr. (3) (p) and (q), Register, May, 1987, No. 377, eff. 6-1-87.

Subchapter V Manufacture of Explosive Materials

ILHR 7.40 Manufacture of high explosives. High explosives manufacturing operations shall be conducted in accordance with methods approved by the department.

Note: Manufacturing procedures recommended by the institute of makers of explosives are generally acceptable.

History: Cr. Register, April, 1985, No. 352, eff. 5-1-85.

ILHR 7.41 Fixed location mixing of blasting agents. Buildings and other facilities used for mixing of blasting agents at a fixed location shall comply with the requirements of this section.

(1) **LOCATION OF MIXING PLANT.** Plants for mixing blasting agents shall be isolated from inhabited buildings, passenger railroads and public highways in accordance with the Table of Distances for Storage of Explosives as specified in s. ILHR 7.218. Separation distances for ammonium nitrate and blasting agents from explosives or blasting agents shall be in accordance with s. ILHR 7.220.

(2) **FUEL STORAGE.** All fuel storage facilities shall be separated from the mixing plant and located so that the fuel will drain away from the mixing plant should rupture of the tank occur, or diked in a manner to contain the tank contents in case of rupture.

Note: See ch. Ind 8 for complete requirements pertaining to flammable and combustible liquids.

(3) **LAYOUT OF MIXING PLANT.** The layout of the mixing plant shall provide separation between the raw ammonium nitrate, manufacturing operations, and the storage of finished product.

(4) **MIXING PLANT CONSTRUCTION.** (a) Mixing plants shall be constructed of noncombustible materials or of sheet metal on wood studs.

(b) The plant shall be properly vented with vents equipped with spark-arresting screens.

(c) The floor of the mixing plant shall be of concrete or of other approved nonabsorbent material.

(d) Floors shall have no drains or piping into which molten materials could flow and be confined during a fire.

Note: See chs. ILHR 50-64 for complete building and heating, ventilating and air conditioning requirements. Complete requirements for automatic fire suppression systems are also contained in these chapters.

(5) **MIXING PLANT HEAT.** Heat for the mixing plant shall be provided from a source outside the building, except that space heaters which do not depend on a combustion process within the heating unit may be used

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if they are properly installed and maintained and are located no closer than 30 inches from raw materials and finished product.

(6) ELECTRICAL EQUIPMENT. All electrical equipment located in the mixing plant shall conform with the requirements of ch. ILHR 16 for installation in a hazardous area.

History: Cr. Register, April, 1985, No. 352, eff. 5-1-85.

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containers and stored in a wooden box or cabinet having walls of at least one-inch nominal thickness.

(3) **COMMERCIAL DISPLAY.** Not more than one pound of black powder may be displayed in commercial establishments.

(4) **COMMERCIAL STORAGE.** (a) Commercial stocks in a building in quantities not exceeding 50 pounds shall be stored in a Type 4 indoor magazine.

(b) Commercial stocks in quantities exceeding 50 pounds shall be stored in a Type 4 outdoor magazine.

(5) **COMBINED STORAGE.** If smokeless propellants are stored in the same magazine with black powder, the total quantity shall not exceed that permitted for black powder.

History: Cr. Register, April, 1985, No. 352, eff. 5-1-85.

Subchapter VII Blasting Resultants

ILHR 7.60 Regulation of blasting resultants. Pursuant to s. 101.15 (2) (e), Stats., the purpose of this subchapter is to provide for the establishment of uniform limits on permissible levels of blasting resultants to reasonably assure that blasting resultants do not cause injury, damage or unreasonable annoyance to persons or property outside any controlled blasting site area.

History: Cr. Register, May, 1987, No. 377, eff. 6-1-87.

ILHR 7.61 Preblasting notification. At least 24 hours before initiation of blasting, the operator shall notify all residents or owners of affected dwellings or other structures on how to request a preblasting survey. Affected dwellings or other structures shall be determined based on the scaled-distance equation specified in s. ILHR 7.64 (4) (c) 1. Using a scaled-distance factor (D_s) of 100, affected dwellings or other structures shall be those located within the distance (D) of the controlled blasting site area for the weight per delay (W) of explosives to be used.

Note 1: An example calculation to determine D is as follows: For 4 pounds of explosives, $D = D_s(W)^{1/2} = 100(4)^{1/2} = 200$ feet.

Note 2: A resident or owner of an affected dwelling or other structure may request a preblasting survey. The operator or a person selected by the resident or owner may conduct a preblasting survey of the dwelling or structure and prepare a report of the survey. A preblast survey provides a baseline record of the condition of a structure against which the effects of blasting can be assessed. When combined with a postblast survey, this will help assure equitable resolution of blast damage claims. While striving to minimize airblast, flyrock and ground vibrations, the blaster should inform local residents of the need for and the importance of blasting. A preblast survey increases communications between the public and the blaster, helps the blaster to maintain good community relations, and may provide protection against later legal claims of damage or nuisance.

History: Cr. Register, May, 1987, No. 377, eff. 6-1-87.

ILHR 7.62 Blasting schedules. All surface blasting shall be conducted between sunrise and sunset, unless:

(1) More restrictive time periods are specified by the department; or

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(2) Nighttime blasting is approved by the department based on a showing by the operator that the public will not be adversely affected by noise and other impacts.

History: Cr. Register, May, 1987, No. 377, eff. 6-1-87.

ILHR 7.63 Instrumentation. All seismographs used for compliance with this subchapter shall meet the following minimum specifications:

- (1) Seismic frequency range: 2 to 200 Hz (+3 Hz).
- (2) Acoustic frequency range: 2 to 200 Hz (+1 dB).
- (3) Velocity range: 0.02 to 4.0 inches/second.
- (4) Sound range: 110 to 140 dB linear.
- (5) Transducers: Three mutually perpendicular axes.
- (6) Recording: Provide time-history of waveform.
- (7) Calibration: Be laboratory calibrated as often as necessary, but at least once every 12 months according to manufacturer's recommendations.

History: Cr. Register, May, 1987, No. 377, eff. 6-1-87.

ILHR 7.64 Control of adverse effects. (1) **GENERAL REQUIREMENTS.** Blasting shall be conducted so as to prevent injury and unreasonable annoyance to persons and damage to public or private property outside the controlled blasting site area.

(2) **AIRBLAST.** (a) *Limits.* Airblast shall not exceed the maximum limits listed in Table 7.64-1 at the location of any dwelling, public building, place of employment, school, church, or community or institutional building outside the controlled blasting site area.

Table 7.64-1
AIRBLAST LIMITS

Lower frequency limit of measuring system, in Hz	Maximum level, in dB
2 Hz or lower — flat response	133 peak
6 Hz or lower — flat response	129 peak

(b) *Monitoring.* 1. The operator shall conduct periodic monitoring with such frequency as is necessary to ensure compliance with the airblast standards. The department may require airblast measurement of any or all blasts and may specify the locations at which such measurements are taken.

2. The measuring systems used shall have an upper-end flat frequency response of at least 200 Hz.

(3) **FLYROCK.** Flyrock travelling in the air or along the ground:

(a) Shall remain within the controlled blasting site area; and

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(b) Shall not be cast from the blasting site more than one-half the distance to the nearest inhabited building within or outside of the controlled blasting site area.

(4) GROUND VIBRATION. (a) *General.* 1. The maximum ground vibration at the location of any dwelling, public building, place of employment, school, church, or community or institutional building outside the controlled blasting site area shall be established in accordance with either the maximum peak-particle-velocity limit of par. (b), the scaled-distance equation of par. (c), the blasting-level chart of par. (d), or by the department under sub. (5).

2. All structures in the vicinity of the blasting area, not listed in subd. 1, such as water towers, pipelines and other utilities, tunnels, dams, impoundments and underground mines shall be protected from damage by establishment by the operator of a maximum allowable limit on the ground vibration. The operator shall establish the limit after consulting with the owner of the structure.

(b) *Maximum peak particle velocity.* 1. An operator may use the maximum ground vibration limits listed in Table 7.64-2.

Table 7.64-2
PEAK PARTICLE VELOCITY LIMITS

Type of structure	Maximum allowable peak particle velocity for ground vibration, in/sec	
	At frequencies below 40 Hz ¹	At frequencies of 40 Hz and greater
Modern homes and structures with drywall interiors	0.75	2.0
Older homes and structures with plaster on wood lath construction for interior walls	0.50	2.0

¹ All spectral peaks within 6 dB (50 pct) amplitude of the predominant frequency must be analyzed.

2. Ground vibration shall be measured as the particle velocity. Particle velocity shall be recorded in 3 mutually perpendicular directions. The maximum allowable peak particle velocity shall apply to each of the 3 measurements and the vector sum of the 3 measurements.

3. A seismographic record shall be provided for each blast.

(c) *Scaled-distance equation.* 1. An operator may use the scaled-distance equation, $W = (D/D_s)^2$, to determine the allowable charge-weight of explosives to be detonated in any 8-millisecond period, without seismic monitoring; where W = the maximum weight per delay of explosives, in pounds; D = the distance, in feet, from the blasting site to the nearest structure listed in par. (a) 1; and D_s = the scaled-distance factor listed in Table 7.64-3.

2. The development of a modified scaled-distance factor may be authorized by the department on receipt of a written request by the operator, supported by seismographic records of blasting at the site. The modified scaled-distance factor shall be determined such that the particle velocity of the predicted ground vibration will not exceed the prescribed maximum allowable peak particle velocity of par. (b) at a 95-percent confidence level.

Table 7.64-3
SCALED-DISTANCE FACTOR LIMITS

Distance (D) from the blasting site, feet	Scaled-distance factor (D _s) to be applied without seismic monitoring
0 to 300	50
301 to 5,000	55
5,001 and beyond	65

(d) *Blasting level chart.* 1. An operator may use the ground vibration limits found in Figure 7.64 to determine the maximum allowable ground vibration.

2. If the Figure 7.64 limits are used, a seismographic record including both particle-velocity and vibration-frequency levels shall be provided for each blast. The method of analysis shall be subject to discretionary review by the department.

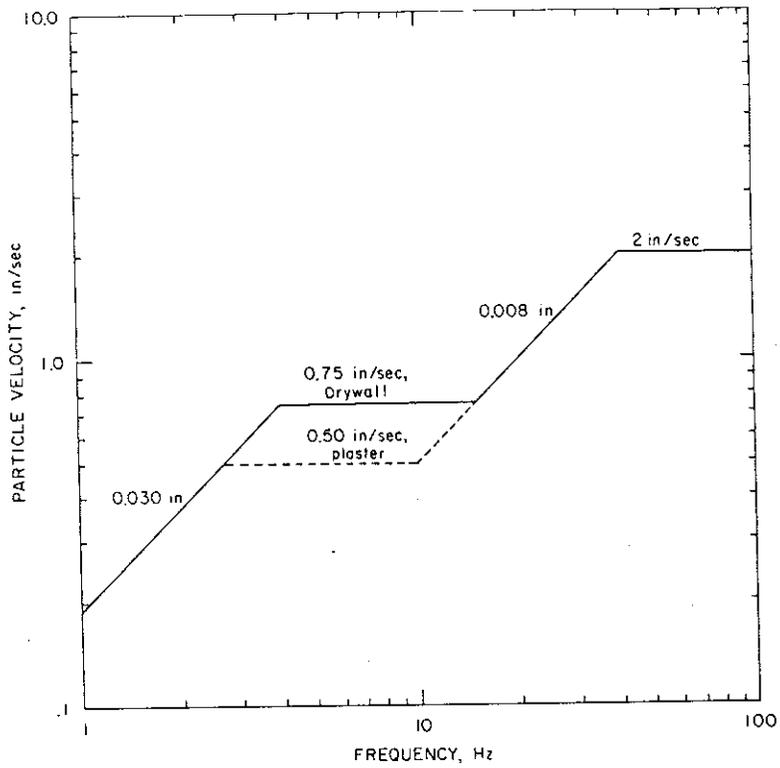


Figure 7.64
BLASTING LEVEL CHART

(e) *Seismic monitoring.* The department may require an operator to conduct seismic monitoring of any or all blasts and may specify the location at which the measurements are taken and the degree of detail necessary in the measurement.

(5) **EXCEPTIONS.** (a) *Exempt area.* The maximum ground vibration and airblast standards of subs. (2) and (4) shall not apply within the controlled blasting site area.

(b) *More restrictive limits.* If necessary to ensure that blasting resultants at a particular blasting site do not cause injury, damage or unreasonable annoyance to persons or property outside any controlled blasting site area, more restrictive limits shall be established by the department.

Note: Local municipalities may have more restrictive regulations than the department.

History: Cr. Register, May, 1987, No. 377, eff. 6-1-87.

Appendix A

PREVENTION OF ACCIDENTS IN
THE USE OF EXPLOSIVE MATERIALS

The prevention of accidents in the use of explosive materials is a result of careful planning and observing the best known practices. The user must remember that a powerful force is being dealt with and that various devices and methods have been developed to assist in directing this force. The user must realize that this force, if misused, may either kill or injure both oneself and one's fellow workers.

It is obviously impossible to include warnings or approved methods for every conceivable situation. A list of suggestions to aid in avoiding the more common causes of accidents is set forth in Appendix B. Information pertaining to explosive materials is available in the Institute of Makers of Explosives Safety Library publications listed below. Copies of these publications may be obtained by writing the Institute of Makers of Explosives, 1575 Eye Street, N.W., Suite 550, Washington, D.C. 20005, or from the explosive materials supplier.

- Construction Guide for Storage Magazines (No. 1)
- American Table of Distances (No. 2)
- Suggested Code of Regulations for the Manufacture, Transportation, Storage, Sale, Possession and Use of Explosive Materials (No. 3)
- Do's and Don'ts (No. 4)
- Glossary of Industry Terms (No. 12)
- Safety in the Transportation, Storage, Handling and Use of Explosive Materials (No. 17)
- Safety Guide for the Prevention of Radio Frequency Radiation Hazards in the Use of Electric Blasting Caps (No. 20)
- IME Standard for the Safe Transportation of Class C Detonators (Blasting Caps) in a Vehicle with Certain Other Explosives (No. 22)

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