

MANITOBA LABOUR AND IMMIGRATION
WORKPLACE SAFETY AND HEALTH

Code of Practice

For the Use of Explosives



**SAFE
WORK**

S SPOT THE HAZARD
A ASSESS THE RISK
F FIND A SAFER WAY
E EVERYDAY

Manitoba 

Code of Practice

for the Use of Explosives

November, 2006



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INTRODUCTION

The Workplace Safety and Health Act, in part, states that it is the employer's responsibility to provide workers with information, instruction, training, supervision and facilities to ensure their safety, health and welfare.

This Code of Practice gives employers and workers practical guidance on how they may fulfill their obligations to protect the safety and health of workers and implement and maintain safe systems of work where there is a requirement or permit for workers to use explosives in the workplace.

In addition to requirements under *The Workplace Safety and Health Act*, the use of explosives in Canada is regulated by *The Explosives Act of Canada*.

Refer to Part 34 of The Workplace Safety and Health Regulation, M.R. 217/2006 for full regulatory requirements.

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INTRODUCTION

This Code of Practice will:

1. Assist in the *development of safe work procedures* for the use of explosives;
2. *Supplement an employer's regular training program* for workers required to use explosives at the workplace;
3. *Assist members of Workplace Safety and Health Committees* in identifying and making recommendations for hazard evaluation and control.

DEFINITIONS

“blaster” – a person who conducts a blasting operation, with or without the assistance of another person.

“blaster’s certificate” – a blaster’s certificate issued by Manitoba Labour and Immigration.

“blasting machine” – an electrical or electro-mechanical device which provides electrical energy for the purpose of energizing electric detonators but does not include batteries by themselves.

“blasting meter” – a test instrument such as a blasting galvanometer, blasting ohmmeter, blasting voltmeter or blasting multimeter used to check detonators and electrical circuits for continuity, resistance, stray currents and other electrical measurements.

“blasting switch” – a device used to permit the firing of electric blasting circuits from power lines and constructed so that the door may only be closed and locked with the switch in the “OFF” position.

“bootleg” – the bottom remnant or an intact portion of a hole that has been charged and blasted, and that contains no visible explosives.

“day box” – a portable unit used for the keeping of explosives during the day and meeting the requirements of the latest edition of “ Magazine Standards for Blasting Explosives and Detonators” as published by the Explosives Division of Energy, Mines and Resources Canada.

“detonator” – a device used to detonate a charge of explosive and includes a blasting cap.

“explosive” – any substance that is made, manufactured or used to produce an explosion or detonation or a pyrotechnic effect, and includes gunpowder and other propellant powders, blasting agents, slurries, water gels, dynamite, detonating cord, lead azide, detonators, ammunition, rockets, fireworks and safety flares.

“extraneous electricity” - unwanted electrical energy greater than 50 milliamps that is present at the blasting area and that could enter an electric blasting circuit including stray current, static electricity, radio frequency energy, and time-varying electric and magnetic fields.

“face” – the rock surface exposed by blasting or excavation.

“firing cable” – a wire that connects an electrical power source with an electric blasting circuit.

“lifter” – the lowest or bottom row of blast holes in a tunnel or bench.

“lead wire” – the wire(s) that connects an electrical power source with a circuit containing electrical detonators.

“magazine” – a fixed unit used for the unattended storage of explosives overnight and which meets the requirements of the latest edition of “Magazine Standards for Blasting Explosives and Detonators” as published by the Explosives Division of Energy, Mines and Resources Canada.

“mishole” – the remnant of a blasted hole containing an explosive that has not been successfully detonated.

“primer” - an assembly consisting of a detonator and a cartridge of explosive.

“supervisor” – a person who is in charge of a workplace or who has authority over a worker, and includes the employer.

“trace” – the part of a drilled hole that remains on the back or side of an excavation after the hole is blasted, but does not include a bootleg.

“tunnel operation” – working below ground, not including a mine.

SAFE WORK PROCEDURES

The Workplace Safety and Health Regulation M.R. 217/2006 – Part 34

- (1) An employer must:
 - (a) develop and implement safe work procedures for the use of explosives, including procedures for removing any misfire;
 - (b) train blasters and other workers who may work in the vicinity of blasting in those safe work procedures; and
 - (c) ensure that the blasters and other workers comply with those safe work procedures.

- (2) The safe work procedures developed and implemented by the employer must be consistent with the code of practice respecting the safe use of explosives issued by the director.

BLASTER CERTIFICATE

M.R. 217/2006 – Part 34

In Manitoba there are four specific classes of blaster certificates issued under the Regulations:

- 1) Unlimited, under which a blaster may detonate explosives by fuse and cap, a non-electrical detonation system or electrical detonation, with no restriction on the number of shots or series.
- 2) Fuse and cap with limited electrical, under which a blaster may detonate a maximum blast of 50 shots by safety fuse and cap assemblies, non-electrical detonation systems or electrical detonators hooked up in a single series.
- 3) Fuse and cap, under which a blaster may detonate a maximum blast of 50 shots by safety fuse and cap assemblies or non-electrical detonation systems.
- 4) Seismic, under which a blaster may detonate a single shot electrical blast for seismic purposes.

In addition, the regulation also provides for classes to be established by the director.

The Workplace Safety and Health Division has established blaster safety training programs and examinations for the different classes of blaster's certificates, including a process for licence renewal.

Manitoba Labour and Immigration CERTIFICATION AND RENEWALS

Those persons passing their examination and providing evidence of sufficient experience by statutory declaration may be issued a blaster's certificate valid for a term of three (3) years. This type of certificate allows the holder to carry out or supervise blasting activities subject to that class of blaster's certificate. An examiner of the Workplace Safety and Health Division will determine whether the candidate has sufficient experience, and is qualified and competent to be issued a particular type of certificate.

Should a candidate pass the written examination but lack the necessary experience, the candidate may be issued a Provisional or learner's certificate, also valid for three (3) years. This type of certificate acknowledges that the candidate has passed a particular examination for a class of blaster's certificate and therefore possesses the basic knowledge of blasting safety rules as applicable to that class of blasting activity. A provisional blaster's certificate allows the holder to perform the specified class of work, but only under the direction and supervision of a duly certified blaster.

At any time during the three (3) year period, when the holder of a provisional certificate has demonstrated to the duly certified blaster that he/she is fully capable of carrying out that class of blasting work under his/her own direction, the duly certified blaster may recommend to an examiner of The Workplace Safety and Health Division that the candidate's certificate be upgraded to regular status. This written declaration must include the candidate's full name and certificate number.

The certificate holder is responsible for ensuring the renewal of his/her blaster's certificates. The certificate holder should notify the division three months prior to their expiry date to make arrangements for renewal of their certificate. Persons demonstrating that they have engaged in blasting for 30 days during the previous three (3) year period will be eligible for automatic renewal at no cost to the certificate holder. Persons who have not had sufficient experience (30 days) will be required to pay for, rewrite and pass their re-examination.

REGULATORY REQUIREMENTS FOR CERTIFICATES

Certificate must be given to person in charge

Prior to using explosives in any operation, a blaster must deliver proof of his or her blaster's certificate to the person in charge of that operation.

Employer's reporting of blaster

If an employer is of the opinion that a blasting operation carried out by a blaster has put the safety or health of any person, including the blaster, at risk, the employer must immediately ensure that:

- (a) the blaster does not perform any further duties as a blaster;
- (b) the actions of the blaster are reported to the director..

Director's suspension of blaster

The director may suspend or cancel the blaster's certificate.

When certificate is suspended

No person whose blasting certificate has been suspended under The Workplace Safety and Health Regulation shall work, and no employer shall require or permit the worker to work in an occupation that involves the use or handling of explosives.

Appeal by certificate holder

In the event of a suspension or cancellation of a blasting certificate under The Workplace Safety and Health Regulation, the holder of the certificate may appeal the suspension or cancellation to the director.

Procedure for reconsideration

A person wishing to appeal the suspension or cancellation of a certificate shall proceed with an appeal within 14 days after receiving notice the person's certificate has been suspended, cancelled or recommended for cancellation. The reconsideration may be initiated by filing a written statement with the director, setting out the grounds upon which the appeal is based.

Director to decide reconsideration

The Director shall decide the reconsideration and may confirm, amend or rescind the suspension or cancellation of the blasting certificate.

GENERAL REQUIREMENTS

Report of dangerous act or occurrence

A person or employer shall, immediately upon discovery, report to the worker's employer and the Workplace Safety and Health Division:

- (a) a dangerous or careless act involving explosives;
- (b) an unsafe condition involving explosives;
- (c) an occurrence where the worker suspects that a fuse, detonator, blasting cap, detonating cord or other explosive might be defective;
- (d) the commission of a dangerous or careless act reported to the employer
- (e) the occurrence of a defective fuse, detonator, blasting cap, detonating cord or explosive, and the employer shall give the safety & health officer/mines inspector:
 - (i) the name of the manufacturer thereof,
 - (ii) if available, the packing slip from the original container thereof, and
 - (iii) all other relevant information available.

General Precautions when using Explosives

No person shall:

- (a) smoke while handling explosives, or within eight (8) m of a place where explosives are stored or being handled;
- (b) take or make an open flame in a magazine or within eight (8) m of a place where explosives are stored or being handled;
- (c) abandon or leave any explosive unattended except in a magazine or designated storage place;
- (d) commit a dangerous or careless act with an explosive or where explosives are stored or being handled; or
- (e) store explosives within eight (8) m of flammable liquids or compressed gas.

Storage of explosives

Explosives shall, at all times, be stored in magazines constructed and maintained in accordance with Storage Standard for industrial Explosives (2001 Edition) published by the Explosives Division of Natural Resources Canada.

Transportation of explosives

Where explosives are to be transported on surface, the employer or blaster shall ensure that transportation occurs in accordance with:

- *The Explosives Act* (Canada), and
- Part VI (Transportation by Road and Private Railway) of the Explosives Regulation.

Precautions before drilling

No person shall commence drilling in a workplace until a blaster has:

- (a) carefully examined the exposed faces for misholes and cut-off holes;
- (b) washed the previously blasted area;
- (c) washed and cleaned out any bootlegs with rigid non-sparking scrapers or wash pipes;
- (d) conspicuously identified the bootlegs; and
- (e) inserted lifter sticks or plugs into the lifters or remnants of lifters.

Handling of stored explosives

An employer shall ensure that:

- (a) when explosives are removed from a storage place, explosives that have been stored the longest are used first
- (b) explosives in a storage place that are found to have deteriorated are promptly removed from the storage place and disposed of without delay;
- (c) tools and equipment for opening and handling explosive containers and for the preparation and capping of safety fuses are of a type designed for the purpose;;
- (d) no article of iron or steel, other than articles on a person, is taken into a place where explosives are stored; and
- (e) every storage place for explosives is kept clean.

Warming of explosives

No person shall use an open fire, a steam boiler or direct contact with steam or hot water to warm explosives.

Primers

The blaster in charge of the blast site shall ensure that primers are made up:

- (a) as near as is practicable to the place where they are to be used; and
- (b) only in sufficient numbers for the immediate work at hand.

Fuses

Where safety fuses are used in a blasting operation, the employer shall:

- (a) supply a capped fuse of uniform, standard length designed for the operation at hand;

- (b) identify the uncapped ends of the fuse as to its length.

More than one shot fired

Where more than one shot is to be fired with a safety fuse in a blasting operation:

- (a) the blaster must use an igniter cord to connect the safety fuse; and
- (b) the blast shall be fired from one of the ignition points.

Marking of misholes

The blaster making the examination shall mark each mishole:

- (a) conspicuously with paint or crayon; and
- (b) with a single capital M in a conspicuous paint or crayon.

Abandonment of blast site

The employer shall ensure that each site, before work is discontinued, has the rock broken at the firing of the last round cleared from the face, and the whole face of the site is washed down and examined for misholes or cut-off holes.

Misfires

Where an explosive charge has misfired or is suspected of having misfired, the employer, at a safe time and without undue delay, shall cause the charge to be:

- (a) reblasted; or
- (b) washed out, unless the charge contains an explosive that is:
 - (i) nitroglycerine sensitized;
 - (ii) not water soluble;
 - (iii) not identified by the employer and the blaster in the safe work procedures for reblasting; or
 - (iv) the explosive charge contains a detonator.

Blasting procedure for misfires

The employer and the blaster shall develop safe work procedures for re-blasting that will identify:

- (a) the type of explosives that may be washed out of a hole; and
- (b) the equipment and method to be used.

Misholes not reblasted or checked before end of shift

Where at the end of a shift, there is, or is suspected to be, a mishole that has not been reblasted or, if reblasted, has not been checked:

- (a) that fact, together with the location of the hole if known, shall be reported by the worker to his or her supervisor who shall report to the supervisor in charge of the next shift of workers going into the blasting site; and
- (b) in addition to any verbal communication, the report referred to in clause (a) shall be recorded in the shift log by the supervisor and countersigned by the oncoming supervisor before work is commenced by that shift of workers.

Drilling near misholes and bootlegs

No worker shall drill a hole or cause or permit a hole to be drilled:

(a) in a tunnel operation on:

- (i) a face containing a mishole;
- (ii) within 1.5 m of a muckpile which might conceal a mishole;
- (iii) a face adjacent to a face containing a mishole where any part of the hole to be drilled could come within 1.5 m of the mishole; or
- (iv) less than 160 mm from a bootleg as measured from the original perimeter of the drill hole socket.

(b) at a surface location:

- (i) less than 4.5 m from a hole containing explosives, or a mishole; or
- (ii) less than 300 mm from a bootleg.

Application to hole drilled to blast misfired charge

A hole may be drilled for the purpose of providing an additional hole for the blasting of a misfired charge if the hole is drilled under the direct supervision of a supervisor.

Furthermore, that supervisor must determine the location, the angle of the hole and the depth to which it is drilled.

Drilling near trace hole

A hole may be drilled within 160 mm of the trace of a hole that has been blasted with a water soluble explosive when the trace is washed to ensure that no residual explosive remains.

Remote controlled drilling for mishole or redrilled hole

Where it is impractical to make a thorough examination for a possible mishole, or where a hole that has been blasted has to be redrilled, the employer shall implement a remotely controlled procedure for drilling which shall provide:

- (a) remote controls at a distance established by a competent worker in consultation with the workplace safety and health committee representative; or
- (b) shielding to ensure the safety of the driller.

Procedures for loading and blasting

Every blaster shall implement the following procedures for the loading of explosives and blasting:

- (a) all drill holes shall be of sufficient size to permit the easy and unobstructed insertion of the explosive charge to the bottom of the hole;
- (b) no hole shall be charged with explosives:
 - (i) in any face where drilling is being performed, or
 - (ii) in any bench where drilling is being performed, within eight (8) m of the hole to be charged.
- (c) before charging a hole with explosives, the hole shall be clear of obstruction;

- (d) an explosive in cartridge form shall be left in its original wrapper;
- (e) in charging holes for blasting, no iron or steel tool, rod or pipe shall be used, and no iron or steel tool shall be inserted in a hole containing explosives;
- (f) when holes are loaded pneumatically with explosives:
 - (i) only a semi-conductive hose manufactured for such a purpose shall be used;
 - (ii) loading equipment and mobile equipment designed for loading shall be adequately grounded;
 - (iii) loading equipment shall not be in electrical contact with the grounding system; and
 - (iv) where electrical blasting detonators are used in the hole:
 - a) no plastic or other non-conducting liners shall be used; and
 - b) the detonator shall not be placed in the hole until pneumatic loading of the hole is completed, unless an alternative safe work procedure has been detailed in writing by the employer.
- (g) each hole charged with explosives shall have a detonating agent placed in the charge;
- (h) each charge shall be fired in its proper sequence in the round;
- (i) all holes that are charged with explosives in one loading operation shall be fired in one blasting operation;
- (j) no safety fuse shorter than one (1) m shall be used in a blasting operation, and no safety fuse shall be trimmed or ignited except at the end;
- (k) the burning time of a spitter or timing device shall be less than that of one-half the length of the shortest fuse used, and persons lighting the blast shall retreat immediately after the first spitter or timing device goes out;
- (l) in a workplace where primary blasting is not performed, secondary blasting shall not be conducted using tape fuses; and
- (m) A blaster must ensure that a worker does not use excessive force when tamping explosives.

Interval before return to scene of blast

No worker shall enter or return to, and no employer shall cause or permit a worker to enter or return to, a workplace affected by a blasting operation:

- (a) when a safety fuse is used in connection with a blast, until a time in minutes that is equal to seven times the number of metres in the longest fuse used in the blasting operation elapses after the last shot is heard;
- (b) when the firing is done by means of delay-action detonators and any shot has fired, until ten (10) minutes elapses from the time at which the blast is initiated;
- (c) when a single shot is detonated electrically, until smoke or lack of visibility do not create a hazard;
- (d) when a misfire occurs or is suspected in the blasting operation:
 - (i) where a safety fuse is used, until a time in minutes equal to ten (10) times the number of metres in the longest fuse, or 30 minutes, whichever is the greater, elapses from the time the last shot is heard;

(ii) where electric detonators are used, until 30 minutes elapse from the time of closing the blasting circuit; or

(e) when a misfired hole is reblasted:

(i) until 30 minutes elapse from the time of closing the blasting circuit;

(ii) where more than one shot is involved, until 30 minutes elapse from the time the last shot is heard; or

(iii) where a tape fuse is used, until a period of time equal to ten (10) times the number of metres in the longest fuse, or 30 minutes, whichever is the greater, elapse from the time the last shot is heard.

Repair of electrical circuit

Where a faulty circuit is indicated when an explosive charge has been fired electrically and no shot is heard, the circuit may be repaired immediately after the requirements under *'Precautions when blasting by electricity'* are complied with.

Electrical storms

At a surface operation upon the approach of an electrical storm, the blaster:

(a) shall not permit loading of explosives to be commenced or continued; and

(b) when holes are charged with explosives, shall ensure that all workers are withdrawn from the area and remain at a safe distance until the danger from the electrical storm passes.

Distance of machinery from loaded holes

The blaster shall ensure that every worker maintains a distance greater than:

(a) 8 (eight) m from an internal combustion engine, other than a vehicle used to transport explosives, to a location where explosives are placed;

(b) 8 (eight) m from any part of any machinery, other than the vehicle used to load explosives or stemming, to the collar of a hole which is loaded or being loaded with explosives.

Application to vehicle of person in charge of blasting

Clause (b) does not apply where a vehicle under the supervision of the blaster in charge of blasting is being used:

(a) to clear a blocked hole;

(b) to drill a hole for reblasting a mishole according to the safe work procedures;

(c) while loading a hole that is likely to cave in if the drill is moved; or

(d) to condition the ground.

Blasting of heated material

Where explosives are used to blast or break up material that by reason of its heated condition might cause a premature explosion, the employer shall:

(a) use only explosives manufactured for blasting in heated conditions; and

(b) ensure that only such methods are used as part of the safe work procedures developed.

Certified blaster to be in charge of blasting

A certified blaster, appointed by the employer, shall be in charge of every blast, and shall:

- (a) ensure that, when using tape fuse, at least two workers are present at the blasting operation;
- (b) In an tunnel operation, ensure that the workers referred to in clause (a) carry lights, unless the blasting operation is conducted on the surface in daylight or under artificial light:
 - (i) fix the time for blasting so that the workers are exposed as little as possible to dust, fumes and smoke;
 - (ii) maintain a clock keeping accurate time to enable the workers to check their watches before entering the tunnel; and
- (c) where it is necessary for the safety of the workers, coordinate times of blasting with times of blasting at connecting or adjacent property.

Area affected by the blast

The blaster shall determine the size of the danger area and ensure that, before the final connection to lead wires is made or the charge is initiated, all persons have moved to a suitable shelter or to a safe distance.

Posting of the blast area

At fixed blasting operations, including surface mines and quarries, the employer shall ensure that the warning procedure and blasting signal code are conspicuously posted.

Warning of blast

Before any blast is fired, the blaster responsible for firing the blast shall ensure that:

- (a) all persons leave the blasting site and any vicinity endangered by the blast including any possible intersection of a drill hole;
- (b) all approaches to the blasting site and other places endangered by the blast are guarded by a worker to prevent access until the blast is fired and until the interval set out in the safe work procedures developed;
- (c) due warning is given in every direction by shouting "Fire";
- (d) sufficient audible and visual warning is given to all persons in or near the danger area;
- (e) all roads and approaches to the danger area are guarded or barricaded in order to prevent anyone from entering;
- (f) all machinery and equipment are clear of the effects of the blast; and
- (g) all persons in the vicinity have moved to a safe distance.

Loaded holes to be guarded

The employer and blaster must ensure that when loading crews are not present at the place where holes have been loaded with explosives, an authorized person is physically present to ensure that unauthorized entry is prohibited.

Precautions when blasting by electricity

Where a blasting operation is being done by means of electricity, every blaster shall cause to be implemented, and every worker shall implement the following precautions:

- (a) the ends of the firing cables or wires leading to the blasting site are short-circuited while the leads from the blasting caps are being connected to each other and to the firing cables or wires;
- (b) the short circuit referred to in clause (a) are not removed until all workers have retreated from the blasting site, and it is so located that any premature explosion would be harmless to the worker opening the short circuit;
- (c) before any worker enters or re-enters the blasting area:
 - (i) the firing cables or wires are removed from the source of electricity, and shall be short-circuited, and
 - (ii) the blasting switch if used is locked in the open position.
- (d) where a portable blasting device is used as the source of electricity:
 - (i) the firing cables or wires are not connected to the blasting device until the area is cleared and the leads are required for the immediate firing of shots; and
 - (ii) the firing cables or wires are disconnected and short-circuited immediately after the shots are fired.
- (e) where electric blasting is energized by a power distribution system:
 - (i) each workplace has its own switch, which is kept in the open position until the blast is ready to fire; and
 - (ii) the system is designed with switches at all cable junctions suitable to give the protection required under subsection (c).
- (f) the blasting circuit cables or wires are not permitted to come in contact with lighting or power cables, or other metallic conductors of electricity.

Precautions regarding radio transmitters

No person shall use, and no employer shall permit a worker to use, electrical blasting caps, electric squibs or electric starters in the presence of radio transmitters or other radio frequency fields, except in accordance with the Institute of Makers of Explosives, Safety Library Publication No. 20, titled *Safety Guide for the Prevention of Radio Frequency Radiation Hazards in the Use of Commercial Electrical Detonators*.

Blasting-machines

Blasting-machines shall be inspected regularly and kept in good mechanical condition. The rated capacity of blasting-machines shall never be exceeded unless in accordance with the manufacturer's recommendations.