

GUIDELINES FOR BULK EXPLOSIVE FACILITIES

Minimum Requirements

Base Factories, Satellite Sites, Temporary Bulk Sites,
Mechanical ANFO Operations (Under 100 t),
Trials and Demonstrations

December 14, 2005

Revision 4

Table of Contents

Table of Contents Page 1 of 71

1 Introduction Page 6 of 71

 1.1 Purpose Page 6 of 71

 1.2 Intent Page 6 of 71

 1.3 Other Documents Page 7 of 71

 1.4 Using the Guidelines Page 7 of 71

2 Scope, Limitations and Definitions Page 9 of 71

 2.1 Scope Page 9 of 71

 2.2 Grandfathering Page 9 of 71

 2.3 Definitions and Limitations Page 10 of 71

 2.3.1 Process Vehicle/Process Unit Page 10 of 71

 2.3.1.1 ANFO Pneumatic Delivery Systems Page 11 of 71

 2.3.2 Base Factory Page 11 of 71

 2.3.3 Temporary Factory Sites (Licence) Page 11 of 71

 2.3.3.1 Preliminary Decontamination Page 12 of 71

 2.3.4 Mechanical ANFO Certificates Page 12 of 71

 2.3.4.1 Non-Mechanical ANFO Certificates Page 13 of 71

 2.3.5 Satellite Sites (Certificates) Page 13 of 71

 2.3.5.1 Active and Inactive Satellite Sites Page 14 of 71

 2.3.6 Transfer Sites (Certificate) Page 14 of 71

 2.3.7 Demonstrations (Certificate) Page 14 of 71

 2.3.8 Customer Sites and Distances Page 15 of 71

 2.3.9 Trials (Permissions) Page 15 of 71

 2.3.10 Authorized Products Page 16 of 71

 2.3.11 Heel Page 16 of 71

 2.3.12 Clean Page 16 of 71

 2.3.13 Decontaminated Page 16 of 71

 2.3.13.1 Disposal of Scrap Page 16 of 71

 2.3.14 QD, D2, D4, D5, D7 Page 17 of 71

 2.3.15 Risk Assessment Page 17 of 71

 2.3.16 Ammonium Nitrate (AN) Page 18 of 71

3 Documentation, Fees and Processing Time Page 20 of 71

 3.1 Forms, Fire Permissions and Environmental Assessment Page 20 of 71

 3.1.1 Site Plan, Licence or Certificate Forms Page 20 of 71

3.1.1.1	Site Plan	Page 20 of 71
3.1.1.2	Form 1	Page 21 of 71
3.1.1.3	Forms 2 and 3	Page 22 of 71
3.1.1.4	Form 4	Page 22 of 71
3.1.1.4.1	Authorized Process Vehicle	Page 23 of 71
3.1.1.5	Form 5	Page 23 of 71
3.1.1.5.1	Authorized Customer List	Page 24 of 71
3.1.1.6	Form 6	Page 24 of 71
3.1.1.7	Form 7	Page 25 of 71
3.1.2	Fire Permissions	Page 26 of 71
3.1.3	Environmental Assessment and Spill Contingencies	Page 26 of 71
3.2	Supporting Documentation	Page 26 of 71
3.2.1	General Safety Rules	Page 27 of 71
3.2.2	Inspections and Audits	Page 27 of 71
3.2.3	Training	Page 27 of 71
3.2.4	Procedures	Page 28 of 71
3.2.4.1	Operating Procedures	Page 28 of 71
3.2.4.2	Decontamination Procedures	Page 28 of 71
3.2.4.3	List of Permitted Maintenance Tasks	Page 29 of 71
3.2.4.4	Explosives Disposal and Burning Ground	Page 29 of 71
3.2.4.5	Emergency Response	Page 29 of 71
3.2.4.6	Control of Changes	Page 30 of 71
3.2.4.7	Maintenance Procedures	Page 30 of 71
3.2.4.8	Miscellaneous Safety Procedures	Page 30 of 71
3.3	Fee Structure	Page 30 of 71
3.4	Processing Time	Page 31 of 71
4	Sites, Facilities and Equipment	Page 32 of 71
4.1	Licence or Certificate Site	Page 32 of 71
4.1.1	Location	Page 32 of 71
4.1.2	Fencing	Page 32 of 71
4.1.3	Gates and Control of Fire-Producing Devices	Page 32 of 71
4.1.4	Storage and Control of Raw Materials	Page 33 of 71
4.1.5	Services and Tools	Page 33 of 71
4.1.6	Heated Washing Facilities	Page 33 of 71
4.1.7	Codes	Page 33 of 71
4.1.8	Other	Page 34 of 71
4.2	Buildings in General	Page 34 of 71
4.2.1	Construction	Page 34 of 71

4.2.2	Barricades	Page 35 of 71
4.2.3	Use of Brass and Copper	Page 35 of 71
4.2.4	Connecting Hoses	Page 35 of 71
4.3	Parking Areas	Page 36 of 71
4.3.1	Location	Page 36 of 71
	4.3.1.1 Parking of ANFO Process Units at Customer Sites	Page 36 of 71
	4.3.1.2 Parking at Isolated Areas	Page 36 of 71
4.3.2	Number of Units and Explosives Quantity	Page 36 of 71
4.4	Tankers, Tanks or Silos for Pumpable Explosives	Page 36 of 71
4.4.1	Location	Page 36 of 71
4.4.2	Installation	Page 37 of 71
4.4.3	Construction	Page 37 of 71
4.4.4	Other	Page 37 of 71
4.5	Fuel Storage	Page 37 of 71
4.5.1	Location	Page 37 of 71
4.5.2	Dyking	Page 38 of 71
4.5.3	Prevention of Syphoning	Page 38 of 71
4.5.4	Other	Page 38 of 71
4.5.5	Use of Waste Oil	Page 39 of 71
4.6	Ammonium Nitrate Storage	Page 40 of 71
4.6.1	Location	Page 40 of 71
4.6.2	Construction	Page 40 of 71
4.6.3	Storage in Tote Bags	Page 40 of 71
4.6.4	Other	Page 41 of 71
4.7	Washing Facilities	Page 41 of 71
4.7.1	Location	Page 41 of 71
	4.7.1.1 Combined Washing/Maintenance Facility	Page 41 of 71
	4.7.1.2 Separate Washing Facility	Page 42 of 71
	4.7.1.3 Separate Maintenance Facility	Page 42 of 71
	4.7.1.4 Washing/Maintenance With Explosives Storage	Page 42 of 71
	4.7.1.5 Mechanical ANFO Certificate	Page 42 of 71
4.7.2	Other	Page 42 of 71
4.8	Washing System	Page 42 of 71
4.8.1	Location	Page 42 of 71
	4.8.1.1 Fuel-Fired Wash System	Page 42 of 71
	4.8.1.2 Electric Wash System, Not CEMA 4X	Page 43 of 71
	4.8.1.3 Electric Wash System, CEMA 4 or 4X	Page 43 of 71
4.8.2	Requirements for the Separate Room	Page 43 of 71

4.8.3	Performance	Page 43 of 71
	4.8.3.1 Washing for ANFO Units	Page 44 of 71
4.8.4	Waste Water and Scrap	Page 44 of 71
4.9	Lunchroom and Welfare	Page 44 of 71
4.9.1	Location	Page 44 of 71
4.10	Office	Page 44 of 71
4.10.1	Location	Page 44 of 71
4.11	Other Storage	Page 45 of 71
4.11.1	Location	Page 45 of 71
4.11.2	Chemicals	Page 45 of 71
4.11.3	Contaminated Parts	Page 45 of 71
4.11.4	Waste and Scrap	Page 46 of 71
4.12	Laboratory	Page 46 of 71
4.13	Laundry	Page 46 of 71
4.14	Electrical Requirements	Page 46 of 71
4.14.1	Electrical Room - Motor Control Centre (MCC)	Page 47 of 71
4.14.2	Power Supply	Page 48 of 71
4.14.3	Grounding	Page 48 of 71
4.14.4	Separate Rooms for Electrical Equipment	Page 48 of 71
4.14.5	Controls	Page 49 of 71
4.15	Equipment Powered by Internal Combustion Engine	Page 49 of 71
4.16	Hydraulic Systems	Page 49 of 71
4.17	Pumps	Page 49 of 71
4.17.1	Progressive Cavity Pump	Page 50 of 71
4.17.2	Other Emulsion or Watergel Pumps	Page 50 of 71
4.18	Augers	Page 51 of 71
4.19	Heating and Furnaces	Page 51 of 71
4.19.1	Location	Page 51 of 71
4.19.2	Fuel Supply	Page 51 of 71
4.19.3	Other	Page 52 of 71
4.20	Process Vehicles	Page 52 of 71
4.20.1	Fire Extinguishers	Page 52 of 71
4.20.2	Electricals	Page 53 of 71
	4.20.2.1 Wiring	Page 53 of 71
	4.20.2.1.1 Class 2 Circuits	Page 53 of 71
4.20.3	Fuel Tanks and Lines	Page 54 of 71
4.20.4	Brakes and Steering	Page 54 of 71
4.20.5	Tires	Page 54 of 71
4.20.6	Exhaust	Page 54 of 71

4.20.7	Compressors	Page 54 of 71
4.20.8	Mobile Process Vehicle Emulsion Tank	Page 55 of 71
4.20.8.1	Hatch on Emulsion Tank	Page 57 of 71
4.20.9	Ammonium Nitrate Bin	Page 57 of 71
4.20.10	Process Fuel Oil Tank	Page 57 of 71
4.20.10.1	Venting	Page 57 of 71
4.20.11	Gassing Solution Tank	Page 58 of 71
4.20.12	Aluminum Bin	Page 58 of 71
4.20.13	Delivery Hose Reel	Page 58 of 71
4.20.14	AN Pneumatic Delivery Systems, AN Blow Loaders, POGs	Page 58 of 71
4.20.14.1	Pneumatic Hoses for Delivery of ANFO	Page 58 of 71
4.20.15	Loading of Process Units	Page 59 of 71
4.20.15.1	Reloading of Process Units	Page 59 of 71
4.20.15.2	Reloading of Process Units With AN	Page 59 of 71
4.20.15.3	Loading ANFO Process Units at Rail Sidings	Page 59 of 71
4.21	Forklifts and Pallet Movers	Page 60 of 71
4.21.1	Electrical Forklifts and Pallet Movers	Page 60 of 71
4.21.1.1	Charging	Page 60 of 71
4.21.2	Diesel Forklifts	Page 60 of 71
4.21.2.1	Fire Extinguishers	Page 60 of 71
4.21.2.2	Electricals and Venting	Page 60 of 71
4.21.2.3	Operations	Page 60 of 71
4.21.3	Propane Forklifts	Page 61 of 71
Appendix A - Additional Terms		Page 62 of 71
Appendix B - Electrical Schematic		Page 67 of 71
Appendix C - Risk Assessment and QD Derogation		Page 68 of 71
Appendix D -Table of Options		Page 70 of 71

1 Introduction

1.1 Purpose

To provide guidelines that describe the minimum requirements for sites and equipment for handling bulk explosives; the guidelines will be used to evaluate the acceptability of licence or certificate applications. Specifically, this covers Base Factories, Satellite Sites, Temporary Factory Sites, Mechanical ANFO Certificates, Demonstrations and Trials. Large complex factories are not included.

To produce and deliver bulk explosives, a company must operate under either a licence or a certificate, i.e., as a Base Factory, a Satellite Site, a Temporary Factory Site, a Demonstration or a Trial, or under a Mechanical ANFO Certificate. These choices can be grouped into two types: the Base Factory and options associated with it, and the Mechanical ANFO Certificate. The Mechanical ANFO Certificate may only be obtained by companies producing ANFO for their own use at their own mine or quarry sites. The Base Factory allows a company to produce, store and sell explosives and is a prerequisite for the other options. The scope and limitations for all of these choices are given under Scope, Limitations and Definition (see Section 2), and are summarized and compared in Appendix D.

Not all details are provided in this document. Other federal, provincial or municipal jurisdictions may have an input. (See Section 29 of the *Explosives Act*.) In general and as a minimum, sites and operations should comply with good standards of a chemical plant or similar industrial site. Companies are expected to understand and maintain the principles of good housekeeping.

“Must” and “will” imply a mandatory requirement. Whenever “should” or “may” appear, companies have the option of following such directives, but must be prepared to defend their decision not to abide by them.

1.2 Intent

Clean and well-maintained explosive process vehicles and process units have always been part of the conditions of safe operation for bulk sites and it was so stated in documents in the past.

The basis of all operations, with the exception of the Mechanical ANFO Certificate (see the next section), is the Base Factory. Without a base, properly equipped with washing and support facilities, it is not possible to ensure the safe operation of vehicles or units. Vehicles and units must be kept clean to reduce the risk of fire and they must be decontaminated in order to avoid accidents during maintenance. Vehicles and units must also be well maintained in order to be safe to operate.

Mechanical ANFO Certificates require that a base with washing and maintenance facilities be available to ensure that vehicles are kept clean and maintained. However, some requirements for a

licensed Base Factory do not apply to operations allowed under an ANFO Mechanical Certificate, and the certificate does not carry all of the privileges of a licence.

These guidelines were developed in conjunction with industry, and companies are expected to follow them. Alternatives to these requirements may be considered by the Chief Inspector of Explosives. Proposals must meet the intent of this document and not be seen as a means to compromise the guidelines.

1.3 Other Documents

Although the guidelines set out the minimum requirements for a bulk explosive operation, they are not a compilation of all legislation or codes issued by the federal, provincial and municipal governments by which companies must abide. The following is presented as a guide to other documents or jurisdictions that must be considered and is not meant to be exhaustive:

Explosives Act and Regulations

Documents issued by and obtainable from the Explosives Branch

- Guidelines for the Pumping of Water-Based Explosives (Pumping Guidelines)
- Storage Standards for Industrial Explosives (Magazine Standards)
- Quantity Distance Principles
- Explosives Branch Process Vehicle Inspection Check List
- Process Vehicle, Guide for Licensing Using Form 4
- Guideline for Completion of Factory/Manufacturing Application
- Explosives Branch Bulletins, issued as required

National Building Code of Canada (to be used as a guide to permit conformance with good engineering practice)

Canadian Electrical Code

National Fire Code of Canada

Transportation of Dangerous Goods Act and Regulations

Canadian Environmental Assessment Act

Provincial labour and/or safety acts and regulations

Municipal by-laws and ordinances

1.4 Using the Guidelines

Companies should become familiar with the contents of these guidelines, and the licence or certificate applications must keep the requirements of the guidelines in mind. Approvals will be based on these guidelines.

Applications and their approval can be broken down into four elements: the licence or certificate forms, the authorized equipment and/or the authorized client list, a company's internal procedures and documentation, and the additional terms of the licence.

The Licence

Forms 1 (including the reverse side or Annex), 4, 5, 6 and 7 and the Site Plan are the basis for approving an application. The forms and site plan describe the site, the facilities, the equipment and the operations. The forms and site plan are approved if they and their content meet the requirements of the guidelines. Likewise, any exception to the guidelines on which there was agreement must be recorded in these forms.

Authorized Process Vehicle and Customers

In order to reduce the number of amendments to forms 4 and 5, a company will prepare an Authorized Process Vehicle List and/or an Authorized Customer List. These lists provide the descriptions of vehicles or the locations and identification of customers. Forms 4 and 5 refer to the lists as follows: on Form 4, "one vehicle from the Location List for Authorized Vehicles" or, on Form 5, "customers according to the Authorized Customer List."

The requirement for Authorized Vehicle and Customer Lists may not be applicable to all companies, e.g., all process vehicle(s) located at one site serving one client.

To use the authorized vehicles location list, a Form 4 must be filled in for each vehicle as detailed in "Process Vehicle, Guide for Licensing Using Form 4."

Company Procedures and Documentation

A company must show that its operations are controlled through formal, written procedures and internal documents. These must meet minimum requirements, in format and in content, described under Documentation, Section 3. Once the procedures have been found to meet the criteria, as a term and condition of the licence, a company must implement them and ensure they are being followed. Procedures and documentation must be in place before a licence will be issued.

Additional Terms of the Licence or Certificate

Certain conditions are set on the operation of bulk vehicles. These are described in Appendix A and are issued as additional terms and conditions of the licence or certificate.

2 Scope, Limitations and Definitions

2.1 Scope

Sites and operations are subject to all existing regulations and codes. These guidelines do not supersede any other regulation or law, be it federal, provincial or municipal, or any codes specified in such legislation. Where alternative requirements exist, the more stringent of the two will apply.

Bulk explosives allowed under these guidelines must be authorized products (see Section 2.3.10) that meet the requirements of the UN 1.5D classification; i.e., they must not be sensitive to a high-strength detonator nor may they detonate in the UN series 5 bonfire test. Additionally, they must not be sensitive to available commercial ammunition. In any of these cases, proof may be requested.

In general, a company is expected to know the properties and behaviour of its raw materials and of its explosives, whether as final products (e.g., classification for transport) or under the conditions of processing (e.g., minimum burning pressures).

Note: Although products and equipment trials are also included in the guidelines, it is understood that such trials may be permitted with other types of explosives, such as packaged products, that may not be 1.5D.

Licensed locations are subject to a formal environmental screening. Locations operating under a certificate are not subject to formal environmental screening, but the holder of the certificate must satisfy the Chief Inspector of Explosives that possible contamination of the environment has been addressed.

Licences or certificates will be granted to only one company per site. Installations located further from each other than the D7 distances for 1.1/1.5 hazard classification (Explosives Potential 1, see Section 2.3.14) may be considered as separate sites.

Sharing of facilities may be considered on a case-by-case basis and then only on an interim basis. One licence will be granted for a location and the licensee will be held responsible. Sharing of magazine storage licences may be permitted under special licences; control must remain with one company.

2.2 Grandfathering

All new sites must comply with these minimum requirements or the company may exceed them if deemed of value. In the case of existing locations that do not fully comply:

-
- a) Incumbent companies are grandfathered; however, when applying for licence renewal, the companies are expected to:
- i) review operations annually and to propose suitable improvements and schedules, acceptable to the Explosives Branch, needed to achieve conformity; or
 - ii) carry out a risk assessment, acceptable to the Explosives Branch, to show that the situation meets acceptable criteria. If accepted, it must be described in the licence; or
 - iii) make changes needed to comply; or
 - iv) explain discrepancies that are not significant and that can be accepted in the licence. If accepted, they must be described in the licence.
- b) Grandfathering granted to incumbent companies will not be extended to cover new companies; when applying for approval in principle or for a new licence, new companies are expected to:
- i) make changes needed to comply; or
 - ii) carry out a risk assessment, acceptable to the Explosives Branch, to show that the situation meets acceptable criteria. If accepted it must be described in the licence; or
 - iii) explain discrepancies that are not significant and that can be accepted in the licence. If accepted, they must be described in the licence.

In general, grandfathering will not be continued if there is a change of scope in the operation or a change in the facility.

2.3 Definitions and Limitations

These definitions complement those in the *Explosives Act* and Regulations. In case of discrepancies, the definitions in the Act and Regulations prevail. This section also describes limitations imposed on some of the choices.

2.3.1 Process Vehicle/Process Unit

The definitions in the Regulation are as follows:

“process vehicle” means...a vehicle on which a manufacturing process or activity relating to explosives is carried out;

“process unit” means...any building, room, or place in which a manufacturing process or activity relating to explosives is carried out....

Process vehicles and portable process units may be looked upon as mobile factories, subject to limitations as required, to ensure public and worker safety. In this document, the term “process vehicles” includes portable process units that may not necessarily have wheels. In this latter case, some requirements for trucks (e.g., exhaust system protection) may not be applicable.

Process vehicles must be associated with a factory licence or satellite or ANFO certificate to ensure that the intent (Section 1.2) is met.

Note: A portable process unit (PPU) is an arrangement of equipment (a machine) which can be moved from place to place and with which explosives may be made. Examples would be an emulsion unit mounted on a skid.

Bagging from a vehicle to make packaged products may be allowed as a factory licence but will include additional requirements to those described in this document. The only type of bagging allowed in these bulk operations is for the purposes of removing explosives for decontamination, sampling, calibration and carrying to hard-to-reach boreholes. These operations, the packaging used, and any storage must be approved in the licence or certificate.

2.3.1.1 ANFO Pneumatic Delivery Systems

Pneumatic delivery systems used for cartridged explosives and those used for ANFO, with a carrying capacity of less than 100 kg, such as blast hole chargers, ANALOADERS, etc., are not subject to these guidelines. All others, including POG,¹ are considered to be process vehicles and are regulated as such.

2.3.2 Base Factory

The Base Factory is a licensed factory and the base of operations, with all the facilities necessary to clean, decontaminate and repair vehicles; it may support Satellite Sites, Customer Sites and Temporary Factories, and Trials and Demonstrations may be conducted from it.

The limitations imposed are the ones described throughout these guidelines and any other conditions that may be developed during the licensing process. An Environmental Assessment (EA) is required. Customers served from the Base Factory must be within the distances allowed.

If bagging or cartridging from a vehicle for subsequent sale of the packaged material is considered, this will be allowed only under a factory licence.

¹POG is an acronym for the name of the person who developed the use of this equipment. It is a pressurized blow case commonly used underground.

2.3.3 Temporary Factory Sites (Licence)

Temporary Factory Sites are licensed factory sites that move with the construction of roads, hydro lines or pipelines, or are of short duration, such as some construction projects (e.g., air fields). Such sites must be supported by existing, licensed base factories equipped to properly service the process vehicles that would be located at the temporary site. A licence for a Temporary Factory is granted when the company has provided evidence that the site is truly temporary in nature. The licence will be renewed for one term only or a maximum of two years. Ongoing contracts, e.g., a quarry blast occurring a limited number of times a year over several years, or major construction projects lasting a number of years, do not qualify. The distinction between a Base Factory and a Temporary Factory is the portable nature of the required facilities and structure(s).

The requirements of a Base Factory apply, but washing/maintenance facilities may be of a temporary nature for purposes of cleaning the vehicle or simple maintenance. Major repairs would be carried out at the Base Factory once the vehicle has been returned to the base after preliminary decontamination at the Temporary Factory.

Whether an Environmental Assessment (EA) is required will depend on the nature of the facilities. Contact the Explosives Branch early in the project development to determine when an EA is needed.

Certain privileges, such as Fire Permissions (see Section 3.1.2), of the Base Factory are not applicable to the temporary site. Multiple customers may be served from a Temporary Factory if all the customers are associated with one project.

2.3.3.1 Preliminary Decontamination

Preliminary decontamination means the removal of all visible explosives from the vehicle. Piping and equipment do not necessarily need to be dismantled. (See Section 2.3.13 on Decontamination.)

2.3.4 Mechanical ANFO Certificates

Mechanical ANFO Certificates are granted to companies producing ANFO to be discharged directly into a borehole at a specified location, mine or quarry owned by the company to which the certificate is issued. This ANFO is nominally 6% fuel oil and 94% ammonium nitrate (AN). No sale of explosives is allowed. Fuel storage and AN storage must meet the requirements of these guidelines. An ANFO Certificate does not provide for the inclusion of any magazines, which must be covered by a separate magazine licence.

The mechanical ANFO operation must be supported by a washing/maintenance facility located at a maximum distance of 200 km from the quarry or mine. Such washing/maintenance facilities need not be licensed factories. When the washing/maintenance facility is not at a licensed factory, no explosives may be present. ANFO mix vehicles going to it must first be emptied of all explosives

by discharging into a borehole and all AN must have been used up or otherwise removed from the vehicle.

One ANFO Certificate will be issued per vehicle. That vehicle may be used at multiple locations if these are owned by the applicant and within 200 km of the base. These locations must be identified in the certificate.

An Environmental Assessment is not required, but a spill contingency plan must be provided by the certificate holder to the Explosives Branch.

Road jobs, pipeline construction and construction jobs do not qualify for Mechanical ANFO Certificates. ANFO Certificates do not permit the bagging or cartridging of explosives.

2.3.4.1 Non-Mechanical ANFO Certificates

In addition to the Mechanical ANFO Certificate, there is the possibility to apply for a Non-Mechanical ANFO Certificate. The requirement is that the applicant mixes ammonium nitrate and fuel oil by hand, without any mechanical aid, for immediate use in a mine or quarry. The applicant must submit the application for this certificate using Form 1, and it must be accompanied by a sketch of the location and the procedure for making the ANFO. These guidelines do not apply to Non-Mechanical ANFO Certificates but they can provide useful information.

2.3.5 Satellite Sites (Certificates)

These are considered to be extensions to a Base Factory, not replacements of one, and therefore do not carry all the privileges of a factory.

The distance away from a Base Factory is limited to 800 km to ensure that a vehicle is no further away than a reasonable 10-hour drive once any Customer Site is taken into account. The distance to any customer from the Satellite Site is limited to 200 km.

No more than two process vehicles are allowed (ANFO blending arrangements may be allowed by special permission of the Chief Inspector of Explosives). No more than two tankers or vessels with a total, maximum physical capacity of 40 000 kg for storage of water-based explosives and only one storage facility (silo, tanker, designated area) for AN are allowed. Fuel storage must meet provincial regulatory requirements. Snow fences may be used to delineate a Satellite Site.

Magazines are allowed on Satellite Sites. The location of the magazine must be in accordance with Quantity Distances Principles. Magazines must be licensed separately from certificates since certificates may only be issued for occasional and temporary activities, and the legal opinion is that storage is not occasional and temporary.

Only the following operations are allowed: at the Satellite Site, loading of the vehicle; and at the Customer Site, approved chemical gassing as required, doping with AN or ANFO, and discharge (with or without mixing/blending) into a borehole.

The Base Factory and the Satellite Site cannot be separated by a body of water other than that which can be crossed by bridges permitting the transport of explosives or by the use of barges or boats chartered specifically to move explosives.

Satellite Sites may not be used for bagging or cartridging operations to produce product for sale. Limited bagging may be allowed as per Section 2.3.1.

The minimum period for a Satellite Site Certificate is one month. Sites may be active, inactive, or no longer required. Payment is due for active times. A site may be declared inactive and then can be reactivated. Once a Satellite Site is no longer required, it must be decommissioned. The exact conditions for considering a site as being decommissioned will vary from site to site, and each will be considered on a case-by-case basis.

2.3.5.1 Active and Inactive Satellite Sites

An active Satellite Site meets the above requirements; fees are paid on a monthly basis.

An inactive Satellite Site does not have fees; all explosives, all vehicles, all raw materials and all explosive signs must be removed; physical structures, such as fences or empty silos, may remain.

If a site remains inactive for six months, it must be decontaminated and a letter of assurance of such decontamination must be submitted to the Explosives Branch.

2.3.6 Transfer Sites (Certificate)

Transfer Sites are sites where the transfer of explosives may occur, but there is no overnight parking. An example is the transfer from a process vehicle into bins to be brought underground or into process vehicles, such as POGs and all-terrain vehicles. These are allowed as certificates and, with the exception of the number of process vehicles,² must meet the conditions of a Satellite Site.

2.3.7 Demonstrations (Certificate)

Demonstrations are Trials at new customer locations with existing technology and products. These are allowed at Satellite Sites whose maximum duration is two months but where the distance requirement from a base site is waived. The same limitations apply as in the case of the Satellite Site,

²For example, since a POG is considered a process vehicle, a delivery truck and a POG constitute two process vehicles. A Transfer Site allows this.

except those regarding distances form the basis for approval. Unique requirements, differing from the Satellite Site limitations, will be considered on a case-by-case basis.

For a Demonstration, no limits are placed on the distance away from a Base Factory; however, limits are placed on duration to ensure that vehicles are not away from a distant base for an extended period of time.

The applicant must show that these are true Demonstrations. Extensions or repeats of this certificate will only be allowed once and only if the applicant has provided an acceptable reason for the extension or repeat.

2.3.8 Customer Sites and Distances (Base Factories or Satellites Sites)

Customer Sites are sites serviced by a vehicle either from a Base Factory or from a Satellite Site. Customer Sites must be no further than 450 km from a Base Factory or 200 km from a Satellite Site.

For sites located further than 300 km from a Base Factory, companies must submit a description of the working day (load, drive, unload, drive) showing how they will abide by the 10-hour driving requirement. A site will be considered if the time required to load is such that there remains ample time to drive safely.

The Customer Site and the Base Factory or the Satellite Site cannot be separated by a body of water other than that which can be crossed by bridges permitting the transport of explosives or by the use of chartered barges or boats.

Customer Sites must be identified on the certificate or licence (see Section 3.1.1.5, Form 5) and the distance to the supporting Base Factory or Satellite Site must be included.

Customer Sites do not apply to Mechanical ANFO Certificates since the certificate holder supplies only their operation; sales to another party are forbidden.

2.3.9 Trials (Permissions)

Product Trials are permissions to produce, store and use explosives that have not been authorized. A temporary classification for the purposes of the trials will be granted.

Equipment trials are permissions to try out pieces of new equipment.

Trials will only be allowed from existing licensed factories.

2.3.10 Authorized Products

Authorized products are those that appear on the List of Authorized Explosives. Only authorized products (with very limited exceptions, see Trials) may be manufactured, stored, transported, possessed or used. The authorization process comprises the following steps: submission of drawings and specifications, review by the Explosives Branch, decision on sampling by the Branch, testing by the Canadian Explosives Research Laboratory (CERL) if required, review of testing results by the Explosives Branch, and decision on authorizing and issuing the transport classification.

In the case of all explosives, but applied here to bulk, approval of a submission and authorization of an explosive is restricted to the type of equipment used to make the explosive. In many cases, this is well known, e.g., making ANFO with an -auger-type arrangement. However, when the explosive or the equipment is novel, the applicant is expected to prove that the processing is safe, with little danger of initiation, and restrictions may be applied to allow only the particular explosive/equipment combination proven to be safe.

Proving safety may be done through testing (e.g., comparison of minimum burning pressure with pumping pressures) and through hazard analysis.

2.3.11 Heel

“Heel” refers to the quantity of explosive product or raw material left in the vehicle that cannot be removed by pumping or augering (note that running a pump dry must be avoided). Heels cannot be greater than 250 kg for water-based explosives and 50 kg for ANFO-type explosives.

2.3.12 Clean

The term “clean” means free of excess grease, oil or coal dust on the outside of the vehicle or in the engine compartment, or explosive spills or AN dust on the outside, so that the fire hazard is reduced. It does not mean dust, mud or dirt. However, hazard placards and explosives signs must be visible.

2.3.13 Decontaminated

“Decontaminated” means free of all traces of explosives outside and inside all interior equipment, including contamination in screw threads, pipes and pumps, the condition of which would permit safe maintenance.

2.3.13.1 Disposal of Scrap

Decontamination and cleaning result in the need to dispose of scrap. Usually this is emptied into bags, stored in magazines and then taken to a location where it may be disposed of by blasting. The issue is that such products have not been authorized and therefore may not be stored or transported.

In order to comply with regulations, each company should submit a list of the products that would be emptied into bags. These will be one of three kinds: straight ANFO, straight water gel or emulsions and blends. It is suggested that the plastic bags will be 5 inches or larger; the exact size should be specified. The bag is to be placed into a UN-certified box approved under the Transportation of Dangerous Goods (TDG) Regulations. The product will be called Special A, Special B or Special C, etc., and will be authorized as such for each company. The products will not appear on the List of Authorized Explosives but are used only as a means of legitimizing storage and transportation.

For the disposal of scrap bulk explosives on a secure mine site, the scrap product will be bagged in plastic bags and may be transported from the factory site to the blast site for disposal. The bags of scrap product must be transported in a plastic-lined, locked wooden container, and the vehicle must display the appropriate signage or placards. The vehicle must remain on the mine site at all time and cannot enter public roads or private roads with public access.

2.3.14 QD, D2, D4, D5, D7

QD refers to Quantity/Distance as described in the *Quantity Distances Principles* manual issued by the Branch and implies the requirements of that manual. Specifically, the 1.1 and 1.5 Distances Tables are cited and the conditions for protecting AN from being initiated by an explosion are given. D2, D4, D5, D7 and others refer to specific levels of protection offered by the QD. Certain of these categories require the presence of barricades. References are made to these throughout the guidelines.

Note: The proposed new regulations will introduce the concept of Explosives Potential (EP). The correspondence between EP and the UN system is as follows: EP1 is 1.1 or 1.5, EP2 is 1.2, EP3 is 1.3, and EP4 is 1.4 with regard to the type of effect an explosive may have in a given situation where factors other than packaging (e.g., confinement) play a role. The UN system is a transportation classification and may not always be applicable in such situations. However, in the case of bulk explosives, the two are very comparable.

2.3.15 Risk Assessment

Risk Assessment is a formalized technique for answering the following questions:

What can go wrong?

What are the consequences and effects, and are these acceptable?

Are the safeguards and controls adequate to render the risk acceptable?

Quantified Risk Assessment answers the following additional questions:

How often might it go wrong?

What are the chances that the consequences will materialize?

How dependable are the safeguards and controls that protect against the risk?

A well-prepared risk analysis may be needed to support arguments for derogation from licensing requirements, such as QD, for some types of operations, and thereby demonstrate that the risk is acceptably low for these operations. In general, risk analysis is considered only after operations have been modified to meet “best practice” and as a last resort in situations that still do not meet requirements; however, some operations would not be licensed regardless of the assessment result, i.e., the Explosives Branch would not license a manufacturing or storage operation near a hospital, nursing home or school, or in a downtown area, regardless of how safe it was thought to be.

One of the most effective safeguards or controls against explosives risks is the Quantity/Distance principle. QD takes no account of how often things might go wrong but is a control working 100% of the time, protecting as far as reasonably possible against the consequences of an explosion during manufacturing processes or the storage of explosives. See Appendix C for a discussion of risk assessment-based derogation from QD requirements for bulk delivery.

Note: It is important to note that software programs do not replace intelligent analysis and study. If a company decides to use such programs, it should critique the results before submitting them. To use a cliché, “garbage in is garbage out;” the software cannot correct errors in judgement or improve what are superficial studies.

2.3.16 Ammonium Nitrate (AN)

Ammonium nitrate is included under the definitions because its behaviour and the way it is treated in commerce bring special problems to how it is regulated in conjunction with explosives.

Although AN is usually classed as an oxidizer for transport, it is well known that it will detonate under confinement, although the conditions may be difficult to define. Bulk explosives in which AN is the major constituent, and the equipment that is used to manufacture or handle bulk explosives, are regulated by the Branch. Therefore, the Branch is obliged to define the manner in which AN is handled in activities under the jurisdiction of the *Explosives Act*.

Transport

While on the road, AN is classified according to current requirements of the *Transportation of Dangerous Goods Act* and Regulations.

Siting

For the purpose of siting, including distance to be observed and allowed operations, AN will be considered an explosive at 50% of its weight when:

- a) AN is brought to explosives or explosives are brought to AN, to within distances at which an explosion would propagate to the AN (See Quantity Distance Principles); and
- b) AN is confined in closed vessels, in hoppers on a process vehicle, or in a process unit.

However, requirements a) and b) do not apply during the loading of AN when a process vehicle is brought into proximity of AN storage if:

- a) The vehicle is equipped with an engineered fire suppression system;
- b) Precautions have been taken to prevent a fire during loading; and
- c) In the case of a vehicle with water-based explosives, only a heel of explosives is on board during loading.

Large stores of AN, usually located in remote areas, will be handled on a case-by-case basis since they would have a devastating effect if they were to detonate. Contact the Explosives Branch for siting details and concerns regarding large stores of 300 tonnes or more and very large stores of 1 000 tonnes or more.

AN solutions containing less than 85% AN are not considered to be explosive.

3 Documentation, Fees and Processing Time

The application for a licence or a certificate includes the following:

Forms 1 (with the annex), 4, 5, 6 and 7, and a Site Plan must be presented. An application for Fire Permission may be made. For licences, in most cases, an Environmental Assessment (EA) must be completed that includes a spill contingency plan, emergency response plan, and site evacuation plan. At a minimum, including certificates, a spill contingency plan, emergency response plan, and site evacuation plan must be presented. Supporting documentation, such as operating or maintenance procedures and special rules (safety rules), must be shown to be available.

In specific cases, other documents may be required to support the licence; for example, a hazard analysis or risk assessment.

Note: Before a licence is issued and when the situation warrants, the Explosive Branch may inspect the site to ensure compliance with the licence proposal.

3.1 Forms, Fire Permissions and Environmental Assessment

3.1.1 Site Plan, Licence or Certificate Forms

The site plan, licence and certificate forms describe the operation. Once approved, they become part of the conditions for the legal operation of a site, and the approval is based on meeting the requirements of these guidelines. However, situations can occur where approval may be granted even when a certain requirement is not met. Any such derogation must then be recorded on the appropriate form (4, 5, 6 or 7); reference should be made to the date when it was approved, to the name of the inspector who first approved it, if this is known, and, as appropriate, to the conditions under which the derogation was allowed. Any documentation referred to in Form 1 must be dated with revision numbers.

If changes are made that will change the description in the forms, amendments to the licence must be submitted approving the changes prior to their implementation.

3.1.1.1 Site Plan

A site plan is required for each site. Engineering drawings to scale, with the scale indicated on the drawings, are preferred. The drawings should carry a standard scale since copy reduction may occur. Small and simple sites (less than 10 items on the plan) can be described by a sketch.

All drawings or sketches must be identified with a title, revision number and applicable date.

The plan must include: i) distances between operations, including washing/maintenance facilities, AN storage, fuel storage, vehicle parking areas, fences, and magazines; ii) distances to offices,

welfare or administrative areas; iii) distances to roads and public thoroughfares; and iv) distances to dwellings and other assembly points, as well as operating pits, mine facilities and similar installations. Distances must be in metres.

The site plan (two copies) should identify all vulnerable sites, such as dwellings, or areas where the public may congregate, within a 2-km radius and show any buffer zone between the operations and the surroundings.

Drawings should include a legend stating: i) the uses of the sites, buildings or structures; ii) quantities of AN, explosives and flammables; and iii) the exact distances between the buildings or structures marked thereon. When applicable, layout sketches or plans should show emergency exits, storage and workplace areas for individual magazines and buildings. For example, the following is acceptable:

Drawing Legend:

<i>Building No.</i>	<i>Description of Building/Operation</i>	<i>Net Quantity:</i>
<i>P-1</i>	<i>Explosive Process, Mixing and Loading</i>	<i>4 000 kg</i>
<i>S-1</i>	<i>AN Storage Silo, Loading of Process Vehicles</i>	<i>50 tonnes AN</i>
<i>G-1</i>	<i>Garage/Wash and Maintenance</i>	<i>less than 2 000 kg</i>
<i>M-1</i>	<i>Magazine/Storage Blasting Explosives</i>	<i>20 000 kg</i>
<i>DI</i>	<i>Magazine/Detonator Storage</i>	<i>100 000 detonators</i>
<i>RES</i>	<i>Residence</i>	<i>Not applicable</i>
<i>O</i>	<i>Office</i>	<i>None allowed</i>

3.1.1.2 Form 1

The form must include the legal company name and a recognized location name for the site. The latter name must remain constant in all correspondence and references to the site. A letter authorizing an individual to sign on behalf of the company must be included. The annex describes the manner in which the other forms are to be completed.

Upon renewal, one copy of all forms is required for both the base site and all satellite sites.

For each amendment request, a new Form 1 application is required to summarize and record the changes made to forms, drawings and documentation. When satellite site(s) are added, removed or restarted, a new Form 1 application is required for both the Base Factory and the Satellite Site.

The same amendment numbers will be applied to the Base Factory and Satellite Site. Amendment numbers start at zero for each renewal.

Unless required because of a change, drawings and documentation need not be resubmitted for renewals or amendments if they are properly named and dated with revision numbers.

3.1.1.3 Forms 2 and 3

These are issued by the Branch. Form 2 grants the licence to a company at a site. Form 3 sets out the terms of the licence and the expiry date.

3.1.1.4 Form 4

Form 4 describes the site, site security, facilities and equipment, including the storage of pumpable explosives, process vehicles, fuel storage, AN storage, magazines, washing facilities, garages, or any other facilities, as well as any major piece of equipment, e.g., pumps, located on the site.

Form 4 also describes any deviation, derogation, or grandfathering provisions that apply to the licence, e.g., QD reduction based on Quantified Risk Assessment or Hazard and Operability Review.

Process vehicles may be described on their own Form 4 (see Section 3.1.1.4.1).

Building descriptions should include, as applicable: dimensions, construction design and general details such as heating, material of construction, walls, roofs, floors, dividing walls, vent walls, firewalls, operational shields, barricades, floor finishing, fire protection installations, electrical classification and equipment, ventilation systems and equipment, services, lightning protection systems, and static grounding systems.

Barricades, berms, or other natural protective features against explosions must be described, especially when the distances or types of distances shown on Form 7 require barricades, e.g., D2 and D4.

Form 4 must include the electrical classification for heating and lighting and for electrical equipment.

In the case of pumps, and because pumping is a critical operation, the exact nature of the pump and its protective features must be described. The choice of pumps should be supported by a hazard review and/or testing to demonstrate that the pump/explosives combination is safe.

Vehicle descriptions must include: make, GWV, tare weight, unit number, serial number, licence plate, augers, and any other equipment present on board. Either photos or general arrangement drawings are required. Companies with fleets of vehicles must use a Location List for Authorized Process Vehicles (see Section 3.1.1.4.1).

Form 4 is also used to identify the location of AN unloading at rail sidings. The following is acceptable wording:

AN storage in rail cars: (location of the siding) to load vehicles totally free of explosives, under the control of Transport Canada, as per Railway Association of Canada Circular DG-2, and with permission of local fire authorities. The Site Plan of the siding and the letters of permission from local fire authorities are referenced on Form 1 of the licence.

3.1.1.4.1 Authorized Process Vehicle

Process vehicles must be authorized before the vehicles are put into operation. This is accomplished by submitting documentation for approval; documentation for approval must fully describe required attributes using a Form 4, schematics and photographs. This is explained in “Process Vehicles, Guide for Licensing Using Form 4.” Companies must maintain a List of all Authorized Process Vehicles that summarizes key attributes.

Once authorized, vehicles must operate from a licensed factory or from a Satellite Site or under an ANFO certificate.

Authorized Process Vehicles List

When a company has more than two process vehicles and moves the vehicles from one site to another site, in order to reduce amendments to Form 4, the company must maintain a Location List for Authorized Process Vehicles so that the location of any process vehicle is known and reported to the Explosives Branch. This Location List is referenced on Form 1 and explained in “Process Vehicles, Guide for Licensing Using Form 4.” Whenever a change occurs in the list, the amended list, showing the new location of a vehicle, must be sent to the Explosives Branch within 48 hours.

Licence amendment is required only when the number of process vehicles to be used at a licensed site is changed.

3.1.1.5 Form 5

The information required on Form 5 is:

Part I: Authorized Explosives

Identify the explosives or articles proposed to be:

Manufactured: Identify products by manufacturer’s designation, proper shipping name, UN number, hazard classification, date of authorization (if available).

Stored: Identify products by proper shipping name, UN number, hazard classification.

Part II: Customer Information

Provide the customer name, location and contact information to allow the Explosives Branch to visit or contact the site. Include the licence number (federal or provincial) in order to comply with s. 117 of the Regulations. Include distances by road from the factory or from the Satellite Site to the loading operations at the Customer Site. Where applicable, describe special situations such as marine transport.

Note: If explosives do not change hands, i.e., if broken rock is provided (\$Z per tonne of rock rather than \$Y worth of explosives), s. 117 does not apply. Applicants may record their own licence number to demonstrate that no sale occurs or, in the case of Quebec, the provincial loading permit number.

In the case of customers further than 300 km from the Base Factory, indicate how the customer can receive service within a 10-hour driving day.

Companies with extended lists of customers must use an Authorized Customer List (see Section 3.1.1.5.1).

3.1.1.5.1 Authorized Customer List

In order to avoid amendment of Form 5 each time a Customer Site(s) is added or changed, a company must list client sites on an Authorized Customer List and refer to this list on Form 5. Whenever a change occurs in the list, the amended list, showing the new customer location, is sent to the Explosives Branch. In cases where the Customer Site(s) are not expected to be added or changed during the term of licence, no list is required and customers can be identified on Form 5.

3.1.1.6 Form 6

Form 6 must describe the operation and state the type and quantity of the explosive and personnel limits with references to specific process units or magazines. The operations of the vehicle at the approved site (with regard to number of personnel allowed, explosives on board and distances to be observed) and at the Customer Site must be described. In the case of operations at a mine or quarry, the description should state the operation without stating the limits. In the case of operations in the public domain, such as pipelines or roads, the personnel allowed, explosives on board and distances to be observed must be described. The latter can be submitted as follows:

Reference	Operation	Explosives Quantity Personnel Limit
Mix Truck #1	Within 15 m	Only explosives loading crew
	15 m to D4	Personnel directly involved with project: loading crew + other workers
	15 m to D7	Any other workers
	Beyond D7	No control

Any special circumstances must be described on Forms 4, 6 and, if applicable, 7, e.g., circumstances that would allow an inspector to relax distances, whether at the approved site or at the Customer Site, would be explained on Form 4 and described on Forms 6 and 7.

Permitted Operations

The operation(s) allowed in a particular building or on a vehicle (including at a Customer Site) must be stated. When more than one type of operation can be conducted in a given area, the operations must be listed as being allowed to run either concurrently (AND) or as alternatives (OR).

Quantities

The type and quantity (in metric units or, in the case of detonators, in units) of explosive and of ingredients, including ammonium nitrate and fuel oil, used to make the explosive are listed. Waste explosives stored and any laboratory samples must also be listed. Any other flammables must also be included.

Personnel

The number of people is listed either as workers or visitors (casuals or transients). Workers are considered by the Branch as personnel who remain in the particular area and are required to accomplish the particular intention of an operation; transients, visitors or casuals are defined as personnel who have a need to go into a particular area to carry out their duties, such as delivery personnel, grass cutters and supervisors, but are not normally required to carry out the intentions of the operations. Visitors may also be external, such as inspectors of explosives.

3.1.1.7 Form 7

Form 7 must show the minimum distance to be maintained and the actual distance between a given building/operation and the activity listed in the column heads (process, magazines, etc.). This distance will depend on the quantity and can be found in the Quantity Distance Principles.

When completing Form 7 it is helpful to record both the quantity and the applicable QD type used for the required distance so that misunderstandings can be quickly identified, e.g., intra-plant distances are directly affected by the presence or absence of barricades.

If the actual distance is less than that required by QD, the deviation must be identified on Form 7 and explained on Form 4 and, if needed, referenced on Form 6. These annotations and explanations formally record the conditions under which a derogation has been approved, e.g., incumbent grandfathering, risk assessment.

3.1.2 Fire Permissions

(Smoking, Matches, Lighters, Welding [including Electric])

When an open flame or a flame-producing device is required for equipment, welding shops, burning grounds, change rooms, furnaces or laboratories, the operator or owner of the site must apply for a Fire Permission. This may be granted by the Chief Inspector of Explosives if the Chief is satisfied as to the safety in accordance with subsection 77(2) of the Regulations. In areas where such a permission is granted, the document granting the permission must be posted.

3.1.3 Environmental Assessment and Spill Contingencies

An Environmental Assessment must be undertaken for any licence that involves a project as defined in the *Canadian Environmental Assessment Act*. A minimum of 30 days should be allowed for its processing. Further details on the requirements of the EA and the process for obtaining approval can be obtained by contacting the Explosives Branch.

However, in the case of Certificates and Permissions, as well as the licences that do not require an Environmental Assessment, contingency plans for spill control and disposition are still required to be submitted.

3.2 Supporting Documentation

Although it is recognized that bulk explosives are less prone to accidental initiation than packaged explosives, the manufacture and handling of any explosive still carry inherent risks. Unwanted effects may be reduced by protecting people and facilities and/or by reducing quantities; probabilities may be reduced by careful design and hazard analyses, by understanding the risks associated with the products, by maintaining operations to design criteria, by controlling changes, by selecting and training personnel, and by preserving an acute awareness of general safety.

In support of the licence application, the documents or procedures set out below must be listed on Form 1 and shown to be available.

Note: Term No. 9 on Form 3, Terms of the Licence, requires the preparation of procedures and special rules drawn up by the Factory Licence holder and designed to secure the maintenance of proper discipline in the factory and the observance of the provisions of the Act, the Regulations, and the terms and conditions of the licence related to safety.

The format of these documents/procedures is left to the individual companies. However, they must be detailed enough to ensure there is but one correct, acceptable and understandable way of accomplishing a task. They must be titled, dated, paginated and approved by a responsible company employee. Certain technical information, described below, must be included.

Note: The Branch does not approve procedures since it is not privy to many of the operating details. Nevertheless, and when appropriate, the Branch will comment.

During inspection, applicants may be requested to demonstrate the adequacy of these procedures; e.g., are they available and understood, do operators and supervisors follow the declared procedures, are procedures routinely reviewed and revised, are changes recorded, are operators trained?

3.2.1 General Safety Rules

Companies must establish and apply documented safety rules addressing both general safety and safety particular to explosives manufacturing. The latter should include the identification of products and process hazards, the controls being exercised, and any other specific rules needed to protect personnel and installations. Safety rules specific to an operation must be posted and observed. Personnel—both site operators and management—must be familiar with them. Explosive inspectors may examine records and question personnel to determine how well the rules are known and applied; e.g., are special safety-related procedures and records kept and followed (i.e., pump and control preventive maintenance)?

3.2.2 Inspections and Audits

Companies must have their operations inspected and/or audited by their operators, supervisors and management to ensure continuing compliance with the regulations, licences, and their procedures, policies and rules. These inspections/audits must be described in written procedures and must be carried out at least once per year. All action items and corrective actions taken must be recorded. Records of these inspections/audits may be requested by the Branch during inspections or for submission with the renewal applications.

3.2.3 Training

Employees must be trained to carry out normal tasks and have the knowledge to make quick and sound decisions in an emergency. A formal training program must be prepared: training requirements identified, courses prepared (both theoretical and practical), safety critical procedures and controls identified in the course, trainers chosen and trained, and records of all training kept. In addition to operations, the program should address needs related to first aid, general safety induction, and any other subject in support of operational safety. Training procedures and training records may be requested during inspections by the Branch or prior to the issuing of the licence.

A licence holder must certify workers as having been trained when the holder has reasonable grounds to believe that the workers are able to perform their duties and understand the hazards of the materials to which they may be exposed. Certification is valid for 36 months. If a change occurs in the procedures for which the certification was issued, the workers must be retrained. Workers must be recertified or retrained after 36 months. Previously certified workers must be retrained if they have not conducted the activities in question in the preceding 12 months.

3.2.4 Procedures

Certain activities must be controlled by procedures in order to ensure there is but one correct and acceptable way of accomplishing a task. Procedures should be developed by qualified personnel and expressed in such a way as to avoid confusion and ensure control at all times. Procedures should be reviewed for continuing applicability. The following procedures must be available:

- Operating procedures for the site or process unit, including any specialty or safety procedure;
- List of permitted maintenance tasks;
- Explosives burning ground and/or waste explosive disposal;
- Emergency response and site evacuation plans;
- Control of changes;
- Maintenance procedures;
- Miscellaneous safety procedures for tasks that are not normally part of day-to-day operations, but that may be required occasionally (lock out/tagout, etc.).

3.2.4.1 Operating Procedures

The procedures must specify any control limits for process variables and equipment. Safety critical parameters, for example, pump temperature or required preventive maintenance, must be highlighted in the procedures. Procedures must include sections on dealing with emergency situations. Procedures must list the materials, tools and equipment, including personal protective equipment, to be used.

Submissions to the Explosives Branch need only provide a table of contents, index or list of all procedures, including the title, revision number and/or applicable date. This is to be provided on Form 1.

Procedures and records may be requested during inspections by the Branch or prior to the issuing of the licence.

3.2.4.2 Decontamination Procedures

Decontamination procedures should consider the following statements and include provisions to address them.

Decontamination of an explosive vehicle or explosives equipment requires that the equipment is completely free of explosives or oxidizers and is clean. This may entail dismantling or removing pumps and pipework or other equipment. The design of the equipment should allow this to be done safely. Tubular construction or hollow welded sections are very difficult to decontaminate and should be avoided. When the equipment is clean and free of explosives or other hazardous material, it can be tagged as decontaminated. The tag should be dated and signed by the person who has verified that the equipment is properly decontaminated.

Procedures and records may be requested during inspections by the Branch or prior to the issuing of the licence.

3.2.4.3 List of Permitted Maintenance Tasks

The company must prepare a list of which maintenance tasks it allows at a given site and which tasks must be carried out at a better-equipped facility. The list must specify whether decontamination is required and the nature of the decontamination.

Procedures and records may be requested during inspections by the Branch or prior to the issuing of the licence.

3.2.4.4 Explosives Disposal and Burning Ground

Two operators must be present during disposal. Initiation of disposal, whether by burning or detonation, must be done remotely. If burning is used, a minimum of two burning pads must be provided or the time between burns must be specified to ensure a cold, clean area for a new burn. The burning pad must be raked and cleaned before a second burn is attempted. The procedure should follow the *Guidelines for the Destruction of Explosives*, Bulletin #43.

Procedures and records may be requested during inspections by the Branch or prior to the issuing of the licence.

3.2.4.5 Emergency Response

All sites must develop formal emergency response procedures and site evacuation plans. This should be done in conjunction with local authorities, with the operating mine and quarry personnel, or with the contractors responsible for a project.

The plan should develop reasonable credible scenarios of possible events, including vehicle collision, fire, explosion, fire encroaching on the site, spills, storms, and power failure, as well as any security. It should establish the criteria needed to trigger the response; give procedures, chronologically organized, to use during the response, including directing personnel to safe

locations; list the resources available and needed during the response, including contact information such as names and phone numbers; and provide site plans showing safe locations.

Procedures and records may be requested during inspections by the Branch or prior to the issuing of the licence.

3.2.4.6 Control of Changes

Companies must establish procedures to control changes and maintain the basis of safety. Changes to equipment, facilities or procedures must be formally approved by a responsible company employee and all such changes must be recorded. Changes to any item appearing on the licence require formal approval by the Explosives Branch prior to implementation.

Procedures and records may be requested during inspections by the Branch or prior to the issuing of the licence.

3.2.4.7 Maintenance Procedures

Companies must have documented maintenance procedures for site equipment, both fixed and mobile, and records of maintenance must be maintained.

Procedures and records may be requested during inspections by the Branch or prior to the issuing of the licence.

3.2.4.8 Miscellaneous Safety Procedures

Companies must develop procedures required by the Branch and/or provincial safety regulations for any potential hazardous tasks that an employee may be required to undertake. Employees need not know the details of each procedure but must be familiar with them, know them when they are required, and know where they can be accessed.

Procedures and records may be requested during inspections by the Branch or prior to the issuing of the licence.

3.3 Fee Structure

Fees should be submitted with the application or the applicant will be invoiced upon issuance of the licence or certificate. If used, bank cheques must be made payable to "Receiver General for Canada." All forms of payment must make reference to the licence or certificate number to which they are to be applied. The fee structure may be subject to change following consultation with the industry. Contact the Explosives Regulatory Division for a listing of fees.

3.4 Processing Time

The target processing time at the Explosives Branch is as follows:

Factories and ANFO Certificates minimum of 30 working days

Note: For applications involving a new EA, it is recommended that a minimum of 60 working days be allowed for planning purposes.

Renewals and amendments minimum of 15 working days

Satellite Sites, Demonstrations and Trials minimum of 5 working days

4 Sites, Facilities and Equipment

4.1 Licence or Certificate Site

4.1.1 Location

Sites must comply with Quantity Distances (QD) tables for the 1.1/1.5 hazard classification. The following are used for most situations:

- D2: from a donor magazine to another magazine,* or from a donor process building to a magazine*
- D4: from a donor process unit to another process unit,* from a donor magazine to a process unit,* or from a donor magazine or donor process unit to lightly travelled roads such as a mine haul road
- D5: from any explosive unit to an operating pit and/or local road
- D7: from any explosive unit to dwellings or places where people not involved with the site may congregate

*These distances require protective barricades and the barricades must be identified on Form 4.

Consult the Quantity Distance Principles for unbarricaded distances, for distances involving a small quantity of explosives, or other unusual situations.

In principle, even when explosives are not present (e.g., empty ANFO Mix Vehicle), licences or certificates will not be granted to sites that are located in public areas.

4.1.2 Fencing

The process site must be delineated by a fence or natural or artificial barriers. Man-made barriers must be a minimum of 1.8 m (6 ft) in height, with either three strands of wire or chain link construction. A height of 1.2 m (4 ft) may be acceptable for remote bulk sites only or on mine properties. A snow fence is an acceptable alternative for temporary sites and certificates. The perimeter of the site must be posted with signs stating "Danger explosives - No trespassing," located every 50 m on any one side and with a minimum of one per side. These may be posted on the fence or erected on natural or man-made barriers. Natural barriers must be indicated on the site plan and approval must be given for their use.

Special consideration with regard to fencing will be given in tundra areas of the far north.

4.1.3 Gates and Control of Fire-Producing Devices

A locked gate must be present at the entrance to the site perimeter; if a guard is present at the site or near the gate, or the site is small in area, located on a secure mine site and occupied by an employee, it need not be locked and may simply be closed. A box for keeping matches and lighters

or other fire-producing items must be provided before entry onto the site. Warning signs should be placed on the access road at D7 distances or D5 when D7 is impractical.

4.1.4 Storage and Control of Raw Materials

Except as allowed elsewhere in these guidelines, and in order to control unauthorized access to raw materials, storage areas for AN, fuel oil or other raw materials must be located within the fence of either licensed factory sites or sites covered by certificates. AN storage may be permitted outside the fenced area on a secure mine site if identified on the factory licence and approved by the Branch.

4.1.5 Services and Tools

Both a temporary and Base Factory site must have electrical power supply, lighting, water supply, wash equipment, and wash-water collection equipment. Sufficient tools must be provided to allow safe removal or disassembly of contaminated pieces, piping and equipment for decontamination purposes.

4.1.6 Heated Washing Facilities

Most sites in Canada require permanently installed heating facilities for year-round operations. Sites without heating will have the term of the licence restricted based on the historical average temperature above 0 (zero)°C applicable to the area.

4.1.7 Codes

All standard industrial installations must comply with the current Canadian Electrical Code (CEC), National Fire Code of Canada (NFC), and the National Building Code of Canada (NBC) or with any other code such as commercial garage standards, or provincial or municipal requirements. When applied to bulk explosives sites, this generally covers non-hazardous locations with noted exceptions (primarily for some aspects of electrical; see Appendix B).

The National Building Code contains the requirements with respect to health and fire safety, which depend upon the use to which a building is put and its type of occupancy. Unless highly combustible and flammable materials are present, this will usually mean complying with Group F, Division 2³

³In these Bulk Guidelines, maintenance garages/washbays are classified as Group F, Division 2 meaning *Medium Hazard Industrial Occupancy* under the Building Code. This designation recognizes maintenance with no explosives present, essentially. If heels are regularly permitted, as is often the case, then the structures should be classified as *High Hazard Industrial Occupancy*, i.e. Group F Division 1, meaning “an industrial occupancy containing sufficient quantities of highly combustible and flammable or explosives materials which, because of their inherent characteristics, constitute a special fire hazard.” The Building Code goes on to define Hazardous Substances, etc.

This said, the Group F, Division 1 was not implemented in these Guidelines because it also brings into play such requirements as sprinkler systems and others which we did not want to see. Architects get involved in the design of such

classification (medium hazard industrial occupancy), which is typical for repair garages and service stations. Process buildings and larger sites may be classed as Group F, Division 1 (high hazard industrial occupancy), with the requirements for structural fire protection generally not applicable as fires involving explosives are not to be fought; as a result, water sprinklers are not called for.

Proof that installations comply with all appropriate codes may be requested during inspections by the Branch or prior to the issuing of the licence.

4.1.8 Other

Sites should have level surfaces large enough to allow turning of vehicles, including snow plows, and be large enough to allow easy clearing of snow.

4.2 Buildings in General

4.2.1 Construction

Buildings must meet good engineering practice and must be non-combustible, unless otherwise permitted. The structure must be adequate for the purpose, i.e., durable, suitable for the local climate, fire resistant, and able to meet the other requirements of these guidelines. Pre-engineered buildings are preferred.

Temporary Factory Sites need not have permanent structures, but any proposal must be approved by the Explosives Branch before implementation. Protection of the washing facilities from the elements is required.

Buildings and structures must be provided with adequate lighting, as specified by labour codes, for activities to be carried out, namely, washing, decontamination, disassembly, assembly, and routine process vehicle repairs.

Buildings must be provided with two safety exits in addition to the roll-up doors or truck doors. The main door(s) must be provided with panic hardware. Exceptions may be granted in the case of small buildings such as sheds. Escape routes must be kept clear of obstruction. Safety exits should lead directly to the outside.

facilities, which can limit occupancy and add a whole host of other restrictions or requirements that we did not believe are warranted. Nonetheless we must recognize that explosives will indeed be contained in such structures and thus they must have many of the noncombustible attributes which combustible structures, such as wood frame, do not. The National Fire Code stipulates that ERD is the "Authority having jurisdiction" and thus can determine whatever requirements it deems necessary under the circumstances.

A sufficient area for spare parts and tools must be made available; with the exception of heavy pieces of equipment, storage on the floor is not acceptable.

Tires and other flammable material must be stored in a separate area. Equipment not associated with explosives manufacturing, e.g., personal cars, boats, vacation trailers, etc., requiring long-term storage, must not be kept in the garage or on the licensed site.

Magazines must comply with the requirements of the *Storage Standards for Industrial Explosives*.

Provided as Information

Asphalt, contaminated by oxidizing salts, can act as a pyrotechnic composition (vigorous, difficult to extinguish flames) when it catches fire.

Concrete should be sealed against AN since, otherwise, ammonia may be liberated.

4.2.2 Barricades

Barricades must be provided as required by the QD Principles. No barricade is required where only a heel of explosive is present in the vehicle.

4.2.3 Use of Brass and Copper

Brass and copper must not be used anywhere where they could come into contact with ammonium nitrate or solutions of ammonium nitrate or ammonium nitrate-based explosives. If brass and copper are unavoidable, e.g., some fire extinguishing systems, they must be protected by paint. Painting must not interfere with function, e.g., nozzles.

An exception may be copper grounding cable used on the exterior of buildings for lightning protection.

4.2.4 Connecting Hoses

Hoses that are attended/in regular use:

- need not be decontaminated;
- should be blown out after use;
- must have loose ends secured with lockable end cap;
- only one hose may be in this condition.

Unattended hoses or hoses not in regular use:

- must be removed;
 - must have both ends secured with lockable end caps to prevent drips;
 - secured in locked magazine/Sea-can/truck box.
-

Hoses must not become a tripping hazard.

Hoses should not be used when overhead piping can prevent tripping hazards and improve egress from the building.

4.3 Parking Areas

A planned area for the parking of process vehicles, including ANFO units and POGs, must be provided. This may be in or out of doors.

4.3.1 Location

More than one parking area may be identified, i.e., with heels and when (partly) loaded. If more than a heel is present, QD must be taken into account. Parking for vehicles with only a heel of explosives need not be barricaded. However, parking areas should take into account operational emergencies requiring unscheduled storage of loaded process vehicles. Parking must be separated by at least 25 m from bulk explosives storage. Parking must be located at least 25 m from any source of potential fire. This section may not be taken to mean that any unattended overnight parking of a loaded vehicle is allowed.

4.3.1.1 Parking of ANFO Process Units at Customer Sites

This is allowed under the following conditions: (i) that it is for overnight storage only; (ii) that the unit is empty and it is possible to show that the unit is empty; (iii) that the parking area is identified on the site plan; (iv) that written approval from the customer is presented; and (v) that the approval of the Explosives Branch has been obtained beforehand.

4.3.1.2 Parking at Isolated Areas

Parking of a loaded vehicle at an isolated construction site will be allowed if the site obtains a Satellite Site Certificate or when attended.

4.3.2 Number of Units and Explosives Quantity

For Satellite Sites and Demonstrations, only two process vehicles are allowed. Transfer Sites allow a process vehicle and POGs or all-terrain vehicles. One ANFO Certificate is issued per ANFO Mix Vehicle. Otherwise, the number of units is limited by the explosive quantity, the available distances and the road weight.

4.4 Tankers, Tanks or Silos for Pumpable Explosives

4.4.1 Location

Siting must take into account the QD Principles. Multiple units may be grouped together if circumstances, including available distances, allow. Barricades are required as per the QD Principles. A Satellite Site has a limitation of one tank.

4.4.2 Installation

The installation must be structurally sound and must be supported on non-combustible cribbing or skids. If road tankers are used as a permanent installation, the tires must be removed.

If road tankers are to be temporarily installed, the wheels must be blocked, the king pin must be locked and jacks should be used. Bulletin #40, which addressed this, is replaced by B620-03, TC423 tankers. Non-coded vessels may not be used on the road but may be used as permanent storage on bulk sites.

If intermodal portable tanks are used for storage, only Type 2, with a working pressure of 14.5 to 25 psi for marine and road transport, are allowed.

4.4.3 Construction

Silos and tanks must meet industrial specifications and be in good condition. All highway tankers, unless permanently installed, must conform to Transport Canada CSA B620 standards as referenced in CAN/CGSB - 43.151-97 EP17 and must be in good mechanical condition.

4.4.4 Other

Concrete or steel pads must be provided for dollies. At temporary locations, other solutions may be considered.

Manholes and discharge valves of explosive tanks must be locked (not just cam lock lug rings) when there is no pumping.

Venting must be provided.

No brass or copper may be used in contact with AN or AN-containing mixtures.

Threaded fittings in contact with water-based explosives should be eliminated where feasible.

With the exception of ANFO, gate valves may not be used with any explosives.

4.5 Fuel Storage**4.5.1 Location**

The location of fuel storage must be above ground as required by environmental regulations; it must be a minimum of 25 m away from AN, from explosives storage, or from manufacturing buildings; it must also be located at a lower elevation than explosives or AN storage. Special circumstances or alternatives that would prevent a leak or loss of containment towards explosives or AN will be considered.

If mine fuel facilities are used, they should be remote from other mine facilities. Vehicles must be fueled before loading explosives and emergency response procedures for explosive incidents must be available.

Unless approved by the Branch, sites must have their own fueling facilities for both vehicle and process use, and the following conditions apply:

- a) Fueling locations must be adequately separated from other site facilities such as AN and emulsion storage;
- b) Vehicles must be fueled before explosives are loaded; and
- c) Emergency response procedures for explosive incidents must be available.

If mine fuel facilities are used, the following conditions apply:

- a) Vehicles must be fueled before explosives are loaded; and
- b) Emergency response procedures for explosive incidents must be available and must have the agreement of the mine.

4.5.2 Dyking

Fuel storage must be dyked to meet safety and environmental requirements or to comply with ULC S601 (double skin) and have a capacity of less than 50 000 litres. Dykes should not have valved drain holes or pipes. Pumps should be mounted so that leaks will be contained by the dykes. Dykes must be kept clear of rainwater.

4.5.3 Prevention of Syphoning

Accidental syphoning from the process fuel tank must be prevented. Feeds must be by means of a pump with automatic shut-off valves to prevent loss of contents in the case of syphoning. Shut-off valves must fail to close (shut in the event of power failure).

4.5.4 Other

When used as feed or head tanks for process purposes, limited fuel storage may be located in the operating building. A zone electrical classification may be applied accordingly.

Small quantities of flammable liquid must have properly designed storage areas, containers or cupboards, and must be located 10 m from any explosives or behind a 30-minute firewall. A preferable solution is the use of CSA-approved flammable storage cabinets.

4.5.5 Use of Waste Oil

Approval for use in surface applications of waste lubricating oil in bulk ANFO products, in bulk ANFO products mixed to form ANFO-emulsion blends and bulk emulsion products, can be considered when:

- a) the waste lubricating oil is generated, characterized and used at the same location, i.e., same province;
- b) approvals have been received from the provincial authority having jurisdiction over use and transport of waste oil;
- c) its use is described in the Factory Licence;
- d) the products are authorized and include the limiting percentages of waste oil (not more than 50% waste oil may be used in the oil phase);
- e) explosive product use and sale is restricted to the base factory site where the waste oil originated.

This policy limits use of waste oil to the waste oil generated at a mine site and ensures that oil from all types of sources is not used unless the composition and the source are known and characterized. Accordingly the following requirements are placed on the sources of waste oil:

- a) a specification against which waste oils can be tested and evaluated; this specification must define:
 - i) composition, i.e., expected contents as well as what is not acceptable (e.g., hydrocarbons, a small quantity of additives, a little water, traces of heavy metals would be expected, but, glycols or chlorinated hydrocarbons would not);
 - ii) viscosity limits (very viscous oils may cause problems with application and adsorption);
 - iii) flashpoint limits (i.e., low flash point can affect pumping safety).
- b) test methods so that the oil can either be accepted or rejected before it is blended with virgin oils and before their use;
- c) companies must develop guidelines for use and testing of waste oil and its blends. The guidelines must include testing or certification of pre-blend waste oil prior to use, defining limits for water and glycol, checking for AN absorption, and conducting routine visual checks for any observed separation of the oil in the blends. Records must be available for inspection.

4.6 Ammonium Nitrate Storage

4.6.1 Location

AN stores must be located at least 25 m from and on higher ground than fuel storage. Special circumstances or alternatives that would prevent the flow of fuel towards the AN will be considered.

Large quantities of AN should be located so as not to be considered an explosive. When considered an explosive, they must be located according to the QD Principles (see Section 2.3.16).

When a vehicle with explosives is brought to the AN storage, AN is considered an explosive and this may be allowed if sufficient distances (QD) are available. However, (i) if the store is protected by an effective barricade as per the QD Principles; or (ii) if no more than a heel of explosives is present in the vehicle; and (iii) if precautions have been taken to prevent a fire during the loading of the AN into an ANFO vehicle, the AN may not be considered an explosive (unless other circumstances are involved) and storage need not take QD into account. These cases, with the expected amount of explosive in the vehicle, the amount of AN stored, any barricade protection and the possible consequences, must be approved by the Explosives Branch beforehand.

When not considered an explosive, the quantity is not limited by the Explosives Regulations but others may apply. The quantity will be listed in the licence or certificate. However, very large quantities will be considered on a case-by-case basis.

4.6.2 Construction

Storage containers or process vehicles must meet any applicable codes, be of sound engineering design, and be in good condition.

AN storage must be vented.

Road vehicles used to store AN must meet Transport Canada requirements with regard to brakes, lights, etc., and mechanical fitness must be demonstrated.

4.6.3 Storage in Tote Bags

AN storage in tote bags will be permitted as follows: 100 t maximum at any one site; the storage area must be identified on the site plan, delineated by a means acceptable to the Explosives Branch to prevent encroachment on any explosives or fuel tanks, and be covered with a tent or other structure. On temporary sites, covering by a tarpaulin will be allowed. Special consideration will be given to northern areas.

4.6.4 Other

Discharge valves must be locked.

UN numbers must be displayed on the storage.

No brass or copper must be used in contact with AN.

Threaded fittings in contact with AN should be eliminated where feasible.

4.7 Washing Facilities

Each Base Factory must have permanent washing facilities in a building to ensure cleanliness and proper decontamination. Temporary factory sites may have temporary washing facilities in a temporary structure. The washing facilities must be protected from the elements to avoid additional volumes of water that might be contaminated and require disposition.

4.7.1 Location

Washing facilities may be separated from or located together with maintenance facilities.

Locating washing and maintenance facilities together may reduce flexibility under certain circumstances; e.g., welding or other hot work will not be allowed as concurrent operations with washing a contaminated vehicle, even if only a heel is present.

4.7.1.1 Combined Washing/Maintenance Facility

The combined facility must comply with QD requirements, taking into account the amount of explosive and any exposure of people. If only a heel is present, QD need not be taken into account.

The facility should be located at D4 distances (barricaded) to other site operations to allow independence of operations. Locating operations within D4 distances may entail restrictions.

The combined facility must be, at minimum, 25 m from any explosive storage to reduce the risk of fire propagating to the storage.

Personnel limits must be set at a minimum required to carry out the work.

Personnel not directly involved with explosives, such as office clerks, must be located at D7 distances.

4.7.1.2 Separate Washing Facility

The washing facility must comply with the same location requirements as described above for the combined facility.

4.7.1.3 Separate Maintenance Facility

If a contaminated process unit is to be brought to the facility, it must comply with the QD requirements outlined under the combined facility. However, no hot work will be permitted in the facility while a contaminated unit is present.

If only decontaminated units are to be brought to the maintenance facility, no restrictions apply. The facility may be sited anywhere, including outside commercial garages. Decontamination procedures must ensure that no explosives remain on the vehicle.

4.7.1.4 Washing/Maintenance With Explosives Storage

Bulk explosive storage under the same roof with maintenance or washing facilities will be considered on a case-by-case basis. This, however, will entail restrictions on the operations. Designs for such arrangements must take into account ignition and spread of fire (a minimum of a one-hour firewall) and the possible consequences of an explosion on the surroundings.

4.7.1.5 Mechanical ANFO Certificate

For washing/maintenance facilities operating under a Mechanical ANFO Certificate, the explosive QD does not apply when no residual explosive is present and when any AN has been removed from the hopper before being brought to the facility.

4.7.2 Other

A sufficient area for spare parts and tools must be made available in the washing/maintenance facility. With the exception of heavy pieces of equipment (e.g., diesel engine), storage on the floor is not acceptable. Tires and other flammable material must be stored in a separate area.

4.8 Washing System**4.8.1 Location**

A washing system must be available for use at any time. Waiting for a system to arrive from some other place might result in a lack of or improper cleaning or decontamination.

4.8.1.1 Fuel-Fired Wash System

A fuel-fired wash system, employed as part of a garage/maintenance facility, must be contained in a separate enclosure (room) with a minimum of a one-hour rated dividing firewall and a one-hour rated ceiling between it and all other facilities. This may be located inside the garage itself or attached to the main garage/maintenance structure.

The storage tank for fuel must be located in accordance with the fuel tank requirements. Systems using gasoline or other low boiling point hydrocarbons (flash point below 100°F or 37°C) may not be used. Propane installations will be considered on a case-by-case basis.

Note: Consult the *National Building Codes of Canada - 1995*, Appendices A and D, for the appropriate wall/ceiling configuration.

4.8.1.2 Electric Wash System, Other Than CEMA 4X

A wash system using an electric heater that is not CEMA/NEMA 4X must be located in a separate room. The electrical classification within a separate room must consist of good industrial wiring and enclosures consistent with the Canadian Electrical Code (CEC). See Appendix “B” for a typical installation. Note that other equipment not meeting CEMA/NEMA 4 X standards could be stored in this area.

4.8.1.3 Electric Wash System, CEMA 4 or 4X

A wash system using an electric heater that meets CEMA/NEMA 4X electrical classification may be located within a garage facility without a wall/ceiling/door structure separating the two.

4.8.2 Requirements for the Separate Room

The door to a separate room may open into the washing area but must be rated for a minimum of one hour and have an auto-closure installed. The door sill must be raised a minimum of 5 cm (2 inches) across the bottom of the door opening. The wall, at grade level (floor), must be caulked all around when gypsum board is used in the wall construction for a one-hour fire rating. A small opening, the size of hose only, is permitted through the wall to allow the wash hose(s) to pass through, (see also Section 4.14.4).

Note 1: A separate door entrance from outside of the garage, i.e., from outdoors, into the wash facility room is permitted without the auto-closure and 5-cm raised door sill requirement. However, there must not be any direct passage from the separate room to the garage.

Note2: Hose(s) must not be permitted under or through an open doorway.

Note 3: Caulking is not necessary at grade level when hollow concrete blocks are used for one-hour fire-rated wall construction.

4.8.3 Performance

The washing system must be proven effective to clean vehicles of oil and grease and to decontaminate vehicles of all explosives under all climatic conditions of operation. The exact design

is left to the company. The following is required: a source of water, detergent, collection and proper disposal, and a pressure system. The following is preferred: pressure, hot water or steam. If a cold washing system proves ineffective, the hot-water pressure system will be imposed.

4.8.3.1 Washing for ANFO Units

Washing systems for ANFO units may take into account the ease with which they may be cleaned and be designed accordingly. Provision should be made for ensuring that the units are not greasy.

4.8.4 Waste Water and Scrap

Waste water and scrap explosives must be collected and disposed of in a manner approved by the provincial or other responsible environmental authority.

Recommendation

It is recommended that water contaminated with explosives or chemicals be separated from water used for washing dirt in order to reduce the burden of disposal.

4.9 Lunchroom and Welfare

A lunchroom and washrooms may be provided as required by provincial regulations.

4.9.1 Location

Such facilities may be located next to the operations if used by the factory personnel or by visitors, such as truck drivers and delivery persons. The number of visitors must conform to the visitor licence limits approved on Form 6.

If used by personnel not connected to the manufacturing operations, they must be located at D7 distances.

Lunchroom for workers at a process building may be located within the building provided:

- it is separate with a door though there is no need for a firewall,
- no hot element equipment (ovens, toasters) are present (microwaves and fridges are OK),
- it is used while there is no operation in the process side,
- the number of personnel using it are in the licence limits approved on Form 6.

4.10 Office

Office space may be provided as required.

4.10.1 Location

The office may be located next to the operation if used only by the personnel directly connected with manufacturing. Personnel limits specified in Form 6 apply. Visitors, such as truck drivers and delivery persons, are permitted within the visitor licence limits approved on Form 6.

If used by personnel not directly connected to the manufacturing operations (e.g., accounting personnel), offices must be located at D7 distances.

One administrative-level employee may be located within D7 but not within D4 distances. The location must be such that the person is not directly in harm's way, e.g., sitting in front of glass windows facing the potential explosion site.

4.11 Other Storage

Inert Material, Chemicals and Contaminated Parts

Sufficient and proper storage for inert materials, chemicals and contaminated equipment or parts must be provided.

4.11.1 Location

Such areas must be located in a manner that does not increase risk to the explosive operations.

4.11.2 Chemicals

Chemicals must be identified and chemicals stored together must be compatible. Oxidizers, fuels and metals must be stored separately from each other. Nitrite salts, although oxidizers, are not compatible with ammonium nitrate and may not be stored with AN. Storage should take into consideration the possible consequences of a fire.

Chemicals should be stored indoors. If circumstances necessitate outdoor storage, a proper storage area must be identified on the site plan. The outdoor storage must be in containers designed for the outdoors. The storage area must be lined with an impermeable membrane, or a spill contingency plan must be prepared and approved. Aluminum may not be stored outside.

All reusable containers must be labelled and old markings must be obliterated.

4.11.3 Contaminated Parts

Contaminated pieces, such as pumps and hoses, must be locked until such time as they are decontaminated. Storage areas may be located either by a garage, by an emulsion tanker or by another licensed area such as a magazine. Pieces should be as clean as possible before storage. Any explosive picked up must be disposed of in an acceptable manner. The storage container must be made of material that is easy to clean or lined with an impervious lining.

Contaminated material, such as bags or cases, must be set aside in a safe, locked area for prompt disposal.

All contaminated pieces should be marked as being contaminated until decontamination.

Do not store contaminated pumps in magazines.

4.11.4 Waste and Scrap

All waste and scrap materials must be handled according to the principles of good housekeeping, i.e., label containers for contents.

4.12 Laboratory

Base Factories should set up small laboratories to conduct quality control of the products being delivered. They may be located at a convenient location.

Proper (hard-wired) electrical connections are required, as applicable, with the receptacle located above the work bench. If the laboratory bench is located in an open area such as a garage, the receptacle may be located below the work bench if it is positioned at a distance, e.g., 3 m.

If explosives are present, they must be stored in a locked cabinet when not being handled. If refrigerators are used as refrigerators, they must conform with the intent of CEMA 4X requirements. (Consult the Explosives Branch for appropriate modifications.) No nitroglycerine products may be placed in a modified refrigerator.

An electrical heater must conform to CEMA/NEMA 4X standards in the case of a baseboard-type unit that is to be installed above the work bench. If an electrical heater unit with a fan is considered for above the work bench, then the fan motor must meet Totally Enclosed Fan Cooled (TEFC) requirements, i.e., no exposed arcing. If there is a need to install heaters below the work bench, the units must be Class 1, Zone 2.

4.13 Laundry

A clothes washer and dryer must be provided for areas where molecular explosives, such as TNT, or hazardous oxidizers, such as perchlorate, are used. The effluent water must be collected. If the washer/dryer are located in a garage area, they must be installed 5 cm above the grade to meet hazardous electrical requirements.

4.14 Electrical Requirements

A schematic for the electrical classification is given in Appendix B as a guide only. Specific situations should be addressed to the Explosives Branch.

Typically, for garage/maintenance facilities, the classification of CEMA/NEMA 4X is appropriate.⁴ The International Standards' IP Protection Classification equivalency is IP66 (totally protected against dust and strong jets of water).

For process production areas, the electrical classification of Class 2, Division 2 must be adhered to at all times when electrical heaters are installed inside the process area. When ammonium nitrate prills are handled as part of the process, then the lighting must also meet the higher Class 2, Division 2 electrical classification for hazardous locations. When no AN prill handling is involved in the process, then the electrical classification for lighting only may be reduced to the lower CEMA/NEMA 4X classification. Typically, where motors are used for pumps and agitators/stirrers, these must be the Totally Enclosed Fan Cooled (TEFC) type, i.e., with no exposed arcing contacts. The attached electrical enclosure must meet the minimum CEMA/NEMA 4X standard for electrical enclosures (not weather resistant). Specific situations may warrant area "zone" classifications of a higher electrical class, within an open-concept production area, to meet special situations, e.g., when large diesel tanks are present indoors.

Portable power tools normally used in a garage are generally not classified for CEMA/NEMA 4X. They must be stored in a closed cupboard and not brought out until the garage or process units in the garage have been decontaminated. Extension cords should be flexible, hard usage cord for an outdoor wet (or damp or dry) location to compensate for abrasion. Extension lights must not have any switches at the bulb ends.

Existing facilities built to the CEMA/NEMA 4 standard need not upgrade subject to the condition that CEMA/NEMA 4 enclosures be painted and well maintained and do not show signs of corrosion. Facilities built to a higher electrical classification need not be changed to CEMA/NEMA 4X.

4.14.1 Electrical Room - Motor Control Centre (MCC)

The most acceptable arrangement is for the MCC to have access from the outside, that is, no entry from the manufacturing side to avoid the risk of a fire originating in the MCC and spreading to the explosive side. A one-hour fire rating is required between the room and the explosives areas.

However, it is recognized that some larger sites may require a direct entrance, usually due to operational controls via programmable logic controllers (PLCs) located in the MCC. This arrangement must be comprised of a one-hour rated firewall, a fire-rated door with auto-closure, and a 5-cm raised curb along the wall, including a 5-cm sill across the door opening.

⁴A full description of the requirements will be found in Appendix E, currently in preparation.

4.14.2 Power Supply

The primary supply must be located so that it can be cut off by switches at one or more central points away from the danger area. Overhead power transmission lines and service lines must not pass within 15 metres of a building or over a building containing explosives. The switch gear must be located outside the building in a weather-proof enclosure or separate motor control centre (MCC) with entrance from the exterior. Power source lead-ins must be placed underground at least 15 metres from the building with no overhead electrical (i.e., no masts) connections permitted.

4.14.3 Grounding

All equipment in explosives areas, including that equipped with internal combustion engines such as generators, must be grounded. Grounding through the plug is not acceptable. Grounding cables must be connected directly to the equipment and to ground bars outside the building. Facilities must have ground fault interruption systems.

4.14.4 Separate Rooms for Electrical Equipment

When called for, a separate room may be required for other equipment not meeting the CEMA/NEMA 4X electrical rating, such as a hot-water heater, deep-water well pump, compressor, or the main electrical panel.

Note 1: The electrical panel can be mounted either inside or outside the garage. When inside (and not within a separate room), it must meet the CEMA/NEMA 4X electrical classification. When outside the building, i.e., outdoors, it must be enclosed in a weather-tight enclosure. The latter installation, i.e., mounted outside the main garage, is preferred.

Note 2: The separate room housing the equipment noted above may also contain a *fuel-fired wash system*.

The separate designated area is not to be used for any general storage.

Where permitted by the Explosives Branch, larger facilities incorporating process production area(s), facility heating systems, electrical MCCs and garage/maintenance facilities all under one roof must have separate designated areas with a minimum of a one-hour fire rating between them.

When separate rooms are used between higher and lower electrical classifications, the separate room must be comprised of a one-hour rated firewall, a fire-rated door with auto-closure, and a 5-cm raised curb along the wall, including a 5-cm sill across the door opening.

Note 1: This issue can be avoided by providing only external access to the electrical or MCC area.

Note 2: Consult the Explosives Branch before proceeding with a detailed proposed design.

4.14.5 Controls

All process controls must have operation and maintenance manuals. Controls should include the following: all wiring be labelled and referenced to drawings; process controls be located in CEMA/NEMA 4X enclosures with sealed wire entries; junction boxes and push-button stations must not be damaged, and must not have any screws missing from the cover; and there must be no water in the box. All electrical circuits should have manually reset breakers or fuses. All buttons and switches should be labelled and all valves should be labelled and easy to access.

4.15 Equipment Powered by Internal Combustion Engine (Generators and Compressors)

Large generators, compressors or other equipment must be at least 15 m from explosives. The fuel to service these must be located a minimum of 25 m from explosives or from an explosives building. Generator/fuel combination must be located a minimum of 25 m from the explosives, and fuel storage must comply with fuel storage requirements. Special permission will be required for I/C equipment using any fuel except diesel.

The equipment must be equipped with fire extinguishers.

Small, portable I/C-powered equipment with fuel tanks smaller than 6 litres may be located as convenient, but in a manner that does not pose a fire hazard for the explosives or oxidizers. They must be fueled before use away from explosives or oxidizers. The equipment is not allowed inside an explosives building if it is gasoline or propane powered. Fire extinguishers must be located nearby.

4.16 Hydraulic Systems

Hydraulic lines and fittings should not leak. Sleeves must protect lines at sharp edges or where lines pass through openings. Lines should be located so that, in the case of a leak of the fluid, the leak will not catch fire on any hot surface.

4.17 Pumps

Pumps (make, model and safety devices) used for pumping explosives or AN liquor must be approved by the Explosives Branch. Companies should abide by the recommendations of the Pumping Guidelines (a copy of the Guidelines may be obtained from the Explosives Branch). A hazard review and/or testing of the pump explosives combination may be required prior to approving the pump. Each progressive cavity pump must have its own log to record all maintenance and any work done on it, and a log is recommended for other pumps.

Records may be requested during inspections by the Branch or prior to the issuing of the licence. Pumps and process units that do not have available up-to-date logs or records must be removed from service until either the required preventive maintenance has been performed or the required records are available.

4.17.1 Progressive Cavity Pump (Fixed and Mobile Locations)

If a progressive cavity (PC) pump is used for pumping explosives, it must have mechanical or lip seals, and must not have any packing glands. It must have a solid rotor, oil-resistant stator and seals, drive guard(s), and at least two of the following pump safety shutdown systems to protect against no-flow pumping: temperature trip, five-minute timer, thermofuse, or flow switch. Other protection against no-flow pumping will be accepted if it has been demonstrated to be effective. If a temperature trip is used, it must be within 50 mm of the end of the rotor. If the PC pump will be operating above 400 psi, protection from initiation caused by adiabatic compression will be required.

If the pumps might be used to transfer explosives, they must have a five-minute timer as well as two safety devices since transfer pumps are sometimes operated without direct supervision.

A testing program must be in place for all the safety shutdown systems. A pump maintenance and testing program log must be available. Pumps whose safety systems are found not to be functional must be removed from service until corrected. Pumps may not be put into service until safety systems have been tested, and this must be repeated on a regular basis.

Maintenance and/or repairs that require disassembly of progressive cavity pumps used to pump explosives must be carried out by technicians certified by the pump manufacturer. Proof of certification must be kept with the pump maintenance records.

Records may be requested during inspections by the Branch prior to the authorization of a process pump and/or vehicle, or prior to the issuing of the licence. Pumps and process units that do not have available up-to-date logs or records must be removed from service until either the required preventive maintenance has been performed or the required records are available.

4.17.2 Other Emulsion or Watertgel Pumps

Pumps other than progressive cavity pumps may require less instrumentation but should be instrumented in accordance with their potential for self-heating when deadheaded or running dry. The exact nature of the instrumentation must be based on a hazard analysis and/or testing and/or the Pumping Guidelines. Refer to the *Guidelines for the Pumping of Water-based Explosives* available from the Explosives Branch for a nominal fee. They are also available electronically upon request from the Explosives Branch.

A pump maintenance log must be available.

Records may be requested during inspections by the Branch prior to the authorization of a process pump and/or vehicle, or prior to the issuing of the licence.

4.18 Augers

Augers must have outboard bearings with stand-off spacing at the ends and have reversible flights or paddle sweepers. Augers should have stainless steel contact surfaces, sealed shafts to prevent fuel oil leakage, and drive guard(s), including at the free ends of the bearings. Mild steel augers are not permitted if aluminum is present.

Records may be requested during inspections by the Branch prior to the authorization of a process pump and/or vehicle, or prior to the issuing of the licence.

4.19 Heating and Furnaces

Electrical heating must comply with the electrical requirements (see Section 4.14). Furnaces are described in the following sections. Before installing any heating system, it is suggested that detailed plans and specifications, along with proof that the proposed installations comply with all appropriate codes, be submitted with the application for review and comment. Proof that the proposed installations comply with all appropriate codes may be requested during inspections by the Branch or prior to the issuing of the licence.

4.19.1 Location

Furnaces or boilers must be installed in separate rooms with a one-hour fire rating.

4.19.2 Fuel Supply

Fuel tanks should be on the surface to meet provincial environment considerations and be at a lower grade than the building to prevent the spread of a possible fire to the building content. The quantity of fuel should be kept to a reasonable limit. Under no circumstances must oil or gas (natural/propane) flow towards the building in the event of a leak. The fuel supply must have two independent shut-off valves between the storage tank and furnace. Brass valves must not be used in areas where brass is incompatible with the explosives or raw materials. Fuel storage and associated dyking must be located as per these guidelines and at the recommended distances identified in the QD Principles manual. Barriers may be required to protect the fuel storage areas from high-energy low-angle projections caused by an explosive event from the hazardous location to ensure that fire or any other event at the fuel storage location would not endanger the explosive operations.

4.19.3 Other

Furnaces must be equipped with redundant high-temperature limiting controls (often built-in) to prevent a runaway situation should the thermostat fail.

If oil or gas are used, a 10-lb dry chemical fire extinguisher must be mounted in the furnace room. A fire extinguisher is recommended in other electrical heating situations.

The operation and installation of fired units must comply with the conditions issued with a Fire Permission (see Section 3.1.2).

4.20 Process Vehicles (Portable Process Units, ANFO Mix Vehicles or Pneumatic Delivery Systems)

Refer also to “Process Vehicles - Guidelines for Licensing Using Form 4.”

Process vehicles must be readily identified with the company name and unit number. Process vehicles must meet federal and provincial requirements. Provincial workplace safety requirements cover user safety, including ladders and guardrails, the guarding of rotating equipment, and pinch points. Canadian Motor Vehicle Safety Standards cover the running gear of the vehicle, including brakes, tires, general roadworthiness, and daily vehicle checks. Transport Canada’s TDG regulations apply everywhere except on a closed and gated site. All process vehicles’ large means of containment are expected to meet TDG standards for construction and placarding, even on closed and gated sites.

All new process vehicles coming into service must meet TDG large means of containment standards and placarding even on closed and gated sites, e.g., mines, unless permitted by the terms of the licence (refer to Section 4.20.8 for “grandfathering” of non-coded large means of containment).

Vehicles must meet the description submitted during authorization and the one identified on the location list. Vehicles that do not comply with authorization description, do not comply with the inspection check list, are mechanically unfit, or are missing the required paper work must be removed from service until accurate supporting documentation is supplied or information provided that shows the needed repairs have been made.

4.20.1 Fire Extinguishers

Fire extinguishers are always expected to meet NFPA Codes and Standards. A minimum of two fire extinguishers of at least 4-A:20-B,C rating must be present on explosives vehicles carrying less than 2000 kg NEQ of explosives. Vehicles carrying more than this require two extinguishers of at least 4-A:70-B,C. In addition, process vehicles are also required to have an engineered fire suppression system for the engine compartment. Vehicles already approved with a third extinguisher mounted to discharge onto likely fire sources in the engine compartment, such as the alternator or hydraulic pump, are grandfathered.

Engineered systems will be required when the cab and chassis of currently authorized vehicles are replaced. All fire extinguishers must be tagged in accordance with NFPA Codes and Standards to demonstrate testing is current.

If aluminum is to be used, a fire extinguisher compatible with aluminum should be present.

Fire extinguishers and fire suppression systems must be inspected on a monthly basis and records of inspection kept.

4.20.2 Electricals

The battery must be enclosed in a battery box. To isolate the battery, an easily accessible manual battery disconnect switch, or manual reset breaker, labelled and located a maximum of 30 cm from the positive terminal, must be provided. The switch or breaker should be located on the positive line.

4.20.2.1 Wiring

All wiring must conform to the *Canadian Electrical Code*.

Process vehicle wiring behind the cab must be in conduit extending into all fittings and junctions. TECK90 XLPE or ACWU90 cable is an acceptable alternative to conduit. Where conduit or cable enters lights, motors, electrical equipment or junction boxes, the wire entries must be sealed, and entry fittings designed for the purpose must be used.

Note: The entry needs to be liquid tight and protect the wires from rubbing damage and the connection from strain.

All wiring must have overcurrent protection.

4.20.2.1.1 Class 2 Circuits

Process vehicles with Class 2 circuits meeting the requirements of Class 2 Circuits in Section 16 of the *Canadian Electrical Code* are acceptable on process vehicles and do not have to meet the above requirements for conduit and cable entry into fittings.

Note: Class 2 circuits are limited voltage and current Class 2 circuits of 0-20 volts must be limited to less than 5 amps. They present no electrical shock hazard and no significant fire hazard. There are rules governing overcurrent protection, conductors and separation from other circuits. These circuits are usually suitable for instrumentation and control. On process vehicles, these circuits could be used for solenoid valves as well as sensors and transducers. Overcurrent protection of different ratings must not be of an interchangeable type.

All exterior electrical boxes must be CEMA/NEMA 4X with sealed wire entries.

Wiring must be protected where mechanical damage is likely when it passes through bulkheads or is next to sharp edges by bushings and supports.

Despite the above, wiring connected to ABS braking systems or other motor vehicle control systems originally installed by the truck chassis manufacturer may be left as installed.

4.20.3 Fuel Tanks and Lines

Fuel tanks must meet Canadian Motor Vehicle Safety Standards (CMVSS). Fuel outlets below the fuel level must be fitted with easily accessible shut-off valves or devices. Shut-off valves should be labeled.

4.20.4 Brakes and Steering

Brakes and steering apparatus must be in good mechanical condition and meet Transport Canada and provincial requirements. Brakes must meet provincial Ministry of Transportation safety requirements and the current CMVSS for service, parking and emergency brakes as per CMVSS 121.

4.20.5 Tires

Tires must meet Provincial Ministry of Transportation safety requirements and the current CMVSS.

4.20.6 Exhaust

The exhaust must extend vertically above the vehicle behind the cab and be protected with a heat shield from the box, body, hoppers, and tanks. Horizontal portions of exhaust must be positioned without any explosive storage or any explosive handling components above. Horizontal portions of exhaust must be shielded from drips of hydraulic fluid, oil or emulsion. Horizontal portions of exhaust exposed to drips of hydraulic fluid, oil or emulsion must be shielded.

4.20.7 Compressors

The compressor (make, model and capacity) for AN or ANFO transfer and its location in relation to the blow case and fuel oil tank must be described on Form 4.

Compressors powered by their own diesel engine, when mounted on the process vehicle, should have a minimum of a one-metre fire separation between the compressor and blow case. If there is less than one metre, then either a fire partition or insulation on the blow case itself with appropriate mechanical protection must be installed between the compressor and the blow case. The compressor should be easily accessible to enable an operator, at ground level, to readily direct a portable fire extinguisher if the need arises. A permanently mounted extinguisher to discharge directly onto the engine is preferred. A better alternative to the latter is an engineered, permanently mounted fire extinguishing system with nozzles directed over the engine.

4.20.8 Mobile Process Vehicle Emulsion Tank

The Explosives Branch has adopted the July 2003 Canadian Standards Association (CSA) B620-03 reference document, entitled *Highway Tanks and Portable Tanks for the Transportation of Dangerous Goods* for non-pressurized tanks. Production vehicles used for the transport and mixing/pumping of emulsion or watergel/slurry must meet B620-03, TC 412 requirements as referenced in CAN/CGSB-43.151-97, "Packing of Explosives (Class 1) for Transportation" under explosives packing methods EP 17, Note 5. This includes, but is not limited to, meeting the appropriate design and working pressures plus venting and pressure relief, rollover and spill protection, in addition to guarding the discharge valve and providing a substantial bumper. Tanks brought into service prior to July 1999 in Canada have been "grandfathered," but those that do not meet the requirements of TC (MC/DOT) 306, 406 or 412 coded vessels built to earlier published B620 or CFR 49 (USA) standards will be limited to private property use only, e.g. mines after January 1, 2010, by the terms of the Explosives Regulatory Division licence.

The emulsion tank should be stainless steel at the product contact surfaces. Where insulation is used, it must be non-porous in nature, i.e., not absorb explosives in the event of a spill, and should normally be clad.

In addition to complying with the requirements of B620-03 for all coded vessels, ERD will also ensure all vehicles, assembled or altered in multiple stages, conform to the applicable Canadian Motor Vehicle Safety Standards (CMVSS) which came into effect in February 2003. This Transport Canada (TC) requirement calls for appropriate lighting, demonstration of centre of gravity calculations, correct selection of chassis for GVWR and GAWR ratings concerning weight distribution, plus adequate braking for a fully loaded vehicle, to name a few of its provisions. It is part of the National Safety Mark (NSM) process administered by TC (reference www.tc.gc.ca) and applies to all intermediate and final stage manufacturers, who assemble or alter a vehicle prior to its sale to the first purchaser, whether imported into or originating in Canada.

Meeting these national vehicle safety standards is not only a requirement for public road usage but also for all private off-road applications, such as process vehicles that may be confined to mines.

Additionally, it will be a mandatory requirement for all shops who assemble or alter used process equipment or change it to a new chassis to demonstrate, as part of the authorization process, that the final assembly meets all the applicable CMVSS Safety Standards. This latter requirement will require confirmation, in writing, by a professional engineer who is proficient in the required standards.

Note 1: Reference to B620-03 requires engineering input and, in most cases, registration with Transport Canada for all aspects of design and assembly to permit the transport of dangerous goods on public roads. Process vehicles with coded emulsion tanks built

to CFR 49 (MC/DOT) or TC equivalent 306, 406 or 412, residing in Canada prior to July 1999 will be “grandfathered” with no restrictions on usage. Used, coded mobile process vehicles, being considered for importation into Canada, be it for a trial or for longer term usage, may, at ERD discretion, be subject to a total design review or inspected by a third-party Transport Canada Authorized Design Agency to ensure compliance with the appropriate standards at the time they were built, all at the licensee’s expense.

Note 2: CFR 49, DOT 412 tanks will be accepted as an alternative once an independent third-party review is done by a Transport Canada Authorized Design Review Agency to show compliance with the applicable standard.

Non-specified emulsion tanks, as part of mobile process vehicles residing, and in use, in Canada prior to July 1999, will be “grandfathered” until January 1, 2010, under the following conditions: (i) the non-coded tank must be initially inspected externally and if possible, internally, plus hydrostatically tested to 5 psi and marked with a permanently attached plate bearing the words “Non-spec tank” and “Not for Dangerous Goods Use after January 1, 2010;” (ii) the date of the first test and the name of the registered facility that performed the initial test is to be included; (iii) the non-specified tanks will be subject to the same periodic inspections as required by Transport Canada for a TC 306 tank; (iv) the tanks must display the familiar V, I, P, K markings with the appropriate inspection dates.

Note 3: Older non-coded “grandfathered” emulsion tanks will not be accepted for dangerous goods by Transport Canada for travel on public roads when loaded with a heel or when fully loaded with explosives after January 1, 2010.

Note 4: When the integrity of the production tank is at risk and/or where the tank and chassis/trailer are assembled separately, the Explosives Branch reserves the right to have the entire design reviewed by a third-party Transport Canada Authorized Design Agency to ensure compliance with either CFR 49, DOT 412 standards or B620-03, TC 412 standards, all at the licensee’s expense. Where the assembly is carried out in Canada, the assembly shop must be registered with Transport Canada, with the reviewer considering the entire design package, not just the tank by itself, as required by B620-03. ERD further reserves the right to have the assembly inspected, at the licensee’s expense, by the third-party reviewer to ensure the package meets the applicable standards.

Note 5: Highway tanks used for the transport of emulsion/watergel/slurries only are addressed separately in CAN/CGSB-43.151-97, EP 17, Note 4.

4.20.8.1 Hatch on Emulsion Tank

Hatches must be lockable. They should be water tight and there should be a sufficient number for tank cleaning. There should be a one-inch wire mesh basket in the opening and adequate drainage around the hatch.

4.20.9 Ammonium Nitrate Bin

The AN bin should be stainless steel or aluminum where in contact with the product and must have one-inch stainless steel grating in the hatch openings. It must have locking hatch covers. The hatch design should prevent water ingress. All nuts in the bin should be tack welded to the bin or locked to prevent them from coming loose.

4.20.10 Process Fuel Oil Tank

The process fuel oil tank must be of metal construction with a non-spill air vent with filter, a fusible fill cap, and shut-off valves at all outlets. It should also have a robust level indicator with a manual or self-closing valve and the proper relief setting on the fuel oil pump. If the capacity is greater than 450 litres, the tank must meet TDG requirements for a large means of containment.

Section 5.14 of the TDG Regulations states that the containers must be selected and used in accordance with the requirements of the standard CAN/CSA B621-98 "Selection and Use of Highway Tanks, Portable Tanks, Cargo Compartments and Containers for the Transportation of Dangerous Goods, Classes 3, 4, 5, 6.1, 8 and 9." This standard prescribes that diesel tanks built after December 31, 2002, must conform to the TC 406 tank specification under CSA B620-98, or its CFR 49, DOT 406 equivalent, when permanently mounted on the frame of a truck or trailer.

4.20.10.1 Venting

Proper venting, sized for the volume of the process fuel tank, must be provided:

Safety Vent: To prevent internal tank pressure from rupturing the tank's body, seams or bottom opening if ever subjected to a fire;

Air Vent: Non-spill air vent (such as a ball check or spring release) that will ensure that, in a rollover situation, fuel is confined to the tank.

The air vent may be combined with the safety vent or be a separate item. Both mechanisms must be able to withstand the hydraulic pressure exerted from within during normal operations as well as in a rollover situation.

4.20.11 Gassing Solution Tank

The gassing solution tank must be made of material compatible with the solution.

4.20.12 Aluminum Bin

The bin holding aluminum should be non-rusting and sealed against water. Stainless augers must be used for aluminized products.

4.20.13 Delivery Hose Reel

There should be a drip tray under the delivery hose reel, a holder for the loose end of the delivery hose (for spill prevention), and a hydraulic counterbalance valve to prevent free wheeling.

4.20.14 AN Pneumatic Delivery Systems, AN Blow Loaders, POGs

The pressure vessel must be certified and fitted with a pressure-relief valve. Pressure vessels may not be used to store AN or ANFO. Vessels must be loaded at the place of use unless permission has been obtained from TDG for road transportation.

4.20.14.1 Pneumatic Hoses for Delivery of ANFO

Pneumatic ANFO deliveries must be made using semiconductive hose. The hose must have an electrical resistance high enough to limit the flow of stray current to safe levels, yet not so high as to prevent drainage of static electric charges to ground. A hose of not more than 2 M Ω resistance over its entire length and of not less than 1 000 Ω per foot meets the requirement. A system resistance of 10 000 Ω and 2 000 000 Ω is satisfactory and will still bleed off static, but slowly enough not to be hazardous. A too-conductive hose provides a low resistance electrical path to the borehole for stray and galvanic currents. Wires placed in the hose, incorporated into the hose or attached to it will dissipate static too quickly and the spark could initiate a detonator.

Note: Loading ANFO into a liner that is not static resistant may also lead to a build-up of a charge. This may occur when ANFO is poured into a hole from a bag, tote or auger. Take the appropriate precautions by grounding vehicles and loaders and using static-resistant conductive or dissipative liners.

4.20.15 Loading of Process Units**4.20.15.1 Reloading of Process Units**

This will be allowed at a Satellite Site meeting QD requirements and located at a minimum D4 from the Customer Site.

4.20.15.2 Reloading of Process Units With AN

Provided the QD requirements are met, process units may be reloaded with AN close to the loading pattern but outside the 15-metre perimeter. This must take into consideration the possibility that the AN behaves as explosive.

4.20.15.3 Loading ANFO Process Units at Rail Sidings

This section does not apply to process vehicles handling bulk water-based explosives. ANFO Mix Process vehicles may be brought for loading at rail sidings under the following conditions:

- Site applications must include a map providing the general location and distances to nearest buildings and roads (if within 1 km). The application will reference the designated factory licence or Satellite Site to which the process vehicle is attached.
- Only sites approved by the rail carrier may be used, and written permission of the rail carrier must be provided to the Explosives Branch, along with permission of the appropriate local authorities. The conditions prescribed in the Railway Association of Canada Circular No. DG-2 must be followed. A maximum of two rail cars of AN may be present during unloading.
- Only one process vehicle may be at the site (defined as within 100 m of the rail car being unloaded) at any time. Vehicles must contain no explosives. Augers must be cleaned out before loading by running AN through them. Oiling systems must be fitted with check valves to prevent oil leaking into the augers. Gas-powered vehicles and gas-powered motors are not allowed at the transfer site during loading.
- No other activities may take place within 100 m of this site. No other raw materials may be stored at this site. No more than two people may be at the transfer site.
- The AN handling equipment must meet the requirements of these guidelines. Spills of AN or fuels at the transfer site must be cleaned up immediately and properly disposed of.
- An Emergency Response Plan must be developed for the operation.

4.21 Forklifts and Pallet Movers**4.21.1 Electrical Forklifts and Pallet Movers**

These must conform to the EE rating when in an operating area. ES-rated forklifts may be used with packaged explosives in magazines.

4.21.1.1 Charging

Charging of forklifts is allowed if the area meets *Canadian Electrical Code* requirements for adequate air exchange, no production is in progress, proper engineering standards have been followed to vent excess hydrogen, no other flammables are present, and lights and fans meet Class 1, Zone 1 electrical ratings.

Forklifts may be charged during production under the additional conditions that the charging is done in a separate room meeting a Class 1, Zone 1 electrical rating and that the door, charger and ventilation fan are wired to prevent charging while the door is opened.

4.21.2 Diesel Forklifts

A type DS may be used inside and outside with the added safety features of these Guidelines.

Type D may only be used outside, never in a process building or magazines. It must have the additional safety features and be accredited by Underwriters Laboratory of Canada, or Underwriters Laboratory Inc. or Factory Mutual.

4.21.2.1 Fire Extinguishers

Two fire extinguishers of at least 10 BC rating, one of which is permanently mounted to discharge directly onto the engine, must be provided. A preferable alternative to the latter is an engineered fire extinguisher system.

4.21.2.2 Electricals and Venting

An easily accessible manual battery disconnect switch located within 30 cm of the battery, or as close as possible to isolate the battery, and a non-spill safety vent valve of sufficient size to prevent pressure rise under fire conditions on the oil tank(s) must be provided.

4.21.2.3 Operations

The forklift or pallet mover is not to be stored in the building or room where explosives are being handled. Refueling must be done outside the building. If the fuel is exhausted while in the building, the forklift must be moved manually. When the equipment is used inside, doors must be open to provide ventilation. When used in a process area, forklifts must, in addition, have spark arrestors and the exhaust must be directed away from the explosive. Type D forklifts may be used only in the outside yard.

4.21.3 Propane Forklifts

Only Liquefied Petroleum-Gas Safety (LPS) power-rated propane forklifts meeting the additional safeguards for the exhaust, fuel and electrical systems, as approved through testing by nationally recognized laboratories, may be used. All such instances must be approved by the Chief Inspector of Explosives and such forklifts are for outdoor use only.

Appendix A - Additional Terms

The following are the additional terms and conditions for bulk sites. They appear as “Operating Rules” issued with the licence or certificate. Details are to be found in “Process Vehicles, Guidelines for Licensing Using Form 4.”

A. Procedural Requirements**1. Prior to Leaving the Licensed Base of Operation (Including Base Factory, Temporary Factory, Satellite Site, Mechanical Certificate)**

The following requirements must be met:

- a) The required vehicle safety features must be in sound operating condition.
- b) The vehicle must be operated only by a trained operator under the supervision of trained personnel experienced in the manufacture of explosives.
- c) The process vehicles covered by this licence must not transport explosives other than bulk ammonium nitrate and fuel oil, bulk slurries or watergel, and bulk emulsions or the ingredients required for their manufacture.
- d) Normal safety precautions applicable to the processing and handling of explosives must be observed at all times. The "No Smoking" and "No Matches" rules must be strictly observed. Smoking and matches will not be permitted within 15 metres of ANFO vehicles or explosive bulk and mix vehicles.
- e) Refuelling of the vehicle must be conducted in accordance with Section 63(i) of the Explosives Regulations.
- f) The proper placards/signs must be displayed as per the guidelines below.

2. Transport on Highways and Other Public Roads

Signage and placarding of a large means of containment must meet TDG requirements.

3. Transport on Mine or Quarry Property

Signage and placarding of a large means of containment must be visible and meet provincial mine regulations or, if these are silent, must be as described in the TDG requirements.

4. While at the Mix Site

The following requirements must be met:

- a) During operations in the field, the area within 15 metres of the vehicle must be free of all operating equipment and of any personnel not associated with the operation.
- b) The appropriate placard and/or sign must be displayed and visible.
- c) The blended ANFO, aluminized ANFO, slurry, waternet or emulsion must be loaded directly into prepared boreholes. The unit must not be used for packaging any product unless so noted within the licence document.
- d) The distances from the operation of a process vehicle to other activities or sites at other than mines or quarries⁵ that are to apply⁶ are described below and must be calculated based on the carrying capacity of the vehicle.
 - i) The Operating Site (Personnel and Workers Associated with the Site):

Within 15 metres:

Only the loading crews are permitted (limits of personnel for loading operations must be specified in Form 6); no other operating equipment may be present; special permission is required for other cases such as loading in bad ground.

From 15 Metres to D4 Distances (From 1.1/1.5 QD Tables):

Only personnel directly involved with the project and not directly involved with explosive loading may be present. The man-limits and all operations within D4 distance of loading are to be recorded in the licence application.

From 15 Metres to D7 Distances (From 1.1/1.5 QD Tables):

⁵This decision is based on the fact that mine and quarry operations are relatively controlled environments and have a good track record.

⁶Dispensation from these requirements will be considered when it has been demonstrated that the risk of an accident is comparable to the level of protection offered by the Quantity Distance Principles or when precautions acceptable to the Branch have been implemented to mitigate possible consequences of an incident, e.g., stopping vehicular traffic. Certain restrictions will apply.

A joint Emergency Response Plan and letter of understanding with the contractor or mine/quarry operator regarding approved operations and personnel limits are to be recorded in the factory licence.

- ii) Dwellings (General Public)
D7 distances from loading are to be maintained.
- iii) Highways (General Public)
D4, D5 or D7 (from 1.1/1.5 QD Tables) distances based upon vehicular traffic are to be maintained. Natural topography may be used to influence required distances.
- e) The vehicle should not be driven over loaded holes whether the holes are primed or not. However, if exceptional operating conditions prohibit normal access, the vehicle may drive over the loaded boreholes provided that:
 - i) a procedure jointly prepared by the mine or quarry and the explosives manufacturer is available; and
 - ii) the procedure addresses the accidental ignition of the hole.

5. Prior to Storing or Repairing the Vehicle

The following requirements must be met:

- a) The ingredient tanks and hoppers containing oxidizer(s) and explosive must be as empty as is practical at the end of the operating day.
- b) The vehicle must not be stored overnight in a built-up area such as a town, or in an office or workshop area, but at an acceptably safe distance therefrom.
- c) The ingredient tanks and hoppers, mixer, and discharge systems must be completely flushed out with water and decontaminated⁷ and the fuel oil storage tank must be

⁷ Free of all traces of explosives outside and inside all interior equipment, including explosive contamination of screw threads, pipes and pumps, the condition of which would permit safe maintenance.

emptied before any hot work repairs are carried out. Decontamination is required before any prolonged⁸ storage of the equipment.

6. Maintenance

Each vehicle must have a log, detailing maintenance.

Some provinces require maintenance to be carried out by certified mechanics. If maintenance is to be performed at a commercial garage, the vehicle must be decontaminated prior to being moved to the garage.

a) Decontamination

Decontamination is required if any hot work (welding, grinding) is to be carried out, if the vehicle is to be taken off site for maintenance, or if power tools are used on that part of the unit containing explosive.

b) Hot Work

Work requiring welding or grinding must be approved by company management subject to procedures submitted with the process vehicle authorization and with the licensing application.

It is left to the management to ensure safe operations.

c) Maintenance on a Contaminated Unit

Emergency repairs and maintenance on a contaminated process unit are allowed according to company procedures; the procedures must address training of site operators in the hazards and in the possibility of ignition.

d) If a contaminated vehicle has broken down and cannot be decontaminated in situ, and the repairs required mean that decontamination is needed, the vehicle may be towed to a place for decontamination according to company procedures that address hazards and possible initiation.

⁸Prolonged storage of a process unit is defined as being idle within the previous three days or being idle for the next 30 days, unless special written permission of the Chief Inspector of Explosives has been obtained or unless allowed under the conditions of the licence.

B. Administrative Requirements

1. The Chief Inspector of Explosives will be informed within 48 hours of a change in location of these units and of all mines and quarry sites where these units will operate in accordance with requirements for the List of Authorized Process Vehicles and the List of Authorized Clients.
2. The Chief Inspector of Explosives will be notified immediately of any accident or incident, including theft of explosives, but particularly those that involve the ignition of materials associated with the unit, whether or not anyone is injured or property is damaged.*
3. This licence is granted subject to the approval of the provincial department of mines or labour that has jurisdiction.

*Fatalities must be reported immediately. Serious accidents/incidents (with injuries, or effects perceived outside the site) are to be reported within two hours. Any other accidents or incidents, particularly those that involve the ignition of materials, whether or not anyone is injured or property is damaged, must be reported within no more than 24 hours. The preferred method for serious accidents/incidents or those with possible serious consequences is by telephone (613-948-5200) followed by a fax (613-948-5195) or e-mail (cwatson@nrca.gc.ca). Other incidents may be reported by fax or e-mail. This is to be followed by a detailed investigation report with root cause identification, recommended actions, and deadlines for implementation.

The following notification information is required: time, date and place; company name and person communicating the information; name(s) of the deceased or seriously injured; accident description (fire, explosion, etc.); amount and type of explosive involved; building, operation, and conditions under which the accident occurred (during start-up, during maintenance, or normal operation); any pertinent meteorological information (rain, snow, etc.); suspected cause, if known; immediate actions and short-term actions (e.g., shutdown of all operations, securing of the area, clean-up, etc.); tentative times for these actions to be carried out; and any other pertinent information.

Appendix B - Electrical Schematic

Rev. 22/01/01 A:\electrdwg

GARAGE

CEILING /LIGHTING: CEMA/NEMA 4X Assumes no hazardous vapours or dusts.
MAIN GARAGE AREA: CEMA/NEMA 4X - MCC preferred outside garage. - All receptacles; auto spring close flaps when unplugged. - Trouble lights; heavy duty cabtire cord, no switch @ bulb. - Ground fault required for all receptacles. - Bldg. grounding required. - Poly coated flexible CEMA/NEMA 1 armoured cable wiring. - Separate room for wash - Bury cable last 15 m with systems, compressor, etc. disconnect at last pole. - 1-hr. fire-rated walls/door and ceiling with 5-cm raised door sill.
FLOOR AREA: Up to 5 cm; Class 1, Zone 2 (new system) or Class 1, Division 2 (old system).

SUMP AREA: Cl. 1, Zone 1 (new) OR Cl. 1, Div. 1 (old)

PRODUCTION (PROCESS) AREA

CEILING/LIGHTING/HEATING: Class 2, Div. 2 Assumes dusting on lights a problem, re: temp. of AN dust. Housekeeping important.
MAIN PROCESS AREA: CEMA/NEMA 4X TEFC MOTORS - As above for garages with exception of no MCC panel(s) permitted unless enclosed in 1-hr. fire rated separate room. - Hazardous “Zones” may need to be established. Consult Explosives Branch HQ for guidance. - Bury cable last 15 m with disconnect at last pole.
FLOOR AREA: Up to 5 cm; Class 1, Zone 2 (new) or Class 1, Div. 2 (old)

SUMP AREA: Cl. 1, Zone 1(new) OR Cl. 1, Div. 1 (old)
--

Appendix C - Risk Assessment and QD Derogation

QD is a very reliable safeguard against the consequences of an unplanned explosion. Allowing operations closer than normal QD distances to members of the public increases their risk of injury from an unplanned explosion. One of the Explosives Branch's primary duties is to protect the public from the hazards of explosives. The Explosives Branch must, therefore, be extremely careful before sanctioning anything that will increase the risk to the public who receive no benefit in exchange. Ideally, the Explosives Branch would like to be convinced that the proposed process with QD derogation is safer than the alternatives. The following approach, using quantified risk assessment, has been successfully taken for construction jobs close to public roads.

For the closer-than-normal-QD process, all the scenarios that could lead to an explosion are identified and quantified and a conservative value for the explosion frequency is established. This is done using a fault tree technique as part of a quantified risk assessment. Typical explosion frequencies calculated during risk assessments of bulk trucks are less than 10^{-6} per year but depend upon safety systems, operating procedures, and the condition of vehicles.

A comparative risk assessment could be carried out between the use of packaged product (that required no QD derogation) and bulk product that, because of quantities, would be inside QD distances, and the assessment used to justify the use of a bulk product. With the safety systems in place for bulk product to control the identified hazards, the risk from each method may be similar, which would establish that the Explosives Branch was not greatly increasing the risk to the public by allowing such a bulk operation.

A value for broadly acceptable risk to the public must be established and agreed upon with the Explosives Branch in line with published risk data. (A more severe target is then chosen by the company for all jobs where they would apply for QD derogation.) When applying for derogation from normal QD, the company must be able to demonstrate that the operations will meet these broadly acceptable risk values with a significant safety margin to compensate for the uncertainties in the risk assessment process.

Note: As a guide, derogation for QD will not be given when there are schools, hospitals or vulnerable buildings with many occupants within the prescribed distance or when there are more than 75 dwellings within D7, including not more than 25 within D5 and not more than 2 within D4 (1.1 Tables).

At each site where derogation is applied for, the population exposed to the explosion risk is identified. For road jobs, there are normally good traffic density surveys that tell the traffic by day and by hour. This information is used to prove to the Explosives Branch that the public risk from operations at the site meet the risk target the company had already agreed upon with the Explosives Branch. This step of a quantified risk assessment is sometimes called a consequence analysis. The

Explosives Branch then decides the merits of the argument and whether or not to grant the privilege of derogation.

At each step in the process, the Explosives Branch must be convinced that risk assessment is comprehensive and that values are reasonable. With any quantified assessment there is uncertainty in the values chosen. The greater the uncertainty, the more conservative the figure must be to compensate.

Where a derogation from normal QD rules has been granted, the work will still have to meet all the terms and conditions in Appendix A except for distances to the general public. Most risk assessments of the likelihood of bulk truck explosions identify fire as the main cause and find that there will be a considerable time between the outbreak of fire and possible explosion. The joint emergency response plan should take this into account and include provisions for quickly stopping road traffic. It is unlikely that there would be time to evacuate houses.

GUIDELINES for BULK EXPLOSIVE FACILITIES

Minimum Requirements

Appendix D -Table of Options

This table is not meant to cover all requirements and does not include any exceptions but is presented to give a summary of the various options and how they compare.

Requirements	Base Factory	Temporary Factory	Satellite Site	ANFO Mechanical Certificate	Demonstration	Trial
Prerequisite	Competence in explosives	Base Factory Proof of temporary nature	Base Factory up to 800 km	For use within the owner quarry/mine	Base Factory Proof of demonstration	Base Factory
Document Issued	Licence	Licence	Satellite Certificate	ANFO Certificate	Satellite Certificate	Letter of Permission
Customer Sites	Any number Up to 450 km Description day for over 300 km	One project Located near site	Any number Up to 200 km	Not applicable	One project may have multiple customers Up to 200 km	Not applicable
Time Constraints	Annual renewal; 9 to 15 months	Single renewal; 2 years maximum	Monthly; 1 month to Base Factory expiry period	Annual renewal	1 month maximum 1 extension of 1 month after proof of demo produced	6 months
Environment	EA and Spill Contingency Plan	Spill Contingency Plan	Spill Contingency Plan	Spill Contingency Plan	Spill Contingency Plan	
Allowed Process	As per licence	Bulk delivery as per licence	Load of vehicle Blend with ANFO Delivery	Blend ANFO at borehole	Bulk delivery as per licence	As per agreement
Explosives	As per licence	Processing Class 1.5 Storage as per licence	Class 1.5	ANFO Class 1.5	Class 1.5	As per agreement
Process Vehicles/Units	As per licence and location list	As per licence and location list	2 Process Units as per location list	1 ANFO mix vehicle	1 Process Unit	As per agreement
Buildings	As per licence	As per licence	As per licence			

GUIDELINES for BULK EXPLOSIVE FACILITIES

Minimum Requirements

Requirements	Base Factory	Temporary Factory	Satellite Site	ANFO Mechanical Certificate	Demonstration	Trial
Magazines	As per licence	As per licence	As per licence	As per licence	As per licence	None
Raw Materials, including AN and Fuel	Stored on site	Stored on site	Stored on site	Stored on site	Stored on site	As per agreement
Fuel Storage	As per licence	As per licence	As per provincial regulations	1 tank	As per provincial regulations	As per agreement
AN Storage	As per licence	As per licence	1 unit: silo, tanker or tote	1 unit	1 unit	As per agreement
Wash Facilities	Permanent required, heated for winter	Temporary, covered, heated in winter	None	Within 200 km	Temporary or weekly return to base	As per agreement
Garage	Access required	Access required	Access required	Access required	Access required	As per agreement
Fees	\$700/process unit \$200/det. mag. \$15/1 000 kg explosives \$2 000 minimum \$20 000 maximum	\$700/process unit \$200/det. mag. \$15/1 000 kg explosives \$2 000 minimum \$20 000 maximum	\$200/month	Over 100 t: \$2 000 Under 100 t: \$1 000	\$200/month	No charge
Processing Time	30 days	30 days	5 days	30 days	5 days	5 days
Fire/Smoking/Welding Permit	May be granted	No	No	No	No	No