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Guidelines for
Bulk Explosives Facilities
Minimum Requirements

Explosives Regulatory Division
Explosives Safety and Security Branch
Minerals and Metals Sector

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1. INTRODUCTION	
1.1 Purpose	1
1.2 Intent	1
1.3 Other Documents	2
1.4 Using the Guidelines	2
2. SCOPE, LIMITATIONS, DEFINITIONS AND GENERAL BACKGROUND INFORMATION	4
2.1 Scope	4
2.2 Grandfathering	4
2.3 Definitions and Limitations	5
2.4 Division 1 Factory Licences	7
2.4.1 FACTORY WITH A WASHBAY	7
2.4.2 FACTORY WITHOUT A WASH BAY	7
2.4.3 FACTORY WITH TEMPORARY STRUCTURES	7
2.5 Satellite Site Certificates	8
2.5.1 OCCASIONAL AND TEMPORARY	8
2.5.2 CERTIFICATES FOR SATELLITE SITES	8
2.5.3 CLIENT SITES AND DISTANCES	
(FACTORIES OR SATELLITE SITES)	9
2.5.4 PRODUCT TRIAL PERMISSIONS	9
2.6 Division 2 Licences and Certificates	10
2.6.1 MANUFACTURING CERTIFICATES FOR THE	
BLENDING OF ANFO	10
2.7 General Background Information	10
2.7.1 HEEL	10
2.7.2 DECONTAMINATION	11
2.7.3 CLEAN	11
2.7.4 DISPOSAL OF SCRAP	11
2.7.5 AUTHORIZED PRODUCTS	11
2.7.6 QUANTITY-DISTANCE (Q-D)	12
2.7.7 RISK ASSESSMENT	12
2.7.8 AMMONIUM NITRATE (AN)	13
2.7.9 MAGAZINES	13
2.7.10 PERSONNEL LIMITS	14
2.7.11 ENVIRONMENTAL ASSESSMENT (EA) AND ABORIGINAL	
CONSULTATION	14
3. DOCUMENTATION, FEES AND PROCESSING TIME	15
3.1 Forms and Environmental Assessment	15
3.1.1 PLANS, LICENCE OR CERTIFICATE FORMS	15

3.1.2	ENVIRONMENTAL ASSESSMENT AND SPILL CONTINGENCIES	20
3.2	Supporting Documentation	20
3.2.1	GENERAL SAFETY RULES	21
3.2.2	INSPECTIONS AND AUDITS	21
3.2.3	TRAINING	21
3.2.4	PROCEDURES	22
3.3	Fee Structure	25
3.4	Processing Time	25
4.	SITES, FACILITIES AND EQUIPMENT	26
4.1	Licence or Certificate Site	26
4.1.1	LOCATION	26
4.1.2	CONTROLLING ACCESS TO THE SITE (FENCING, OTHER BARRIERS)	26
4.1.3	CONTROL OF FIRE-PRODUCING DEVICES	27
4.1.4	STORAGE AND CONTROL OF RAW MATERIALS	27
4.1.5	SERVICES AND TOOLS	27
4.1.6	HEATED WASHING FACILITIES	28
4.1.7	CODES	28
4.1.8	OTHER	28
4.2	Buildings in General	29
4.2.1	CONSTRUCTION	29
4.2.2	BARRICADES	30
4.2.3	USE OF BRASS AND COPPER	30
4.3	Parking Areas	30
4.3.1	LOCATION	31
4.3.2	PARKING OF MPU'S	31
4.4	Number of Units	32
4.5	Tankers, Tanks or Silos for Pumpable Explosives	32
4.5.1	LOCATION	32
4.5.2	INSTALLATION	32
4.5.3	CONSTRUCTION	32
4.5.4	SECURITY	33
4.6	Combustible Liquids	33
4.6.1	GENERAL FUEL STORAGE REQUIREMENTS	33
4.6.2	DYKING	34
4.6.3	USE OF WASTE OIL	34
4.7	Explosive Fuel Phase	35
4.8	Flammable Liquids	35
4.9	Ammonium Nitrate Prill Storage and Handling	36
4.9.1	LOCATION	36

4.9.2	HANDLING OF AN	37
4.9.3	STORAGE OF BULK AN	37
4.9.4	STORAGE OF AN IN TOTE BAGS OR 25-KG BAGS	38
4.9.5	SECURITY	38
4.10	Ammonium Nitrate Solution	39
4.11	Washing Facilities	39
4.11.1	LOCATION	39
4.11.2	OTHER	40
4.12	Washing System	41
4.12.1	LOCATION	41
4.12.2	REQUIREMENTS FOR THE SEPARATE ROOM	41
4.12.3	PERFORMANCE	42
4.12.4	WASTE WATER AND SCRAP	42
4.13	Lunchroom and Welfare	42
4.13.1	LOCATION	42
4.14	Office	42
4.14.1	LOCATION	42
4.15	Other Storage B Inert Material, Chemicals and Contaminated Parts	43
4.15.1	LOCATION	43
4.15.2	CHEMICALS	43
4.15.3	CONTAMINATED PARTS	43
4.15.4	WASTE AND SCRAP	44
4.16	Laboratory	44
4.17	Clothes Washing/Laundry	44
4.18	Electrical Requirements	44
4.18.1	ELECTRICAL ROOM - MOTOR CONTROL CENTRE (MCC)	45
4.18.2	POWER SUPPLY	45
4.18.3	GROUNDING	45
4.18.4	SEPARATE ROOMS FOR ELECTRICAL EQUIPMENT	45
4.18.5	CONTROLS	46
4.19	Equipment Powered by Internal Combustion Engine (Generators and Compressors)	46
4.20	Hydraulic Systems	46
4.21	Pumps	47
4.21.1	PROGRESSIVE CAVITY PUMP (FIXED AND MOBILE LOCATIONS)	47
4.21.2	OTHER EMULSION OR WATERGEL PUMPS	48
4.22	Augers	48
4.23	Heating and Furnaces	48

4.24 Mobile Process Units (MPU's), including units for ANFO Mixing	49
4.24.1 HATCH ON EXPLOSIVES TANK	49
4.24.2 PNEUMATIC HOSES FOR DELIVERY OF ANFO	49
4.24.3 LOADING OF MOBILE PROCESS UNITS	49
4.25 Forklifts and Pallet Movers	50
4.25.1 ELECTRICAL FORKLIFTS AND PALLET MOVERS	50
4.25.2 DIESEL FORKLIFTS	50
4.25.3 PROPANE FORKLIFTS	51
Appendix A - Electrical Schematic	52
Appendix B - Risk Assessment and Q-D Derogation	53
Appendix C -Table of Options	54
Appendix D - Storage of Large Quantities of Ammonium Nitrate	57

1. INTRODUCTION

1.1 Purpose

The aim of these guidelines is to outline the minimum requirements for sites and equipment for handling bulk explosives. These guidelines will be used to evaluate the acceptability of licence or certificate applications and to evaluate sites during inspections. These guidelines cover Division 1 Factories (factories with and without washbays, and factories with temporary structures), Division 1 Certificates (Satellite Site Certificates, including Satellite Site Certificates for Demonstrations), Division 2 factories and Certificates for the mechanical and non-mechanical blending of ANFO, and permissions for trials.

To produce bulk explosives and have bulk explosives delivered, a company must operate under either a licence or a certificate.

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 for a chemical plant or similar industrial site. Companies are expected to understand and maintain the principles of good housekeeping.

AMust[®] and Awill[®] imply a mandatory requirement. Whenever Ashould[®] or Amay[®] 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

These guidelines are intended to be used as a guide to meet the requirements of the *Explosives Regulations, 2013 for bulk explosives sites*.

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

The basis of all bulk explosives operations involving mobile process units, with the exception of a Licence or Certificate for the Blending of ANFO (see the next section), is a factory with a washbay. Without such a site, properly equipped with washing and support facilities, it is not possible to ensure the safe operation of mobile process units. Mobile process units must be kept clean to reduce the risk of fire and they must be decontaminated if appropriate in order to avoid accidents during maintenance. Mobile process units must also be well maintained in order to be safe to operate.

Licences or Certificates for the blending of ANFO require that a site with washing and maintenance facilities be available to ensure that mobile process units are kept clean and maintained. However, some requirements for a licensed Factory with a washbay do not apply to operations allowed under a Licence or Certificate for the Blending of ANFO.

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 circumvent the guidelines.

1.3 Other Documents

Although the guidelines set out the minimum requirements for a bulk explosive operation, they are not a complete compilation of all legislation or codes issued by 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, 2013.

Documents issued by and obtainable from the Explosives Regulatory Division (ERD):

- Guidelines for the Pumping of Water-Based Explosives (Pumping Guidelines)
- Storage Standards for Industrial Explosives (Magazine Standards)
- Quantity-Distance Principles
- Classification by PE (Potential Effects)
- Requirements for Bulk Mobile Process Units
- Explosives Branch Process Vehicle Inspection Check List
- Guideline for Completion of Factory/Manufacturing Applications
- Classification and Authorization – General and Detailed Requirements for Type E Explosives
- Fire Safety Plan Guideline
- Site Security Plan Guideline
- Key Control Plan Guideline
- ERD Directives, 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 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, company's internal procedures and documentation, and the additional terms of the licence.

THE LICENCE

Forms F05-01A, F05-01B, F05-01C, F05-01D and F05-01E and the site and building drawings are the basis for approving an application. The forms and drawings describe the site, facilities, equipment, and operations. The forms and drawings are approved if they and their content meet the requirements of the guidelines. Any exception to the guidelines on which there was agreement must be recorded in these forms. How to deal with authorized mobile process units and customers are described under Section 3.1 on Forms.

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 described under Section 3 (Documentation). Procedures and documentation must be in place before a licence will be issued. As a term and condition of the licence, a company must implement them and ensure they are being followed.

2. SCOPE, LIMITATIONS, DEFINITIONS AND GENERAL BACKGROUND INFORMATION

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 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. Proof that a bulk explosives meets these requirements may be requested.

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

Note: Although product 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 may be subject to a formal environmental screening. A holder of a certificate or licence must satisfy the Chief Inspector of Explosives that possible contamination of the environment has been addressed. If an operation is to be located on Aboriginal land or may have an impact on Aboriginal treaty rights, consultations with affected parties will be necessary before a licence or certificate can be issued.

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

Sharing of facilities is not allowed and will only be considered on a case-by-case basis for emergency situations. 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; but control must remain with one company.

This guideline is for bulk explosive operations that are located on the surface (vs. underground). Manufacturing underground is subject to Division 3, Part 5, which exempts these types of operations from requiring a licence. Note, however, that there are many provincial/territorial requirements for underground operations which will have to be taken into account.

2.2 Grandfathering

All new sites must comply with or exceed the minimum requirements of this guideline. There are situations in existing licensed locations that would not meet the current requirements, but met the requirements at the time they were first licensed. Some of these situations have been allowed to continue and as such have been grandfathered. This does not apply to situations in which inaccurate information or a lack of information on a situation resulted in it being approved when it would not otherwise have been approved. In the case of existing locations that do not fully comply:

- Incumbent companies are grandfathered; however, when applying for licence renewal, the companies are expected to:

- review operations annually and to propose suitable improvements and schedules, acceptable to ERD, needed to achieve conformity; or
 - carry out a risk assessment, acceptable to ERD, to show that the situation meets acceptable criteria. If accepted, it must be described in the licence; or
 - make changes needed to comply; or
 - explain discrepancies that are not significant and that can be accepted in the licence. If accepted, they must be described in the licence.
- 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:
 - make changes needed to comply; or
 - carry out a risk assessment, acceptable to ERD, to show that the situation meets acceptable criteria. If accepted, it must be described in the licence; or
 - 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 significant change of scope in the operation or a significant change in the facility.

2.3 Definitions and Limitations

The following information is provided as a guide to the definitions and terms found in the Explosives Act and Part 5 (Manufacturing Explosives) of the Regulations.

DIVISIONS IN PART 5 OF THE REGULATIONS

Division 1: Sections 55 through 105 explains how to obtain a Division 1 factory licence or a satellite site certificate. It also outlines the requirements for holders of the license or certificate and for workers at, and visitors to, a factory or satellite site.

Example: A licence for a factory with a washbay.

Division 2: Sections 106 through 132 explains out how to obtain a Division 2 factory licence or a manufacturing certificate. It also outlines the requirements for holders of the license or certificate and for the workers at, and visitors to, the workplace.

Example: A Certificate for the Mechanical Blending of ANFO

Division 3: Sections 133 through 142 sets out the manufacturing activities that do not require a factory licence or a manufacturing certificate and the requirements for people who carry out those activities.

Example: Experiments at a school, college or university.

Only Divisions 1 and 2 are applicable in this guideline for the manufacturing of Bulk Explosives.

¹ ASignificant[®] can be best explained by examples. If a site is grandfathered for an explosives quantity of 10 000 kg with inadequate distance, then no increase in quantity would be allowed. An office that has been grandfathered with less than the required distance from an explosives operation would not be allowed to increase the personnel limit nor would the explosive operation be allowed to change.

DEFINITIONS

Applicable definitions in Part 5 of the Regulations include:

- “Division 1 Factory License” – means a licence that is issued under paragraph 7(1) (a) of the Explosives Act and authorizes the manufacture of explosives at a factory.
- AProcess Unit[®] - means a building, structure, room, vehicle or place in which an explosives manufacturing operation is carried out at a factory.
- AFactory Magazine[®] - means a magazine that is located at a factory or a satellite site.
- “Client Site” – means a blast site at which a mobile process unit is used to manufacture explosives away from a factory or satellite site.
- “Satellite Site” – means a site that is located away from a factory and is used to manufacture and temporarily store explosives for use at a blast site.
- “Satellite Site Certificate” – means a manufacturing certificate that is issued to the holder of a factory licence under paragraph 7(1) (c) of the Explosives Act and authorizes the manufacture of explosives at a satellite site.
- AMobile Process Unit[®] - means a vehicle or portable machine that is used at a factory, a satellite site or a client site to carry out an explosives manufacturing activity.
- “Competent Person” – means a person who has been certified as trained in accordance with section 83 under a Division 1 factory licence or satellite certificate and under Section 122(2) for a Division 2 factory licence or manufacturing certificate under the Regulations.
- “Division 1 Worker” – means a person who is at a factory or a satellite site to carry out a manufacturing operation or other kind of work (for example, maintenance of facilities or repair of equipment) for the holder of a Division 1 factory licence.

Division 2 Specific Definitions:

- “Division 2 Factory Licence” – means a licence that is issued by the Minister of Natural Resources under paragraph 7(1)(a) of the Explosives Act and authorizes a manufacturing activity referred to in Subsection 83(2) at a workplace.
- “Manufacturing Certificate” – means a certificate that is issued by the Minister of Natural Resources under paragraph 7(1) (c) of the Explosives Act and authorizes an activity referred to in Section 107 at a workplace under the Regulations.
- “Workplace” – means a building, room or area where an activity involving the manufacture of explosives, including their storage, is carried out.
- “Division 2 Worker” – means a person who is at a workplace to carry out a manufacturing operation or other kind of work (for example, maintenance of facilities or repair of equipment) for the holder of a Division 2 factory licence.

2.4 Division 1 Factory Licences

2.4.1 FACTORY WITH A WASHBAY

A factory with a washbay is a licensed facility and the base of operations with all the capabilities necessary to clean, decontaminate and repair mobile process units. It may support factories without a wash bay, satellite sites, client sites and factories with temporary structures. Trials and demonstrations may be conducted from a licensed factory.

The following operations are allowed at a factory with a wash bay: storing of mobile process units, storing of explosives (bulk and non-bulk), storing of raw materials, transferring of explosives and raw materials. Factories with a wash bay may be used for ANFO bagging, emulsion manufacturing and cartridgeing of emulsion to produce product for sale. Bagging from a mobile process unit to make packaged product may be allowed at a factory site, but will include additional requirements to those described in these guidelines. The operations allowed at client sites are as follows: approved chemical gassing as required, doping with AN or ANFO, discharge with or without mixing or blending into a borehole, emulsifying AN liquor and a fuel phase and blending of ANFO.

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

2.4.2 FACTORY WITHOUT A WASH BAY

A factory without a wash bay is a licensed factory close enough to a factory with a washbay to allow it to function without a wash bay. This type of factory could support customer sites, trials and demonstrations. It should be within 250 km from a factory that has a wash bay. The distance to any customer must meet the 450 km distance requirement from the factory with the wash bay.

A maximum of two mobile process units are allowed. The maximum amounts of AN and emulsion allowed on the site are subject to Q-D limitations. Fuel storage must meet this guideline's requirements.

The operations allowed at a factory without a wash bay are the same as for a factory with a washbay.

No satellite site may be attached to a factory without a wash bay.

2.4.3 FACTORY WITH TEMPORARY STRUCTURES

This type of factory is a licensed factory that moves 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 factories equipped to properly service the mobile process units that would be located at this type of factory. A licence for a factory with temporary structures 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., quarry blasting 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 factory with a washbay and a factory with temporary structures is the portable nature of the required facilities and structure(s).

The requirements of a factory apply, but the washing/maintenance facilities may be of a temporary nature for the purposes of cleaning a mobile process unit or for simple maintenance. Major repairs

would be carried out at the supporting factory with a washbay once the mobile process unit has been returned to its base of operations after preliminary decontamination at the factory with temporary structures. Preliminary decontamination means the removal of all visible explosives from the mobile process unit. Piping and equipment do not necessarily need to be dismantled.

2.5 Satellite Site Certificates

2.5.1 OCCASIONAL AND TEMPORARY

Certificates are issued for sites that are occasional and temporary.

An *Occasional* site is a site that is not in operation frequently, or now and again, not continuous, e.g., a site that is used no more than 2 days per week or no more than 20 days per year.

A *Temporary* site is a site that is operated for a period of time, but not permanently, e.g., a site that does not run longer than two years.

2.5.2 CERTIFICATES FOR SATELLITE SITES

These are considered to be extensions to a factory, not replacement of one, and therefore do not carry all the privileges of a factory. They can be issued only for occasional and temporary sites.

The distance away from a factory is limited to 800 km. The distance to any client from the satellite site is limited to 200 km.

No more than two mobile process units are allowed. No more than two tankers or vessels with a total maximum physical capacity of 40 000 kg for storage of water-based explosives and one storage facility (silo, tanker, designated area) for AN is allowed. Fuel storage must meet the requirements of these guidelines.

The following operations are allowed at a satellite site:

- storing of a mobile process unit
- storing of bulk explosive and/or raw materials
- transferring of an explosive or a raw material

The following operations are allowed at a client site:

- approved chemical gassing as required
- doping with AN or ANFO
- discharge (with or without mixing/blending) into a borehole
- emulsifying AN liquor and a fuel phase into a borehole

Transfer sites are to be licensed as satellite sites.

A factory with a washbay and a satellite site associated with it 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 for the purposes of removing explosives for decontamination, sampling, calibration and carrying to hard-to-reach boreholes.

The minimum period for a satellite site certificate is one month. Sites may be active, inactive, or no longer required. Fees are payable 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.

Active and Inactive Satellite Sites

An active satellite site meets the above requirements; fees are payable at the time the application is submitted.

An inactive satellite site does not have fees; all explosives, all mobile process units, 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 ERD.

Satellite Site Certificate for Demonstrations

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 factory is waived. Limits are placed on duration to ensure that mobile process units are not away from a distant factory 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.

2.5.3 CLIENT SITES AND DISTANCES (FACTORIES OR SATELLITE SITES)

Client sites are sites serviced by a mobile process unit either from a factory or from a satellite site. Client sites must be no further than 450 km from a factory with a washbay or 200 km from a satellite site.

For sites located further than 300 km from a factory, companies must submit a description of the working day (load, drive, unload, drive) showing how they will abide by the provincial or federal regulations regarding driving time restrictions. A site will be considered if the time required to load is such that there remains ample time to drive safely.

The client site and the factory or 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.

2.5.4 PRODUCT TRIAL PERMISSIONS

Product trials are permissions to produce, store and use explosives that have not been authorized. A temporary product authorization for a specified period for the purposes of the trials will be required.

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

Trials will only be allowed at or from existing licensed factories.

2.6 Division 2 Licences and Certificates

2.6.1 MANUFACTURING LICENCES AND CERTIFICATES FOR THE BLENDING OF ANFO

Licences or Certificates for the Blending of ANFO by mechanical means are granted to the owners of mines or quarries producing ANFO at a blast site at their mine(s) or quarry(s). The blending is usually done on a Mobile Process Unit and the ANFO discharged directly into a borehole at a specified location, mine or quarry owned by the company to which the licence or certificate is issued. This ANFO is nominally 6% fuel oil and 94% ammonium nitrate (AN). Fuel storage and AN storage must meet the requirements of these guidelines. An ANFO Certificate does not provide for the inclusion of any permanent magazines, these must be covered by a separate magazine licence as set out in Part 6 of the Regulations.

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. Mobile process units 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 mobile process unit.

There are no limits on the number of Mobile Process Units that can be associated with an ANFO Licence or Certificate. These mobile process units may be used at multiple locations if within 200 km of the base, *all belonging to the same owner*. These locations must be identified in the licence or certificate.

An EA is not required for an ANFO certificate, but a spill contingency plan must be provided by the certificate holder to the ERD.

Road jobs, pipeline construction, and construction jobs do not qualify for Licence or Certificates for the Blending of ANFO. These licences or certificates do not permit the bagging or cartridging of explosives.

In addition to the Licences and Certificate for the Mechanical Blending of ANFO, there is the possibility to apply for a Certificate for the Non-Mechanical Blending of ANFO. 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. Most of this guideline does not apply to Non-Mechanical ANFO Certificates, but the sections on the licence can provide useful information for the applicant.

2.7 General Background Information

This section provides information on items or requirements that are related to most bulk explosive licences or certificates.

2.7.1 HEEL

AHeel® refers to the quantity of explosive product or raw material left in the mobile process unit that cannot be removed by pumping or augering (note that running a pump dry must be avoided). When citing the quantity of explosive remaining on a mobile process unit stored, the quantity of Aheel® allowed is usually understood to be 250 kg (NEQ) or less. All mobile process units must be able to off-load unused explosives. In the case of mobile process units from which AN cannot be unloaded without being contaminated, and where a heel of more than 250 kg NEQ will remain, the quantity

remaining must be allowed for on the licence and secure storage must be provided.

Off loading, while possible, is not always desirable. If a MPU returns with more than a heel it must either be unloaded or parked with full Q-D, i.e. as if it were fully loaded.

An area on the site plan must be designated for parking loaded MPU's if this activity is allowed by the licence.

2.7.2 DECONTAMINATION

Decontamination means to completely remove, clean or purge an explosive substance from a building, room, area, vehicle, equipment or container.

2.7.3 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 any fire hazard is reduced. It does not mean dust, mud or dirt. However, dangerous goods safety marks must be visible.

2.7.4 DISPOSAL OF SCRAP

All explosives waste and explosives-contaminated material must be destroyed in a manner that does not increase the likelihood of an accidental ignition during or after the destruction. Usually the explosives waste is bagged, 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 bagged. These will be one of several kinds: straight ANFO, straight water gel, or emulsions and blends. It is suggested that the plastic bags be five inches or larger; the exact size should be specified. The bag is to be placed into an 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 will be used only as a means of legitimizing storage and transportation.

For the disposal of bulk explosives waste on a secure mine site, the product will be bagged in plastic bags and may be transported from the factory site to the blast site for disposal. The bags of explosives waste 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 times while transporting the explosives and cannot enter public roads or private roads with public access.

2.7.5 AUTHORIZED PRODUCTS

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

Approval of a submission and authorization of an explosive is normally based on the use of specific equipment and processes. When there is a substantial change to a process or to the manufacturing equipment, a company may be required to demonstrate to ERD that the product can be manufactured to the specifications of the authorized product. The applicant is also expected to prove that the processing will be safe, with little danger of initiation, and restrictions may be applied to allow only the particular explosive/equipment combination proven to be safe.

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

2.7.6 QUANTITY-DISTANCE (Q-D)

Quantity-Distance (or Q-D) principles are outlined in the Quantity-Distances Principles Manual issued by ERD. In general, for bulk explosives sites section 5 and Table 1 (QD Table for Hazard Division PE1 and the Table of Recommended Distances of Ammonium Nitrate from Blasting Agents) will apply. Certain of these categories require the presence of barricades, as indicated in the Quality-Distance Principles manual.

Potential Effects

The United Nations classification of Class 1 dangerous goods (i.e. explosives) is based on the behaviour of explosives as packaged for transportation. Potential effects considers their behaviour in the form they occur during storage or production, which may not be the same as their behaviour when tested as per the UN Testing Manual for the transportation of dangerous goods. For most purposes on sites where bulk explosives are handled, PE 1 will be the same as the UN 1.1 or 1.5. For more details the document "Classification by PE" should be consulted.

2.7.7 RISK ASSESSMENT

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

- What can go wrong?
- What are the consequences and effects if something goes wrong, 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 deviation from licensing requirements, such as Q-D, for some types of operations, and thereby demonstrate that the risk is acceptably low for these operations.

One circumstance in which risk analysis is undertaken is when existing operations do not meet licensing requirements in spite of having been upgraded as much as possible. An example of this might be when an existing facility no longer meets normal Q-D because of encroachment.

The other circumstance in which risk analysis is undertaken involves new operations involving the delivery of bulk explosives at a blasting site without full Q-D. One of the most effective safeguards or controls against explosive risks is the Quantity-Distance principles. Q-D is a consequence-based

protection, it 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 B for a discussion of risk assessment-based derogation from Q-D requirements for bulk explosives 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, *Agarbage in is garbage out*; the software cannot correct errors in judgment or improve what are superficial studies.

2.7.8 AMMONIUM NITRATE (AN)

Ammonium nitrate is included in the guidelines because its behaviour as an explosive necessitates it to be included when used in conjunction with explosives.

Although AN is usually classed as an oxidizer for transport, it is well known that it will detonate under suitable conditions, although these 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 ERD. Therefore, ERD is obliged to define the manner in which AN is handled in activities under the jurisdiction of the Explosives Act and Regulations.

AN solutions containing less than 92% AN are not considered to be explosive.

Transport

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

Fire with explosives and Ammonium Nitrate

Many of the requirements of this guideline are focused on minimizing the possibility and magnitude of a fire involving explosives and ammonium nitrate. This is based on many past occurrences involving fires transitioning to explosions, sometimes within 20 minutes or less. Such explosions have occurred during manufacturing, storage and transportation situations.

Therefore, the guideline requirements address not only the prevention of fires, but also allowing adequate escape routes and time to escape and put emergency response plans into action.

2.7.9 MAGAZINES

Every factory magazine must be constructed to meet the requirements of the Magazine Standards for Industrial Explosives.

Magazines Licensed by the Explosives Factory Licensee

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 if the magazines are to be used on a permanent basis, beyond the duration of the manufacturing certificate, or if they are not being used for the purpose of the manufacturing activity. If this is the case, the information on the magazines, including licence number, must be supplied on Forms F05-01B and F05-01E, but not on Form F05-01D.

Magazines Licensed by Another Party

Magazines within D7 distances may be permitted, but access to the magazines and the satellite site must be controlled at least at a D4 distance such that each party is aware of the presence of the other party. One party must assume control of the site and there must be a letter of understanding to that effect, signed by all parties concerned, on the satellite site file.

2.7.10 PERSONNEL LIMITS

One of the fundamental principles of operations involving explosives is to minimize the exposure of people by restricting the personnel to the minimum number required to operate safely, for the minimum time. This means that only persons with jobs essential to a particular hazardous operation should be within a vulnerable distance (within D7). Personnel not directly involved with explosives, such as office clerks, must be located outside D7 distances.

2.7.11 ENVIRONMENTAL ASSESSMENT (EA) AND ABORIGINAL CONSULTATION

Under the Canadian Environmental Assessment Act (CEAA 2012), an environmental assessment (EA) is normally not required if a factory or magazine licence is issued. An EA may be required for factory or magazine licences located north of the 60° parallel. It should be noted that aboriginal consultation may be required if the licence is to be located on land subject to land claims. ERD should be contacted for further information.

Aboriginal Consultation:

Aboriginal consultation may be required prior to issuing a new manufacturing licence or certificate, and for substantial amendments to existing manufacturing licences or certificates. All applications for new manufacturing licences or certificates, and substantial amendments of manufacturing licences or certificates will be reviewed to determine if aboriginal consultation will be required by Natural Resources Canada. The applicant may consult with First Nations if a factory is near a First Nation community in order to give them the opportunity to raise concerns about the project. Concerns raised must be reported and addressed. Proponents should document their Aboriginal Consultation process and activities well in their screening report in and keep NRCan advised of any discussions undertaken with Aboriginal groups in relation to a project.

3. DOCUMENTATION, FEES AND PROCESSING TIME

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

Forms F05-01A, F05-01B, F05-01C, F05-01D and F05-01E, plans and drawings must be presented. In most cases an environmental assessment (EA) will not be required for licences, but at a minimum, a spill contingency plan, emergency response plan, and site evacuation plan is required, for both licences and certificates. Supporting documentation, such as operating or maintenance procedures must be shown to be available, where applicable.

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

Note: Before a licence is issued, ERD may ask for copies of supporting documentation and, ERD may inspect the site to ensure compliance with the licence proposal.

3.1 Forms and Environmental Assessment

3.1.1 PLANS, LICENCE OR CERTIFICATE FORMS

The licence or certificate forms and the plans or drawings describe the operation. Once approved, they become part of the conditions for the legal operation of a site. 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. The best way to approach this is to declare the deviation/non-conformance to the guideline on the appropriate form (F05-01B, F05-01D and/or F05-01E). When a deviation has been approved by a letter, this must then be recorded on the appropriate form (F05-01B, F05-01C, F05-01D and/or F05-01E). Reference should be made to the date 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 and any deviation or non-conformance information must be carried forward each year upon renewal. Any documentation referred to in Form F05-01A must be dated with revision numbers.

3.1.1.1 *Plans and Drawings*

Several types of plans or drawings are listed on Form F05-01A. These are Area Plan, Site Plan, Building Layout, Process Schematics, and Piping, Instrumentation and Equipment layout drawings. The area and site plans are the two that can be considered mandatory.

Every drawing, sketch or plan must be drawn to scale, or be a reasonable approximation of actual distances and dimensions, and must include a legend. Engineering drawings to scale, with the scale indicated on the drawings, are preferred. The drawings should carry a standard scale since size reduction may occur during copying. Small and simple sites (less than 10 items on the plan) can be described by a sketch. All drawings, sketches or plans must be identified with a title, revision number, and applicable date.

The area plan should clearly show the location of the site and any neighbouring vulnerable features or hazardous facilities such as dwellings, power lines, and other explosives operations within a radius of, ideally, at least D8.

A site plan is required for each site. The plan must include: i) distances between operations, including washing/maintenance facilities, AN storage, fuel storage, vehicle parking areas,

fences/barriers, and magazines; ii) distances to offices and 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 meters.

In some situations, the site plan can be used as an area plan as well, but it should identify all vulnerable sites such as dwellings or areas where the public may congregate within a D8 radius and must show any buffer zone between the operations and the surroundings.

Plans or drawings must clearly identify the company, proposed location, and licence number, if known. When applicable, layout sketches or plans should show emergency exits, and storage and workplace areas for individual magazines and buildings.

IMPORTANT: The building identification (number or legend) used must be consistent throughout all the plans, forms, and other documents. Building layout plans are required for sites with multiple rooms or divisions, or to show equipment layouts. Process schematics or Piping, Instrumentation and Equipment layouts are not usually needed for most simple operations, but may be required for more complex operations.

3.1.1.2 Form F05-01A: Application – Factory or Manufacturing Certificate

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 for a new company or when there is a change in a licensing officer at an existing company.

Upon renewal, one copy of Form F05-01A should be included, with amended forms and/or updated reference documents for both the base site and all its associated satellite sites.

For each amendment request, a new Form F05-01A application is required to summarize and record the changes made to forms, drawings, and documentation. When satellite site(s) are added, removed, amended or restarted, a new Form F05-01A 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.

Drawings and documentation need not be resubmitted for renewals or amendments if they have not been changed.

When procedures referenced on Form F05-01A have been changed, the licensee/certificate holder may wait until annual renewal of the licence/certificate before making the changes to the information on Form F05-01A.

Permission/Permit from Landowner and AHJ:

If applicable, it is recommended to obtain the required permission from the landowner and the proper operation permit from the Authority Having Jurisdiction (AHJ) for the location of the site.

3.1.1.3 Form F05-03: Licence & Terms and Conditions

This is issued by ERD. Form F05-03 grants the licence to a company at a site, noting the expiry date, and sets out the terms of the licence.

3.1.1.4 Form F05-01B: Site Description

Form F05-01B describes the physical aspects of the site, the site security, facilities and equipment, including the storage of pumpable explosives, mobile process units, 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 F05-01B also describes any deviation, derogation, or grandfathering provisions that apply to the physical aspects of the licence, e.g., Q-D reduction based on quantified risk assessment or hazard and operability review.

Form F05-01B should start with a site description that includes access roads, gates, fencing, security, and other such general features. Following that, specific buildings and operations can be addressed. Geographical coordinates for at least one structure or building on the site should be provided on Form F05-01B.

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.

Terms such as “approved magazine” or “approved equipment” should not be used. For example, in describing electrical installations, DO state A meets EEMAC 4@ (if that is the case). DO NOT state A approved electrical installations@ or A explosion-proof,@ etc.

When documentation regarding equipment has been submitted to ERD for approval, it should be referenced by a date, e.g., A information on heater submitted to ERD November 30, 2011.@ If it is referenced by stating A submitted with this application@, then when the application is renewed or amended, that statement will no longer be valid.

Magazines should be described at a minimum by giving the dimensions in meters (L x W x H) and magazine type vs. ERD standards, e.g., Type 4 magazine with its ERD tag number. That should be shown in the left-hand column.

Barricades, berms, or other natural protective features against explosions must be described, especially when the distances or types of distances shown on Form F05-01E require barricades, e.g., D2 and D4. For all buildings or operations that are mounded, describe the type of mound and the directions in which the mounding is effective.

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.

Form F05-01B 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 The Railway Association of Canada Circular No. 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”.

Authorized Mobile Process Units:

Mobile process units may be described on their own Form F05-01B. Process units must be authorized before the units are put into operation. This is accomplished by submitting documentation for approval. Documentation for approval must fully describe required attributes using a Form F05-01B, schematics, and photographs. This is explained in “Requirements for Bulk Mobile Process Units”. Companies must maintain a list of all authorized mobile process units that summarizes key attributes.

Authorized Mobile Process Unit List:

When a company has more than two mobile process units and moves the units from one site to another site, in order to reduce amendments to Form F05-01B, the company must maintain a location list for authorized mobile process units so that the location of any mobile process unit is known and reported to ERD. This location list is referenced on Form F05-01A and explained in “Requirements for Bulk Mobile Process Units”. Whenever a change occurs in the list, the amended list showing the new location of a unit must be sent to ERD within two working days.

Form F05-01B refers to the list as follows: e.g., “Two mobile process units from the Location List for Authorized Mobile Process Units.”

A licence amendment is required only when the maximum number of mobile process units to be used at a licensed site is changed.

3.1.1.5 Form F05-01C: Manufacture and Storage of Explosives

The information required on Form F05-01C is:

Manufacture and Storage:

Identify the explosives or articles proposed to be:

Manufactured or Processed: Identify products by manufacturer’s designation, proper shipping name, UN number, hazard classification, date of authorization or authorization file number (if available). Manufacture here is by the Explosives Regulations (Part 5) definition, and therefore includes explosives that are processed (e.g., pumped, augered, etc.).

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

Client Information:

Provide the client name (where explosives are being manufactured for loading into boreholes), location, and contact information to allow ERD to visit or contact the site. 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), applicants may record their own licence number to demonstrate that no sale occurs or, in the case of Quebec, record the provincial loading permit number.

Clients between 300 and 450 km:

In the case of clients located between 300 and 450 km from the factory, indicate how the client can receive service while abiding by provincial or federal regulations regarding driving time restrictions. Sites further away than 300 km must be described and approved on the licence by inclusion on Form F05-01C. Addition of these clients to Form F05-01C requires a licence amendment.

Clients Less than 300 km:

In order to avoid amendment of Form F05-01C each time a customer site(s) is added or changed, companies with extended lists of customers must list client sites on an Authorized Client List and refer to this list on Form F05-01C. Whenever a change occurs in the list, the amended list, showing the new customer information, is sent to ERD prior to commencing servicing the new client. Only client sites within 300 km of a base or 200 km of a satellite site may be on this list. Form F05-01C refers to the list as follows: e.g., Acustomers according to the Authorized Client List.®

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 F05-01C.

3.1.1.6 Form F05-01D: Manufacturing Operations Description

Form F05-01D must describe the operation and state the type and quantity of the explosive and personnel limits with references to each specific process unit or magazine, as given on Form F05-01B. The operations of a mobile process unit 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.

Any special circumstances must be described on Forms F05-01B, F05-01D and, if applicable, F05-01E, 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 F05-01B and described on Forms F05-01D and F05-01E.

Permitted Operations:

The operation(s) allowed in a particular building or on a mobile process unit (including at a client 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 simultaneously (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 ERD to be personnel who remain in the particular area and are required to accomplish the particular intention of an operation; visitors 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 or contractors. Personnel limits must be set at a minimum required to carry out the work.

When there are several operations at a site, each with their own personnel limit, there should also be a global site limit. For example, a site may have five magazines or processes each with a limit of 3 operators and 2 visitors, but that does not mean a combined limit for the site of 15 operators and 10 visitors, but perhaps 5 operators and 2 visitors.

3.1.1.7 Form F05-01E: Distances

In the left-hand column of Form F05-01E, in the column entitled "Reference Number" each building/operations/location with explosives are listed. These are regarded as potential donors to the vulnerable locations and explosives building/operations/locations listed in the other columns to the right. It is useful to record the quantity (NEQ) of explosives in this column.

The second set of columns on this form should be used to show distance to vulnerable features on site such as AN storage and fuel storage, as well as features outside the site, such as dwellings, etc.

The third set of columns are used to show distance to all explosives storage areas (e.g. magazines, emulsion storage), and the fourth set of columns to all process areas (e.g. washbay, emulsion manufacturing building).

Form F05-01E must show the minimum distance to be maintained and the actual distance between a given building/operation/location and the building/operation/location/ activity listed in the column headings (process, magazines, etc.). This distance will depend on the quantity of explosives at the location listed in column 1 and can be found in the Quantity-Distance Principles Manual.

When completing Form F05-01E, it is helpful to record the applicable Q-D type (e.g. D4, D7) 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 Q-D, the deviation must be identified on Form F05-01E and explained on Form F05-01B and, if needed, referenced on Form F05-01D. These annotations and explanations formally record the conditions under which a derogation has been approved, e.g., incumbent grandfathering, risk assessment.

3.1.2 ENVIRONMENTAL ASSESSMENT AND SPILL CONTINGENCIES

As mentioned in Section 2.7.10, under the Canadian Environmental Assessment Act (CEAA 2012), an environmental assessment (EA) is normally not required if a factory or magazine licence is issued. An EA may be required for factory or magazine licences located north of the 60° parallel.

However, in the case of certificates, 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. The probability of initiation may be reduced by careful design of equipment and facilities and by hazard analyses, by understanding the risks associated with the products, by maintaining operations to the original 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 F05-01A and shown to be available.

The Regulations require the preparation of procedures and special rules drawn up by the factory licence holder which are designed to ensure 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 procedures is left to the individual companies. However, the documents must clearly detail the correct, acceptable and understandable way of accomplishing a task. They must be titled, dated, the pages numbered, and must be approved by a responsible company employee.

Note: ERD does not approve procedures or drawings. Nevertheless, and when appropriate, ERD will comment.

During an 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?

Copies of documents, procedures, and records may also be requested prior to the issuing of the licence.

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 trained and competent 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., for pumps: control of preventive maintenance)?

3.2.2 INSPECTIONS AND AUDITS

Companies must have their operations internally inspected and/or audited. This means inspections or audits by 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. All action items and corrective actions taken must be recorded. Records of these inspections/audits may be requested by ERD during inspections or for submission with the renewal applications. An annual audit would meet the intention of the regulations.

3.2.3 TRAINING

Every employee must be trained to carry out their duties at the factory or a satellite site in a safe and lawful manner. 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 training 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 ERD or prior to the issuing of the licence.

There is a requirement for training regarding hazardous products under the Workplace Hazardous Materials Information System (WHMIS) and employers must comply with this legislation.

However, explosives are currently exempt from WHMIS, so ERD requires comparable training and available information regarding the hazards of explosives. In the case of small operations that are exempt from WHMIS requirements, ERD requires that all personnel be trained on the hazards associated with the materials in use, that information on the chemicals other than explosives (Material Safety Data Sheets [MSDS]) be available, and that hazardous materials be labeled.

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. An employee's training certification must expire not more than five years after the date of certification. If a change occurs in the operating procedures for which the certification was issued, the workers must be trained in the new operating procedures but the expiry date of the certification must remain the same. Workers must be recertified or retrained within five years. Previously certified workers must be reassessed if they have not conducted the activities in question in the preceding 12 months.

When training personnel on procedures, it is important to show not only the tasks to be carried out, but also why the tasks are performed (the basis of safety). Thus, the operator will know why a task is to be done a certain way and the possible consequences of not performing the task in a given way.

3.2.4 PROCEDURES

Certain activities must be controlled by procedures in order to ensure the correct and acceptable way of accomplishing a task is clearly and understandably detailed. 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 annually.

The following procedures must be available:

- Operating procedures for the site or process units, including any specialty or safety procedure;
- List of permitted maintenance tasks;
- Explosives burning ground and/or waste explosive disposal;
- Emergency Response Plan and Fire Safety Plan;
- Site Security Plan;
- Key Control Plan;
- Management of change procedures;
- 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/tag out, etc.);
- Hot Work procedures
- Memoranda of Understanding

When procedures referenced on Form F05-01A have been changed, the licensee/certificate holder may wait until annual renewal of the licence/certificate before making the changes to the

information on Form F05-01A; however, the latest procedures must be available at the site. The intent is not that ERD approves procedures, but that changes are reflected in the licence and that inspectors can verify that the latest procedures are used.

3.2.4.1 Operating Procedures

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

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 require dismantling or removing pumps and pipework or other equipment. The design of the equipment should allow for 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 must be inspected by a supervisor to verify that it no longer contains any explosives, and it should be tagged.

3.2.4.3 List of Permitted Maintenance Tasks

A 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.

3.2.4.4 Maintenance Procedures

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

3.2.4.5 Explosives Disposal and Burning Ground

Two operators must be present during disposal of explosives or packaging that may be contaminated with explosives. 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. For developing a procedure the Guidelines for the Destruction of Explosives should be consulted.

3.2.4.6 Emergency Response Plan and Fire Safety Plan

All sites must develop formal Emergency Response Plans and Fire Safety Plans. This should be done in conjunction with local authorities, with the operating mine and quarry personnel as appropriate, or with the contractors responsible for a project.

The Emergency Response Plan and Fire Safety Plan for the site need not be separate documents, but could all form part of the site's Emergency Response Plan.

The plan should develop reasonable credible scenarios of possible events, including vehicle collision, fire on the site, explosion, fire encroaching on the site, spills, storms, and power failure, as well as events regarding 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.

3.2.4.7 Key Control Plan

Companies should develop a formal Key Control Plan to control access to all locations where explosives may be found on the site. A Key Control Guideline is available from ERD to assist with the development of a Key Control Plan.

3.2.4.8 Site Security Plan

The site must be assessed for security risks and a Site Security Plan must be developed for the site. A Site Security Guideline is available to aid development of a Site Security Plan.

3.2.4.9 Management of Change Procedures

Companies must establish procedures to control changes to equipment and procedures to maintain the basis of safety and security. All technological and organizational changes, whether temporary or permanent, must be assessed and approved by the holder of the licence. All such changes must be recorded and retained for two years after the change is made. ERD should be consulted prior to any implementation of these changes.

3.2.4.10 Miscellaneous Safety Procedures

Companies must develop the procedures required by ERD 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 know when they are required, and must be trained on the procedure prior to undertaking the task.

3.2.4.11 Hot Work

When the use of an open flame or a flame-producing device (matches and lighters, including electric) or equipment producing sparks is required (e.g. in welding shops, on burning grounds, in a maintenance garage), proper safety procedures are required.

Smoking is prohibited from all Division 1 and 2 licenced operations.

3.2.4.12 Memoranda of Understanding

When a company operates a site in a domain that is not under total control of the explosives company (e.g., on a mine or quarry-s property, on a road job, etc.), a Memorandum of Understanding (MOU) must be written and signed by all parties. The objective of a well-written MOU is to clarify the ownership of the domain/site, responsibilities of each party on the site, ensure good communications between all parties on the site, note the facilities/operations present on the site, describe the access/egress control and security of the licensed site, and the scope of the explosives operations, including those of the mine/quarry and how they would affect each other. An MOU will usually include the development of a Joint Emergency Response

Plan by all parties present in a domain.

MOUs are also needed for all clients- sites with respect to approved operations and personnel limits.

3.3 Fee Structure

A fee is payable at the time an application is submitted.

If bank cheques are used, they must be made payable to AReceiver General for Canada.® All forms of payment must make reference to the licence or certificate number to which they are to be applied. Contact ERD for a listing of fees.

3.4 Processing Time

If the application is complete, the target processing time to review and issue the licence/certificate at ERD is as follows:

- For new factories and certificates: maximum of 60 working days.
- For renewal and amendments: maximum of 30 working days.
- For satellite sites, demonstrations and trials: maximum of 30 working days.

If there are aspects that are unclear, or if additional information is required, then ERD will issue an information request within 14 days of receipt of application. From receipt of the additional information or revised application, the target processing time will be of 30 working days.

4. SITES, FACILITIES AND EQUIPMENT

4.1 Licence or Certificate Site

4.1.1 LOCATION

Sites must comply with Quantity-Distance (Q-D) tables for the PE1 hazard classification. The following are used for most situations:

- D2: from a donor magazine to another magazine,* or from a donor process unit 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 traveled roads such as a mine haul road;
- D5: from any explosive unit or donor magazine to an operating pit and/or local road
- D6: from a donor magazine to another magazine, or from a donor process unit to a magazine
- D7: from a donor process unit to another process unit, from a donor magazine to a process unit, or from any explosive unit or magazine 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 F05-01B. Consult the Quantity-Distance Principles for details.

It is important to note that there are other locations from which there is a minimum setoff distance for explosives. These are:

- a site where surface blasting is taking place;
- aboveground storage of large stocks of fuel or other hazardous materials;
- underground pipelines or underground storage of large stocks of fuel or other hazardous materials;
- electrical installations or power lines;
- airports.

If there are any such locations within D8 of an explosive location, then the ERD Quantity-Distance Principles Manual should be consulted.

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 CONTROLLING ACCESS TO THE SITE (FENCING, OTHER BARRIERS)

Access to the factory or certificate site must be restricted and controlled. Limiting and controlling access to the site enhances both public safety and security of explosives by minimizing the exposure of persons who do not have any reason to be there. The measures in place to control site access must be described on Form F05-01B. If any of the measures stipulated in this section have not been implemented, the alternative must be described and justified on Form F05-01B.

All sites must restrict road access with a lockable gate at the entrance to the site perimeter. There must be barriers to prevent access at any other site access points. These may be man-made barriers or natural barriers such as trees, difficult terrain, etc. Page-wire or chain-link fences might be an acceptable man-made barrier for permanent sites, but the exact fencing requirements might vary based on the types of operation and appropriate security measures to be taken due to the site's location. A snow fence is an acceptable alternative for temporary sites and certificates. Special consideration will be given for fencing in remote areas or areas in which the terrain makes

erection of a fence problematic. Barriers may be erected around process locations rather than the perimeter of a large site. Man-made barriers other than a fence will be considered on a case-by-case basis.

Site gates must be kept locked unless the site is attended and the person or persons at the site can observe persons entering the gate.

Many bulk explosives sites are located on land that companies do not own or fully control. In the case of sites located at surface mines or quarries, when there is fencing and security for the entire site, the explosives operation has to make sure that it is delineated from the rest of the mine.

The barriers described will not be as effective in preventing access by persons on foot or with ATVs, motorcycles, snowmobiles, etc. Therefore, the perimeter of the site must also be posted with signs warning against unauthorized entry. These signs may also have to meet the requirements of the province or territory.

In the vicinity of any structures with explosives, e.g., magazines, process buildings, wash facilities, etc., signs must be posted to warn of the explosives. A sample of suitable wording follows:

DANGER B EXPLOSIVES	DANGER B EXPLOSIFS
NO TRESPASSING	ACCES INTERDIT
PENALTY - SECTION 18	PÉNALITE - ARTICLE 18
CANADA EXPLOSIVES ACT	LOI SUR LES EXPLOSIFS DU CANADA
NO SMOKING B NO MATCHES	INTERDIT DE FUMER B AUCUNE ALLUMETTES

Such signs must be displayed on the fence around these structures or at a distance of 30 m from them so that a sign is clearly visible from any possible direction of approach. Such warning signs should be placed on the access road at D7 distances, or D5 when D7 is impractical.

4.1.3 CONTROL OF FIRE-PRODUCING DEVICES

A box for keeping matches and lighters or other fire-producing items must be provided before entry onto the site. The normal location for this is at the gate entering the site, placed near a warning sign described in the previous section.

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 ERD.

Drums of petroleum products or chemicals must be tightly sealed, protected against corrosion and rust, and kept in a dry building or shed with an impermeable floor (or on a spill containment basin such as specially designed pallets). Solid chemicals in bags or other forms of packaging must also be kept in a dry building, shed, or container.

4.1.5 SERVICES AND TOOLS

A Division 1 licenced factory with either permanent or temporary structures 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 terms of the licence restricted based on the historical average temperature above 0°C (zero) applicable to the area.

4.1.7 CODES

All standard industrial installations must comply with the 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 A).

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 2² classification (medium hazard industrial occupancy), which is typical for repair garages and service stations. Process buildings and larger sites are usually 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 ERD 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.

² In these *Guidelines for Bulk Explosives Facilities*, maintenance garages/washbays are classified as Group F, Division 2, meaning *medium hazard industrial occupancy* under the Building Code. This designation essentially recognizes maintenance **with no explosives** present. 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 explosive 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, classification was not fully implemented in these guidelines because it also brings into play such requirements as sprinkler systems and others that ERD did not want to see. Architects get involved in the design of such facilities, which can limit occupancy and add a host of other restrictions or requirements that ERD did not believe are warranted. Nonetheless, ERD must recognize that explosives will indeed be contained in such structures and thus they must have many of the non-combustible attributes that combustible structures, such as a wood frame, do not. The National Fire Code stipulates that ERD is the authority having jurisdiction® and thus can determine what requirements are deemed necessary under the circumstances.

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 steel buildings are preferred.

It is not uncommon for such building structures to house vehicles and equipment containing explosives with their inherent characteristics constituting a special fire hazard. As an example, this could be in the form of residue, a heel, or contaminated pumps/hoses resulting in the structure falling under Group F, Division 1 or 2, for hazardous rated buildings under the National Building Code of Canada (NBC).

In many parts of the country, there is a requirement to heat facilities, thus requiring a structure to be insulated. As a minimum, any insulation, be it rigid or a spray-on application, must meet a flame spread rating of 25 or less as defined in the NBC. Such a rating serves to resist a flame spread, thereby reducing the effects of a temperature rise in the event of a fire.

Insulating material is only one component of a typical non-combustible composite structure such as that used for load-bearing walls and ceilings. Other non-combustible materials of construction, such as gyprock or metal cladding on the interior of the building, must be incorporated in the design to complete the required thermal barrier protection of the building assembly for a Group F, Division 1 or 2, hazardous rated building.

All forms of interior non-combustible thermal barrier protection materials must be installed to the full height of the structure, including the ceiling. When only interior metal cladding is used as a thermal barrier, it must be installed to the full height of the structure, including the ceiling, to complete the thermal barrier protection of the building assembly. When other forms of interior non-combustible thermal protection materials are used, such as gyprock to the full height, it may be desirable and acceptable to add a protective non-corrosive metal skin on the lower portion of the interior wall to ward off the affects of moisture from washing, for instance. Exposed plastic vapour barrier or spray-on applications serving the same purpose, installed partially or to the full height of the building interior, are not acceptable in a Group F, Division 1 or 2, hazardous rated building.

There has been interest in using fire-resistant fabric buildings. These fabrics are not non-combustible and are not permitted for buildings with explosives, as explained in the preceding section 4.1.7 on Codes and the associated footnote explaining the code requirements. The issue with fabric-covered structures is not compatibility or long wear; it is that they are combustible. The MSMA (Membrane Structures Manufacturers Association) web site states that structures will meet the building code classifications used in Part 9 and Part 3 of the National Building Code of Canada as combustible construction. As explained in the footnote to section 4.1.7, structures where mobile explosive vehicles with residue, heels, or pumps/hoses are commonly kept, decontaminated, and maintained are deemed under the National Building Code to be high hazard industrial occupancy and classed as Group F, Division 1. ERD, being the authority having jurisdiction, has permitted the use of fabric structures that meet flame resistance requirements for wash facilities and as garages at factories with temporary structures, but that was a concession that was never meant to be applied at regular factory sites.

In certain instances a factory site may be required for a limited time period and the structures on it need not be permanent structures, but any proposal must be approved by ERD before implementation. Protection of the washing facilities from the elements is required. Membrane or

fabric used in structures must comply with National Building Code Section 3.1.6, and specifically Section 3.1.6.5 for Flame Resistance, plus Sections 3.3 and 3.4. The material must conform to CAN/ULC-S109 A Standard for Flame Tests of Flame-Resistant Fabrics and Films® and NFPA 701 A Flame Resistance for Textiles and Films.®

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 safety exit 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.

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 on the licensed site.

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

Provided as Information

Asphalt contaminated by oxidizing salts can act as a pyrotechnic composition (able to burn with vigorous and 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 Q-D 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 (see section 4.9.2, Handling of AN). 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.

4.3 Parking Areas

A planned area for the parking of mobile process units, including ANFO units, must be provided. This may be indoors or outdoors. Given that the following sections require that parking be at least 25 m from AN and explosives and 25 m from any source of potential fire, it is difficult to have indoor parking when explosives are in the building.

4.3.1 LOCATION

A process vehicle with no more than a heel on board can be regarded as having zero NEQ for Q-D requirements to vulnerable locations that are part of the licensed operation. Normal Q-D requirements to outside vulnerable locations must still be met. This applies to requirements for taking on AN or fuel, or for minimum set-off distances from fuel, etc. However, a vehicle is still a potential source of fire and must accordingly be parked at least 25 m from stored explosives or AN.

If more than a heel is present (i.e., greater than 250 kg), Q-D must be taken into account.

Site layouts should take into account operational emergencies requiring unscheduled storage of loaded process vehicles.

4.3.2 PARKING OF MPU'S

Empty MPUs with a heel of less than 250 kg NEQ may be parked on a licensed site as though they were empty but not decontaminated.

Often an MPU will return to the factory with more than a heel on board and sometimes it may have to park fully loaded (e.g. if the blast is cancelled after the vehicle has been loaded) in which case it must be parked meeting Q-D. The site licence must include a suitable area designated for this parking, shown on the site plan. ERD believes it may be safer to park the vehicle overnight with more than a heel than to pump off the excess product. If multiple vehicles are parked with more than a heel, the maximum vehicle NEQs must be added together for Q/D purposes unless the vehicles are separated. (i.e. D2 barricaded or D4 unbarricaded using the maximum NEQ of the vehicles).

When parked, the AN and explosives bins and hoppers must be locked and the battery must be isolated. The keys to the vehicles must be kept in a secure place to prevent theft of partially loaded vehicles.

4.3.2.1 *Parking of pre-loaded MPU's*

If the explosives are loaded the night before, then the vehicles must be equipped with a GPS tracking and communication system including an anti theft system. This activity must have been approved on the site licence. Generally MPUs should not be loaded sooner or with more product than is required but in some circumstances pre-loading may be permitted by licence depending upon the justification, site location, site security, quality of site operations, frequency and the procedures proposed to control this activity.

4.3.2.2 *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 of all AN; (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 ERD has been obtained beforehand.

4.3.2.3 *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 if the MPU is attended. An isolated area is one that has sufficient distance from vulnerable sites to meet Q-D requirements.

4.4 Number of Units

Any number of vehicles up to the total listed on the licence may be located at a factory with a wash bay.

For satellite sites, only two Aactive® process vehicles are allowed.

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 NEQ.

4.5 Tankers, Tanks or Silos for Pumpable Explosives

This part deals with containers that are in use for the storage of pumpable explosives (typically emulsion or watergel). Storage means that the explosives are held unattended. This type of container may be a tank, a silo, a road tanker, or a road tanker removed from service. Intermediate bulk containers (IBCs) or totes are not included because they are essentially packaged product that must be stored in a magazine.

4.5.1 LOCATION

Siting must take into account the Q-D Principles. Multiple units may be grouped together if circumstances, including available distances, allow. Barricades are required as per the Q-D Principles.

4.5.2 INSTALLATION

The installation must be structurally sound and must be supported on a non-combustible structure.

If road tankers are to be temporarily installed (i.e., a tanker of emulsion is used for unattended storage, not refilled on site, but replaced by another tanker), the wheels must be blocked, the king pin must be locked and jacks should be used. This is addressed in B620, TC423 tankers.

If road tankers are used as a permanent installation (i.e., not temporarily installed as above, but refilled on site) the tires must be removed. Non-coded vessels may not be used on the road, but may be used as permanent storage on bulk sites.

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

If intermodal portable tanks are used for storage, only Type 2, with a working pressure of 14.5 to 25 psi normally used for marine and road transport, are allowed. However, these are not allowed for transporting of explosives.

4.5.3 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. Transport Canada tank standards require the following tests for highway tankers:

- TC 407 and 412: External and leak tests every year, internal and pressure every 5 years;
- TC 423: Internal external and leak tests every year, pressure every 5 years.

The surface of the tank that is in contact with the explosive must be able to withstand the constituents of the explosive and must be non-porous and easily cleaned. Stainless steel is a good material for most existing emulsion or watergel explosives. Mild steel is corroded by the nitrate salts in the explosive. Polyethylene is a suitable material for water-based explosives, but it must be structurally able to withstand the elevated temperatures at which emulsion explosives are manufactured and stored.

Any material used in or around the tanks must be compatible with the explosive. No brass or copper may be used in contact with AN or AN-containing mixtures (see Section 4.9.2, handling of AN). Where insulation is used, it must be non-porous in nature, i.e., not absorb explosives in the event of a spill.

Emulsion storage tanks must be constructed in a manner that prevents accumulation of explosives and raw material in cracks and cavities. There must not be any enclosed containment areas such as framing support pockets. Any pocket area must be provided with a vent and drain or weep area in order to allow for decontamination.

Double- or multiple-walled tanks are not permitted.

Venting must be provided.

Threaded fittings in contact with water-based explosives are not permitted, unless these are specialized fittings that cannot be replaced, such as instrumentation fittings.

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

4.5.4 SECURITY

All points of access (e.g., manholes and discharge valves) of explosive tanks, tankers, silos, etc., must be locked (not just cam lock lug rings) when not attended.

4.6 Combustible Liquids

This section deals with combustible liquids which are, per the National Fire Code, a liquid having a flash point at or above 37.8°C and below 93.3°C. This includes fuel oil, diesel oil (flash point 37.8°C), and kerosene (flash point 65-85°C).

In all cases, the storage tanks must meet applicable regulations and codes for tank construction, installation, and dyking requirements.

4.6.1 GENERAL FUEL STORAGE REQUIREMENTS

The location of above-ground combustible fuel storage must be a minimum of 25 m away from AN, from explosives storage, or from manufacturing buildings. The tank 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.

Under no circumstances must the combustible liquid be able to flow towards buildings in which explosives may be found in the event of a leak. The fuel supply must have two independent shut-off valves between the storage tank and the point of discharge in the structure. Brass valves must not be used in areas where brass is incompatible with the explosives or raw materials.

Accidental siphoning 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 siphoning. Shut-off valves must fail in the closed mode (shut in the event of power failure).

Amounts not exceeding 10 000 litres may be located up to 8 m from a structure in which explosives may be found. This fuel should not be used for transfer to vehicles. No AN should be kept unattended in the structure.

4.6.1.1 Fuel storage for transfer to mobile process units

The storage must be placed to permit the vehicle from which or to which fuel is being transferred to be not closer than 25 m to AN or explosives.

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

- Fuelling locations must be adequately separated from other site facilities such as AN and emulsion storage;
- Mobile Process Units must be fuelled before explosives are loaded; and
- Emergency response procedures for explosive incidents must be available.

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

- Mobile Process Units must be fuelled before explosives are loaded; and
- Emergency response procedures for explosive incidents must be available and must have the agreement of the mine.

4.6.1.2 Combustible liquid as raw material feed

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.

4.6.1.3 Combustible liquid as fuel feed to equipment

It should be noted that the requirement for the location of fuel stored to supply equipment powered by internal combustion engine, e.g., generators and compressors, is more stringent than the above. This requirement is outlined in section 4.9, Equipment Powered by Internal Combustion Engine.

4.6.2 DYKING

To contain spills or leaks from an above-ground combustible liquid storage tank, the tank shall be dyked in accordance with subsection 4.3.7 of the National Fire Code of Canada 2005, or it must 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. It should be noted that the impermeability requirement for the above dyking precludes earth, sand, or granular dykes.

4.6.3 USE OF WASTE OIL

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

- the waste oil is generated, characterized and used at the same location, i.e., same province;
- approvals have been received from the provincial authority having jurisdiction over the use

and transport of waste oil;

- its use is described in the Factory Licence;
- 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); and
- explosive product use and sale is restricted to the factory site where the waste oil originated.

This policy limits the 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 specification against which waste oils can be tested and evaluated; this specification must define:
 - 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),
 - viscosity limits (very viscous oils may cause problems with application and adsorption),
 - flashpoint limits (i.e., low flash point can affect pumping safety);
- test methods so that the oil can either be accepted or rejected before it is blended with virgin oils and before their use;
- 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.

4.7 Explosive Fuel Phase

This section deals with raw material for explosives (e.g., emulsion fuel phase) that does not fall into the categories of combustible or flammable liquid. The flash point of this fuel phase is typically 165°C or greater and this fuel phase must usually be heated.

This fuel phase may be located within or outside a structure in which explosives are processed, the limitations being that the storage vessel(s) must be constructed and installed according to good engineering practice and dyked as per the requirements in section 4.5.2 They must also be located separately from the explosive matrix and AN or AN solution so that, in a fire situation, the fire of the fuel phase does not engulf these materials.

4.8 Flammable Liquids

This section deals with flammable liquid which, per the National Fire Code, is a liquid having a flash point below 37.8°C and a vapour pressure not more than 275.8 kPa at 37.8°C as determined by ASTM D323.

The storage of large quantities is not dealt with here because it is not permitted at a bulk explosives site.

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. The

preferred solution is the use of CSA-approved flammable storage cabinets.

4.9 Ammonium Nitrate Prill Storage and Handling

This section deals with the storage of solid ammonium nitrate prills and any reference to AN here means Ammonium Nitrate Prills.

AN storage must take into consideration risk of an explosion initiated by a nearby detonation, the risk of fire transitioning to explosion, the security of the AN from theft for illicit purposes, and the prevention of environmental contamination.

4.9.1 LOCATION

This section deals with the location for AN storage relative to explosives, other hazardous materials, and vulnerable sites. The guidelines here are designed for storage of 100 tonnes or less of AN. Most operations that are not remotely situated have much less than this amount in stock because they can be re-supplied on a regular basis. A guideline for the storage of more than 100 tonnes of AN at remote locations (self-contained locations that cannot readily be accessed from a road that connects to populated areas) will be found in Appendix D.

The first consideration is attempting to find a location for AN storage that is far enough removed from explosives so that the AN does not have to be considered explosive. This distance depends on the amount of explosive and the minimum separation distance can be found in ERD-s Quantity-Distance Principles manual.

In some cases, for example when AN is fed from a silo to an explosive operation in a structure, AN cannot be located far enough away from explosives to be considered non-explosive, and half of the quantity stored must be added to the total NEQ of the site and located according to Q-D principles.

When a vehicle with explosives is brought to the AN storage, AN is considered an explosive at 50% of its weight and the entire quantity, explosive on the vehicle, and the AN must be situated according to Q-D Principles. However, (i) if the vehicle is equipped with an engineered fire suppression system, and (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 Q-D 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 ERD beforehand.

When not considered an explosive, the quantity is not limited by the Explosives Regulations, but other regulations may apply.

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

Ammonium nitrate is a water pollutant and many explosive sites are near sensitive areas. Environmental considerations require that the AN storage be no closer than 30 m to a body of water. If an installation is within 30 m of a body of water, an environmental assessment must be conducted. In situations with sensitive aquatic environments, a greater distance may be required.

4.9.2 HANDLING OF AN

This section's guidelines are intended to address the following concerns with the handling of AN: environmental contamination by spillage, contamination of the AN, and avoidance of fires.

- Any areas on which AN is transferred must be fitted to provide a catchment area for spilled AN from which the AN can be readily collected. As an example, loose gravel or sand would not fit this description.
- Spilled AN must be immediately picked up to be disposed of in an environmentally acceptable manner.
- If the immediate collection of spilled AN is not possible, the storage or handling area must be underlaid by a water-impermeable cover that collects and stores any runoff water. This water must then be disposed of in an environmentally acceptable manner.
- AN transferred via dumping (e.g., from a trailer or tanker to an auger or bucket elevator feed hopper) must be protected from getting wet and from other contamination (stones, etc.).
- Equipment used to transfer AN (e.g., augers, bucket elevators, pneumatic blowers) may be hydraulically or electrically powered, but must not be powered by a gasoline engine.
- Equipment used to transfer AN must not contaminate the AN, e.g., leaking oil, on equipment used for other materials and not decontaminated.
- No brass or copper may be used where it may get into contact with AN prills or solution (to prevent possible formation of the explosive compound tetra-ammine copper(II)nitrate).

4.9.3 STORAGE OF BULK AN

Bulk AN prills can be stored in a number of ways. No matter what the storage method, the AN must be kept dry and free from contamination and the storage must be vented. The types of storage that have been encountered are discussed below, with some guidelines. The design and construction of any container or structure must meet good engineering practices and all applicable codes and regulations.

As with explosives, threaded fittings and places where AN can be trapped are to be avoided. There have been incidents involving explosion of AN trapped in places to which a welding torch was applied.

4.9.3.1 Road Trailers, Tankers, Railcars

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

If road tankers or trailers are to be temporarily installed (i.e., a tanker or trailer is used for storage, not refilled on site, but replaced by another tanker or trailer), the wheels must be blocked, the king pin must be locked, and jacks should be used.

If road tankers or trailers are used as a permanent installation (i.e., not temporarily installed as above, but refilled on site), the tires must be removed.

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

be considered.

4.9.3.2 Silos

Mild steel is corroded by nitrate salts. Some silos are made of mild steel with an internal epoxy coating. If this coating is not maintained with further coats, the abrasive AN wears away the coating, exposing the mild steel, which will corrode at a rapid rate. This has resulted in at least one catastrophic failure. Therefore, the integrity of mild steel silos should be verified from time to time.

Stainless steel stands up well to AN.

4.9.3.3 Shipping Containers

There are shipping containers that have been fitted to transport, store and transfer bulk ammonium nitrate. These have a polymeric liner bag and reinforcing around the bag.

These containers appear to be an acceptable means of storage for AN, if they meet transportation requirements.

4.9.3.4 Buildings or Warehouses

Buildings or structures must meet the requirements of NFPA Standard 400 (Hazardous Materials Code, 2010 Edition).

4.9.4 STORAGE OF AN IN TOTE BAGS OR 25-KG BAGS

Storage of AN in packages such as tote bags or 25-kg bags must be in a lockable container or structure unless in a remote area (self-contained locations that cannot readily be accessed from a road that connects to populated areas). This is for security purposes.

Storage of large quantities of these AN packages in remote areas must meet the requirements outlined in sections 4.8.1 and 4.8.2 of this guideline, and Appendix D. If the storage is proposed to be open air, then packages, in addition to being underlaid as described in Part 4.8.2, must be covered by a tarpaulin or other means to keep precipitation away from the packages. The storage areas must be clearly indicated and delineated to prevent any accidental incursions there.

Any open-air storage of totes in remote areas will likely be an item of concern.

A storage area layout that has been approved in an Environmental Assessment must be adhered to or the proponent must obtain approval from the EA responsible agency for a different arrangement.

4.9.5 SECURITY

All points of access (e.g., hatches, discharge points) for ammonium nitrate in containers (silos, shipping containers, tankers) must be lockable and locked when unattended. All points of access to buildings or structures in which ammonium nitrate is stored must be lockable and locked when unattended.

Exceptions to this requirement may be possible in remote locations (self-contained locations that cannot readily be accessed from a road that connects to populated areas).

4.10 Ammonium Nitrate Solution

This section deals with the storage of AN solutions for explosives (e.g., emulsion oxidizer aqueous phase).

This AN solution may be located within or outside a structure in which explosives are processed, the limitations being that the storage vessel(s) must be constructed and installed according to good engineering practice and dyked as per the requirements in section 4.5.4, and they must be located separately from combustibles so that, in a fire situation, the fire of the fuel phase does not engulf these materials.

Given the elevated temperature at which these solutions are held and made, a safety shower and eye wash must be nearby.

4.11 Washing Facilities

A factory that serves as a base for mobile process units must have a wash facility that is capable of fully decontaminating any mobile process unit that is based there.

Each base factory must have permanent washing facilities in a building to ensure cleanliness and proper decontamination of mobile process units and other explosives equipment. Factory sites with temporary structures may have temporary washing facilities in a temporary structure. The washing facilities must have an impermeable floor/base that allows wash water and residues from washing to be collected and dealt with in an environmentally sound manner. The facilities must be protected from the elements to avoid additional volumes of water from precipitation that might be contaminated and require disposition.

4.11.1 LOCATION

Washing facilities may be separated from or located together with maintenance facilities. Locating washing and maintenance facilities together will reduce flexibility under certain circumstances, e.g., welding or other hot work will not be allowed as simultaneous operations with washing a contaminated mobile process unit, even if only a heel is present.

4.11.1.1 Combined Washing/Maintenance Facility

The combined facility must comply with Q-D requirements, taking into account the amount of explosive and any exposure of people.

If only a heel is present, Q-D 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 silo 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 or not essential to a particular hazardous operation at the site with explosives, such as office clerks, must be located at D7 distances.

4.11.1.2 Separate Washing Facility, ANFO Trucks, Mobile Base

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

For non-water-proofed explosives

- allow mobile/portable temporary facility to serve as a base factory for ANFO only operation
- require an acceptable catchment area, e.g., Instaberm, not tarp on the ground, with collection sump
- require shelter over the catchment area
- require hot water and heater capability
- essentially any of the good practices required of a factory with temporary structures.

4.11.1.3 Separate Maintenance Facility

If a contaminated mobile process unit is to be brought to the facility, it must comply with the Q-D 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.

4.11.1.4 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.

4.11.1.5 Mechanical ANFO Certificate

For washing/maintenance facilities operating under a Certificate for the Mechanical Blending of ANFO, the explosive Q-D 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.

There must be the capability of washing the mobile process unit on site. There must be a catchment area that either collects the washwater for environmentally acceptable disposal or directs it to an existing water collection pond or basin that is capable of dealing with oily water containing ammonium nitrate. The water treatment or disposal method must be described on F05-01B of the certificate application.

4.11.2 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.

4.12 Washing System

4.12.1 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.

See Appendix A for a schematic of the typical electrical requirements of wash systems and their locations.

4.12.1.1 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) must not be used.

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

4.12.1.2 Electric Wash System, EEMAC 4X

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

4.12.1.3 Electric Wash System, Other Than EEMAC 4X

A wash system using an electric heater that is not EEMAC 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). Note that other equipment not meeting EEMAC 4X standards could be stored in this area.

4.12.2 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.

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.

Note 2: Hose(s) must not be used under a door 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.

4.12.3 PERFORMANCE

The washing system must be proven to be effective to clean mobile process units of oil and grease and to decontaminate mobile process units 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 of wastewater, and a pressure system. Pressure washing with hot water or steam is preferred. If a cold washing system proves to be ineffective, a hot-water pressure system will be imposed.

4.12.4 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.

4.13 Lunchroom and Welfare

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

4.13.1 LOCATION

Such facilities may be located next to the operations if used only 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 F05-01D.

If used by personnel not essential to a particular hazardous operation at the site operations (e.g., includes blasting crews visiting from the mine), they must be located at D7 distances.

Lunchroom for workers at a process building may be located within the building provided it meets the requirements outlined in section 4.11.2 (requirements for a separate room) if it contains electrical fittings not meeting EEMAC 4X and the number of personnel using it are within the licence limits approved on F05-01D.

4.14 Office

Office space may be provided as required. Note that if the office space is part of the process building, it must meet the requirements outlined in section 4.11.2 (requirements for a separate room) if the offices contain electrical fittings not meeting EEMAC 4X.

4.14.1 LOCATION

The office may be located next to the operation if used only by the personnel directly connected with manufacturing. Personnel limits specified in F05-01D apply. Visitors, such as truck drivers and delivery persons, are permitted within the visitor licence limits approved on F05-01D.

If used by personnel not essential to a particular hazardous operation at the site (e.g., accounting, sales personnel), offices must be located at D7 distances.

4.15 Other Storage B Inert Material, Chemicals and Contaminated Parts

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

4.15.1 LOCATION

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

4.15.2 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 other materials with an acidic pH and must be stored separately from AN or explosives. Storage should take into consideration the possible consequences of a fire.

Drums containing liquid petroleum products or chemicals must be tightly sealed, protected against corrosion and rust, and kept in a dry building, shed or container with an impermeable floor (or on a spill containment basin such as specially designed pallets). Solid chemicals in bags or other forms of packaging must also be kept in a dry building, shed or container. Aluminum may not be stored outside.

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

4.15.3 CONTAMINATED PARTS

These sections refer to equipment or parts contaminated with explosives or explosives residues.

Contaminated pieces such as pumps must be locked away in a suitable location (an explosives magazine is not required for this) until 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 (including a date) until decontamination.

Connecting Hoses

This section refers to hoses that are used to transfer emulsion or watergel explosives.

Normally there would be one hose in regular use. This hose in regular use should be blown out after use and closed with end caps to prevent drips.

Hoses not in regular use should be blown out, closed with locked end caps, tagged and dated, and locked away in a suitable location (an explosives magazine is not required for this) until decontaminated.

Care must be taken with the placement of hoses, avoiding sharp or abrasive surfaces. The hoses typically move during use and this can cause them to be cut by repeatedly rubbing on sharp surfaces. Particular attention must be paid to hoses passing through walls.

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.

4.15.4 WASTE AND SCRAP

All waste and scrap materials must be handled according to the principles of good housekeeping. Containers must be labelled to identify contents. Note that TDG regulations apply to transportation of waste and scrap materials on public roads, and they need to be handled accordingly.

4.16 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 metres.

If explosives are present, they must be stored in a locked cabinet or in a locked room when not being handled. The building and room with such explosives must have appropriate warning signs. If refrigerators are used for explosives, they must conform with the intent of EEMAC 4X requirements. (Consult ERD for appropriate modifications.)

An electrical heater must conform to EEMAC 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.

4.17 Clothes Washing/Laundry

Clothes that have been soiled with the constituents of normal bulk explosives such as oil or ammonium nitrate may be washed as any work industrial clothes. If the washer and dryer are located in a garage area, they must be installed 5 cm above the grade to meet hazardous electrical requirements.

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.

4.18 Electrical Requirements

A schematic for the electrical classification is given in Appendix A as a guide only. Specific situations should be addressed with ERD.

Typically, for garage/maintenance facilities, the classification of EEMAC 4X is appropriate. 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 EEMAC 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 EEMAC 4X standard for electrical enclosures (not weather resistant). Specific situations may warrant area Azone® 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 EEMAC 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, heavy duty 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 EEMAC 4 standard need not upgrade subject to the condition that EEMAC 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 EEMAC 4X.

4.18.1 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 one hour fire rated door with auto-closure, and a 5-cm raised curb along the wall, including a 5-cm sill across the door opening.

4.18.2 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. There must be a disconnect at the last pole.

4.18.3 GROUNDING

All equipment in explosives areas, including that equipped with internal combustion engines such as generators, must be grounded. Grounding through the plug is neither equivalent nor acceptable. Grounding cables must be connected directly to the equipment and to ground bars outside the building. Facilities must have ground fault interruption systems for all receptacles in the garage.

4.18.4 SEPARATE ROOMS FOR ELECTRICAL EQUIPMENT

When called for, a separate room may be required for other equipment not meeting the EEMAC 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 EEMAC 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 ERD, 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 with higher and lower electrical classifications, the separate room must be comprised of a one-hour (minimum) rated firewall, a one-hour (minimum) 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 ERD before proceeding with a detailed proposed design.

4.18.5 CONTROLS

All process controls must have operation and maintenance manuals. Controls should include the following: all wiring should be labelled and referenced to drawings; process controls should be located in EEMAC 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 breakers or fuses that reset manually. All buttons and switches should be labelled and all valves should be labelled and easy to access.

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

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

Small, portable internal combustion 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 fuelled before use away from explosives or oxidizers. Gasoline or propane powered equipment is not allowed inside an explosives building. Fire extinguishers must be located nearby.

4.20 Hydraulic Systems

Hydraulic lines and fittings should not leak. Lines must be protected with sleeves 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.

4.21 Pumps

Pumps (make, model and safety devices) used for pumping explosives or AN liquor must be approved by ERD. Companies should abide by the recommendations of the Pumping Guidelines (a copy of the Guidelines may be obtained from ERD). 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 as well.

Records may be requested during inspections by ERD 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.

4.21.1 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,
- NO packing glands,
- a solid rotor,
- oil-resistant stator and seals
- drive guard(s)
- at least two of the following pump safety shutdown systems, engineered to protect against no-flow pumping:
 - pressure trip,
 - flow switch,
 - temperature trip,
 - five-minute timer.

Bursting disks are not regarded as a safety shut-down system. A worn pump, when deadheaded, may not generate enough pressure to burst the disc fast enough. Burst disks will provide protection against initiation caused by adiabatic compression.

Thermofuses are encouraged, but may not protect against dry running.

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 5 cm 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 shut-down systems. A pump maintenance and testing program log must be available. Pumps for which the 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 competent technicians.

4.21.2 OTHER EMULSION OR WATERGEL 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 Guidelines for the Pumping of Water-Based Explosives issued by ERD.

4.22 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 in the product.

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

4.23 Heating and Furnaces

For all furnaces, no matter what type, a high temperature limiting control must be included in the heater and in the hot air duct between the heater and the area where explosives are present, in addition to the usual two thermostats in the area where explosives are present. If oil or gas is 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.

Oil-fired furnaces or boilers must be installed in separate rooms with a one-hour fire rating. The room must have no direct access from the building or part of the building that contains explosives. If this requirement cannot be met, then the unit must be located in a fire-resistant building sited at least 8 metres from the danger building. Guidelines for fuel storage are in section 4.5.3. The building that contains explosives must be protected by a fire damper activated by a fusible link or other safety device to close and seal the duct as near to the furnace as reasonable. The operation and installation of fired units must be covered by an operating procedure (see section 3.2.4).

Electrical heating must comply with the appropriate electrical requirements (see section 4.1.8). Electrical heating can be done in a number of different ways:

- A convection heater mounted horizontally or an electric air heater blower unit, commonly known as a unit heater;
- A heat exchanger outside the building that circulates a hot water/glycol solution into
 - unit heaters mounted in the building or
 - in-floor heating.

Any interior unit heaters must be mounted above any possible explosive materials (preferably at ceiling level) and must have mechanical protection and adequate standoff from combustible surfaces.

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 ERD or prior to the issuing of the licence.

Propane or natural gas-fired heaters will be dealt with on a case-by-case basis. One general precaution to note with propane is that it is heavier than air, so a leak will accumulate in low lying areas, e.g., sumps, and pose a vapour phase explosion risk there.

4.24 Mobile Process Units (MPU's), including units for ANFO Mixing

A separate guideline has been written for Mobile Process Units:

- "Requirements for Bulk Mobile Process Units", which is available free of charge, electronically.

Mobile Process Units must be readily identified with the company name and unit number. MPU's must meet both federal and provincial requirements. Provincial workplace safety requirements cover user safety, including ladders and guardrails, the guarding of rotating equipment, and pinch points. The Canadian Motor Vehicle Safety Standards cover the running gear of the vehicle, including brakes, tires, general roadworthiness, and daily vehicle checks. ERD requires all MPU's to meet all appropriate aspects of the CMVSS and B620 tank requirements regardless of where the unit will be used (on public or on private roads, such as mine sites).

All MPU's are expected to meet TDG standards for construction and placarding, even on closed and gated sites. All new MPU's coming into service must meet TDG large means of containment standards and placarding, even on closed and gated sites (e.g., mines).

Mobile Process Units must meet the F05-01B description submitted for them during authorization at all times.

Provided that the number of MPU's at a licensed site does not exceed the number specified on the license and the MPU location list is updated, they may be moved from site to site without amending the site licences.

4.24.1 HATCH ON EXPLOSIVES TANK

All hatches, discharge valves and outlets must be lockable and must be locked when not attended or when on public roads. When on mine or quarry roads and attended, this is not required. 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.

4.24.2 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 2 000 000 Ω resistance over its entire length and of not less than 1000 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.

4.24.3 LOADING OF MOBILE PROCESS UNITS

4.24.3.1 Reloading of Mobile Process Units

This will be allowed at a satellite site meeting Q-D requirements and located at a minimum D4 from the customer site.

4.24.3.2 *Reloading of Mobile Process Units With AN*

Provided the Q-D 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 AN behaves as explosive.

4.24.3.3 *Loading ANFO Process Units at Rail Sidings*

Note that this section does not apply to mobile process units handling bulk water-based explosives.

ANFO mobile process units 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 must reference the designated factory licence or satellite site to which the MPU is attached.
- Only sites approved by the rail carrier may be used, and written permission of the rail carrier must be provided to ERD, 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 mobile process unit may be at the site (defined as within 100 metres of the rail car being unloaded) at any time. The MPU 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 metres 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.

4.25 Forklifts and Pallet Movers

4.25.1 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.

4.25.1.1 *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

4.25.2 DIESEL FORKLIFTS

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

Type D forklifts may only be used outside B 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.

4.25.2.1 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.

4.25.2.2 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.

4.25.2.3 Operations

The forklift or pallet mover is not to be stored in the building or room where explosives are being handled. Refuelling 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.

4.25.3 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 -
Electrical Schematic**

GARAGE

CEILING /LIGHTING:	EEMAC 4X
Assumes no hazardous vapours or dusts.	
MAIN GARAGE AREA:	EEMAC 4X
<ul style="list-style-type: none"> - MCC preferred outside garage. - All receptacles EEMAC 4X; auto spring close flaps when unplugged. - Trouble lights; heavy duty cabtire cord, no switch at bulb. - Ground fault required for all receptacles. - Bldg. grounding required. 	
	EEMAC 1
<ul style="list-style-type: none"> - Poly coated flexible armoured cable wiring. - Bury cable last 15 m with disconnect at last pole. 	
<ul style="list-style-type: none"> - Separate room for wash systems, compressor, etc. - 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: Class 1, Zone 1 (new) OR Class 1, Division 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: EEMAC 4X TEFC MOTORS
<ul style="list-style-type: none"> - As above for garages with exception of no MCC panel(s) permitted unless enclosed in 1-hr. fire rated separate room. - Hazardous AZones® may need to be established. Consult ERD HQ for guidance. - Bury cable last 15 m with disconnect at last pole.
FLOOR AREA: Up to 5 cm; or Class 1, Zone 2 (new) or Class 1, Division 2 (old).
SUMP AREA: Class 1, Zone 1 (new) OR Class 1, Division 1 (old)

Refer to section 4.16 for the electrical requirements for laboratories.

Appendix B - Risk Assessment and Q-D Derogation

Q-D is a very reliable safeguard against the consequences of an unplanned explosion. Allowing operations closer than normal Q-D distances to members of the public increases their risk of injury from an unplanned explosion. One of ERD's primary duties is to protect the public from the hazards of explosives. ERD must, therefore, be extremely careful before sanctioning anything that will increase the risk to the public who receive no benefit in exchange. Ideally, ERD would like to be convinced that the proposed process with Q-D 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-Q-D 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 this depends upon safety systems, operating procedures, and the condition of mobile process units.

A comparative risk assessment could be carried out between the use of packaged product (that requires no Q-D derogation) and bulk product that, because of quantities, would be inside Q-D 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 ERD 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 ERD in line with published risk data. (A more severe target is then chosen by the company for all jobs where they would apply for Q-D derogation.) When applying for derogation from normal Q-D, 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 Q-D 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 (PE1 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 will supply data of the traffic by day and by hour. This information is used to prove to ERD that the public risk from operations at the site meet the risk target the company had already agreed upon with ERD. This step of a quantified risk assessment is sometimes called a consequence analysis. ERD then decides the merits of the argument and whether or not to grant the privilege of derogation.

At each step in the process, ERD 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 Q-D rules has been granted, the work will still have to meet all the terms and conditions Section 99 of the *Explosives Regulations, 2013* except for distances to the general public. Most risk assessments of the likelihood of mobile process unit 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.

Appendix C -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	Factory with washbay	Factory with temporary structures	Satellite Site	Certificate for Blending of ANFO	Satellite site for Demonstrations	Permission - Trial
Prerequisite	Competence in explosives	Factory with washbay, proof of temporary nature	Factory with washbay up to 800 km	For use within the owner quarry/mine	Factory with washbay, proof of demonstration	Factory with washbay
Document Issued	Licence	Licence	Satellite certificate	Certificate for Blending of ANFO	Satellite certificate	Letter of permission
Customer Sites	Any number, up to 450 km, Description of day for distance of 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	Single renewal; 2 years maximum	Monthly; 1 month to base factory expiry period	Annual renewal	Two months maximum	6 months
Environment	EA and Spill Contingency Plan	Possible EA, Spill Contingency Plan	Spill Contingency Plan	Spill Contingency Plan	Spill Contingency Plan	Factory with washbay must have EA and Spill Contingency Plan

Requirements	Factory with washbay	Factory with temporary structures	Satellite Site	Certificate for Blending of ANFO	Satellite site for Demonstrations	Permission - Trial
Allowed Process	As per licence	Bulk delivery as per licence	Storing of a process vehicle, storing of bulk explosive and/or raw materials, transferring of explosive or raw materials	Blend ANFO at borehole	Bulk delivery as per licence	As per agreement
Explosives	As per licence	Processing, PE1 storage as per licence	PE1	ANFO PE1	PE1	As per agreement
Mobile Process Units (MPU)	As per licence and location list	As per licence and location list	2 MPU's as per location list ANFO MPU	1 MPU	As per agreement	
Buildings	As per licence	As per licence	As per licence			
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

Requirements	Factory with washbay	Factory with temporary structures	Satellite Site	Certificate for Blending of ANFO	Satellite site for Demonstrations	Permission - Trial
Wash Facilities	Permanent required, heated for winter, sites within 250 km of another factory site with washbay might have this requirement waived.	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
Processing Time	New: 60 days Amendments / renewals: 30 days	30 days	30 days	30 days	30 days	30 days

Appendix D - Storage of Large Quantities of Ammonium Nitrate

When ammonium nitrate is not stored at the required distance from explosives, then ERD considers that half the total weight of the ammonium nitrate is explosive for the purpose of assessing distances to vulnerable locations (Q-D). Table 5-9 in ERD's Quantity-Distance manual gives the distance that AN must be from explosives in order to be considered non-explosive for Q-D assessment purposes. This distance depends on the quantity of explosive and whether there is an effective barricade (defined in the manual based on the quantity of explosive) between the explosive and the AN. The quantity of AN stored at a site is usually less than 100 tonnes; amounts of AN larger than 100 tonnes will be regarded as large quantities and are subject to this Appendix.

There are situations where, particularly in remote locations, a large quantity of AN must be shipped in and stored. The storage of large quantities of AN is not without attendant hazards and risks, especially at remote locations such as mine sites or northern communities where emergency response or evacuation may be complicated by the location and elements.

As has been mentioned, environmental assessments (EA) are required in order to issue an explosives factory licence. Among other things, an EA looks at Emergency Response Plans and an estimate of the effects of a worst-case scenario, i.e., spill, fire, explosion. The location of a large AN storage facility would certainly be considered during the EA process.

Based upon well-documented catastrophic incidents involving large stockpiles of AN, most recently at Toulouse in France, ERD recommends that AN storage and explosives operations be situated according to:

1. The normal explosive plant quantity safety distance requirements, as per ERD's Q-D Principles manual, from locations where explosives may be found to the airport, camp, mill, roads, pits, mine operations and AN storage facilities; and
2. Quantity-distance requirements based upon 50% of the peak storage capacity of AN quantity and a scale factor of 9.6 (corresponding to a distance between D4 and D5) to calculate the separation distances from the AN storage location to the airport, mill and camp areas

The 9.6 scale factor was chosen based upon:

- The type of damage typically found at these distances would limit damage and injuries to people, buildings and the airport;
- The fact that AN does not normally behave as an explosive;
- The separation distances are calculated using the estimated peak stock levels attained for only a few months during the year during reception of AN on winter roads.

Example: Assuming the net equivalent explosive quantity to be one-half of the total AN of 10 000 000 kg, or 5 000 000 kg, a 1640-metre³ separation affords safety distance protection equivalent to between D4 and D5, or blast over pressure values of between 3.15 psi and 1.35 psi, respectively, from an explosive event at a 10 000 000-kg AN storage facility.

³ Safety distance [metres] = scale factor x (net explosive quantity kg).^{1/3}

In addition to the above, ERD recommends that:

1. Community and/or mine site emergency response and evacuation procedures be developed to ensure that they adequately cover fire and/or explosive events at a bulk AN storage facility;
2. The design of the AN storage and handling facilities and equipment include all reasonable means to prevent and control fire, and that local authorities review and approve the design and construction of the building and its equipment (see references below);
3. If totes are to be used, then limit the amount of AN stored in any one pile or area, e.g., 200 tonnes: subdivide or split the AN tote bag storage into several areas separated by 10 metres or so, and also, to further separate the stocks in these 200-tonne piles by using 1- to 1.5-metre aisles between say each 50-tonne pile or area.

The following are useful references:

- NFPA Standard 400 (Hazardous Materials Code, 2010 Edition);
- Chapter 1145 of the Canada Transportation Act: Ammonium Nitrate Storage Facilities Regulations – Regulations respecting the design, location, construction operation and maintenance of storage facilities for ammonium nitrate and ammonium nitrate mixed fertilizers. [It is available from the Justice web site (<http://laws.justice.gc.ca/eng/>) in .pdf format].
- Good Practice Guide: Storage of Solid Technical Grade Ammonium Nitrate (SAFEX Good Explosives Practice Series, GPG 02 rev01, SAFEX International)

Some important considerations noted in these references:

- Storage buildings should be of non-combustible construction;
- There should be no hollow equipment, drains, cavities, etc., where molten AN could collect;
- There should be adequate ventilation systems or means to deal with the gases produced by ammonium nitrate in a fire;
- Large storage facilities should preferably be sprinklered.