



Natural Resources  
Canada

Ressources naturelles  
Canada

# Guidelines for Bulk Explosives Facilities

## Minimum Requirements

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

July 2010  
Revision 5.1

Canada

# Table of Contents

<b>1. INTRODUCTION</b> .....	1
<b>1.1 Purpose</b> .....	1
<b>1.2 Intent</b> .....	1
<b>1.3 Other Documents</b> .....	2
<b>1.4 Using the Guidelines</b> .....	2
<b>2. SCOPE, LIMITATIONS, DEFINITIONS AND GENERAL BACKGROUND INFORMATION</b> .....	4
<b>2.1 Scope</b> .....	4
<b>2.2 Grandfathering</b> .....	5
<b>2.3 Definitions and Limitations</b> .....	6
2.3.1 PROCESS VEHICLE/PROCESS UNIT.....	6
ANFO Pneumatic Delivery Systems .....	6
2.3.2 BASE FACTORY .....	7
2.3.2.1 FACTORY WITHOUT A WASH BAY .....	7
2.3.3 TEMPORARY FACTORY SITES (LICENCE).....	7
2.3.4 MECHANICAL ANFO CERTIFICATES .....	8
Non-Mechanical ANFO Certificates (Permissions) .....	8
2.3.5 SATELLITE SITES (CERTIFICATES).....	9
Active and Inactive Satellite Sites .....	9
2.3.6 DEMONSTRATIONS (CERTIFICATE) .....	10
2.3.7 CUSTOMER SITES AND DISTANCES (BASE FACTORIES OR SATELLITE SITES) .....	10
2.3.8 TRIALS (PERMISSIONS).....	10

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

2.3.9	AUTHORIZED PRODUCTS .....	10
2.3.10	HEEL .....	11
2.3.11	CLEAN .....	11
2.3.12	DECONTAMINATED .....	11
2.3.13	OCCASIONAL AND TEMPORARY .....	11
<b>2.4</b>	<b>General Background Information .....</b>	<b>12</b>
2.4.1	DISPOSAL OF SCRAP .....	12
2.4.2	Q-D, D2, D4, D5, D7 .....	12
2.4.3	RISK ASSESSMENT .....	13
2.4.4	AMMONIUM NITRATE (AN) .....	13
2.4.5	MAGAZINES .....	14
2.4.6	PERSONNEL LIMITS .....	14
2.4.7	FIRE WITH EXPLOSIVES AND AMMONIUM NITRATE .....	14
2.4.8	ENVIRONMENTAL ASSESSMENT (EA) .....	15
<b>3.</b>	<b>DOCUMENTATION, FEES AND PROCESSING TIME .....</b>	<b>17</b>
<b>3.1</b>	<b>Forms, Fire Permissions and Environmental Assessment .....</b>	<b>17</b>
3.1.1	PLANS, LICENCE OR CERTIFICATE FORMS .....	17
3.1.1.1	Plans and Drawings .....	17
3.1.1.2	Form 1 .....	18
3.1.1.3	Forms 2 and 3 .....	19
3.1.1.4	Form 4: Plant, Buildings and Equipment .....	19
3.1.1.5	Form 5: Authorized Explosives Manufacture and Storage .....	21
3.1.1.6	Form 6: Authorized Operations and Processes .....	22
3.1.1.7	Form 7: Distances to be Maintained Between the Buildings and Process Units of the Site(s) and Other Buildings and Works Outside the Site or Operations .....	23

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

3.1.2	FIRE PERMISSIONS (SMOKING, MATCHES, LIGHTERS, WELDING [INCLUDING ELECTRIC]) .....	23
3.1.3	ENVIRONMENTAL ASSESSMENT AND SPILL CONTINGENCIES .....	23
<b>3.2</b>	<b>Supporting Documentation</b> .....	<b>24</b>
3.2.1	GENERAL SAFETY RULES .....	24
3.2.2	INSPECTIONS AND AUDITS .....	25
3.2.3	TRAINING .....	25
3.2.4	PROCEDURES.....	26
3.2.4.1	Operating Procedures.....	26
3.2.4.2	Decontamination Procedures .....	26
3.2.4.3	List of Permitted Maintenance Tasks.....	27
3.2.4.4	Explosives Disposal and Burning Ground.....	27
3.2.4.5	Emergency Response .....	27
3.2.4.6	Control of Changes .....	27
3.2.4.7	Maintenance Procedures .....	27
3.2.4.8	Miscellaneous Safety Procedures.....	28
3.2.5	MEMORANDUM OF UNDERSTANDING .....	28
<b>3.3</b>	<b>Fee Structure</b> .....	<b>28</b>
<b>3.4</b>	<b>Processing Time</b> .....	<b>28</b>
<b>4.</b>	<b>SITES, FACILITIES AND EQUIPMENT</b> .....	<b>29</b>
<b>4.1</b>	<b>Licence or Certificate Site</b> .....	<b>29</b>
4.1.1	LOCATION.....	29
4.1.2	CONTROLLING ACCESS TO THE SITE (FENCING, OTHER BARRIERS).....	30
4.1.3	CONTROL OF FIRE-PRODUCING DEVICES .....	31
4.1.4	STORAGE AND CONTROL OF RAW MATERIALS.....	31
4.1.5	SERVICES AND TOOLS.....	31

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

4.1.6	HEATED WASHING FACILITIES.....	31
4.1.7	CODES.....	31
4.1.8	OTHER .....	33
<b>4.2</b>	<b>Buildings in General .....</b>	<b>33</b>
4.2.1	CONSTRUCTION .....	33
4.2.2	BARRICADES .....	35
4.2.3	USE OF BRASS AND COPPER.....	35
<b>4.3</b>	<b>Parking Areas.....</b>	<b>36</b>
4.3.1	LOCATION.....	36
4.3.1.1	Parking of ANFO Process Units at Customer Sites.....	36
4.3.1.2	Parking at Isolated Areas .....	36
4.3.2	NUMBER OF UNITS AND EXPLOSIVES QUANTITY .....	36
<b>4.4</b>	<b>Tankers, Tanks or Silos for Pumpable Explosives .....</b>	<b>37</b>
4.4.1	LOCATION.....	37
4.4.2	INSTALLATION.....	37
4.4.3	CONSTRUCTION .....	37
4.4.4	SECURITY .....	38
<b>4.5</b>	<b>Combustible Liquids.....</b>	<b>39</b>
4.5.1	STORAGE FOR FUELLING OR TRANSFER TO PROCESS VEHICLES .....	39
4.5.2	COMBUSTIBLE LIQUID AS PROCESS RAW MATERIAL FEED.....	39
4.5.3	COMBUSTIBLE LIQUID AS FUEL FEED TO EQUIPMENT.....	40
4.5.4	DYKING .....	40
4.5.5	USE OF WASTE OIL.....	41

**Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

**4.6 Explosive Fuel Phase**.....42

**4.7 Flammable Liquids** .....42

**4.8 Ammonium Nitrate Prill Storage and Handling**.....42

    4.8.1 LOCATION.....42

    4.8.2 HANDLING OF AN.....44

    4.8.3 STORAGE OF BULK AN.....44

        4.8.3.1 Road Trailers, Tankers, Railcars.....45

        4.8.3.2 Silos .....45

        4.8.3.3 Shipping Containers.....45

        4.8.3.4 Buildings or Warehouses .....45

    4.8.4 STORAGE OF AN IN TOTE BAGS OR 25-KG BAGS .....46

    4.8.5 SECURITY.....46

**4.9 Ammonium Nitrate Solution**.....46

**4.10 Washing Facilities** .....47

    4.10.1 LOCATION.....47

        4.10.1.1 Combined Washing/Maintenance Facility.....47

        4.10.1.2 Separate Washing Facility, ANFO Trucks, Mobile Base .....48

        4.10.1.3 Separate Maintenance Facility .....48

        4.10.1.4 Washing/Maintenance With Explosives Storage.....48

        4.10.1.5 Mechanical ANFO Certificate .....48

    4.10.2 OTHER .....48

**4.11 Washing System** .....49

    4.11.1 LOCATION.....49

        4.11.1.1 Fuel-Fired Wash System.....49

        4.11.1.2 Electric Wash System, Other Than CEMA 4X.....49

        4.11.1.3 Electric Wash System, CEMA 4 or 4X.....49

    4.11.2 REQUIREMENTS FOR THE SEPARATE ROOM.....50

    4.11.3 PERFORMANCE .....50

    4.11.4 WASTE WATER AND SCRAP.....50

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

<b>4.12 Lunchroom and Welfare</b> .....	51
4.12.1 LOCATION.....	51
<b>4.13 Office</b> .....	51
4.13.1 LOCATION.....	51
<b>4.14 Other Storage - Inert Material, Chemical and Contaminated Parts</b> .....	51
4.14.1 LOCATION.....	51
4.14.2 CHEMICALS .....	52
4.14.3 CONTAMINATED PARTS.....	52
Connecting Hoses.....	52
4.14.4 WASTE AND SCRAP.....	53
<b>4.15 Laboratory</b> .....	53
<b>4.16 Clothes Washing/Laundry</b> .....	53
<b>4.17 Electrical Requirements</b> .....	54
4.17.1 ELECTRICAL ROOM - MOTOR CONTROL CENTRE (MCC).....	54
4.17.2 POWER SUPPLY .....	55
4.17.3 GROUNDING .....	55
4.17.4 SEPARATE ROOMS FOR ELECTRICAL EQUIPMENT .....	55
4.17.5 CONTROLS .....	56
<b>4.18 Equipment Powered by Internal Combustion Engine (Generators and Compressors)</b> .....	56

**Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

**4.19 Hydraulic Systems** .....56

**4.20 Pumps**.....57

    4.20.1 PROGRESSIVE CAVITY PUMP (FIXED AND MOBILE LOCATIONS) .....57

    4.20.2 OTHER EMULSION OR WATERGEL PUMPS.....58

**4.21 Augers** .....58

**4.22 Heating and Furnaces**.....58

**4.23 Process Vehicles (Portable Process Units, ANFO Mix Vehicles or Pneumatic Delivery Systems)** .....59

    4.23.1 FIRE EXTINGUISHERS ..... 60

    4.23.2 ELECTRICALS .....60

        4.23.2.1 Wiring .....60

            4.23.2.1.1 Class 2 Circuits.....61

    4.23.3 FUEL TANKS AND LINES .....61

    4.23.4 BRAKES AND STEERING.....61

    4.23.5 TIRES .....61

    4.23.6 EXHAUST .....62

    4.23.7 COMPRESSORS .....62

    4.23.8 MOBILE PROCESS VEHICLE EMULSION TANK.....62

        4.23.8.1 Hatch on Emulsion Tank .....64

    4.23.9 AMMONIUM NITRATE BIN .....64

    4.23.10 PROCESS FUEL OIL TANK.....64

        4.23.10.1 Venting.....65

    4.23.11 GASSING SOLUTION TANK.....65

    4.23.12 ALUMINUM BIN .....65

**Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

4.23.13 DELIVERY HOSE REEL.....65

4.23.14 AN PNEUMATIC DELIVERY SYSTEMS, AN BLOW LOADERS, POGS.....65

    4.23.14.1 Pneumatic Hoses for Delivery of ANFO .....66

4.23.15 LOADING OF PROCESS UNITS.....66

    4.23.15.1 Reloading of Process Units.....66

    4.23.15.2 Reloading of Process Units With AN.....66

    4.23.15.3 Loading ANFO Process Units at Rail Sidings.....66

**4.24 Forklifts and Pallet Movers.....67**

4.24.1 ELECTRICAL FORKLIFTS AND PALLET MOVERS .....67

    4.24.1.1 Charging.....67

4.24.2 DIESEL FORKLIFTS.....67

    4.24.2.1 Fire Extinguishers .....68

    4.24.2.2 Electricals and Venting.....68

    4.24.2.3 Operations.....68

4.24.3 PROPANE FORKLIFTS .....68

**APPENDIX A - ADDITIONAL TERMS .....69**

**APPENDIX B - ELECTRICAL SCHEMATIC.....74**

**APPENDIX C - RISK ASSESSMENT AND Q-D DEROGATION.....75**

**APPENDIX D -TABLE OF OPTIONS.....77**

**APPENDIX E - STORAGE OF LARGE QUANTITIES OF AMMONIUM NITRATE .....79**

## **1. INTRODUCTION**

### **1.1 Purpose**

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

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

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

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

### **1.2 Intent**

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

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

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

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

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

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

### **1.3 Other Documents**

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

- *Explosives Act* and Regulations
- Documents issued by and obtainable from the Explosives Regulatory Division (ERD):
  - Guidelines for the Pumping of Water-Based Explosives* (Pumping Guidelines)
  - Storage Standards for Industrial Explosives* (Magazine Standards)
  - Quantity-Distance Principles
  - Explosives Branch Process Vehicle Inspection Check List
  - Process Vehicle, Guide for Licensing Using Form 4
  - Guideline for Completion of Factory/Manufacturing Application
  - ERD Bulletins, issued as required
- National Building Code of Canada (to be used as a guide to permit conformance with good engineering practice)
- Canadian Electrical Code
- National Fire Code of Canada
- *Transportation of Dangerous Goods Act* and Regulations
- *Canadian Environmental Assessment Act*
- Provincial labour and/or safety acts and regulations
- Municipal by-laws and ordinances

### **1.4 Using the Guidelines**

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

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

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### THE LICENCE

Forms 1 (including the reverse side or Annex), 4, 5, 6 and 7 and the Site Plan are the basis for approving an application. The forms and site plan describe the site, facilities, equipment, and operations. The forms and site plan are approved if they and their content meet the requirements of the guidelines. Likewise, any exception to the guidelines on which there was agreement must be recorded in these forms. Authorized process vehicles 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, for procedures and documents available and content thereof, described under Documentation, Section 3. Once the procedures have been found to meet the criteria, as a term and condition of the licence, a company must implement them and ensure they are being followed. Procedures and documentation must be in place before a licence will be issued.

### ADDITIONAL TERMS OF THE LICENCE OR CERTIFICATE

Certain conditions are set on the operation of bulk vehicles. These are described in Appendix A and are issued as additional terms and conditions of the licence or certificate (Form 6R).

## **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. In any of these cases, proof may be requested.

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

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

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

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

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

This guideline is for bulk explosive operations that are located on the surface (vs. underground). If a party wishes to obtain a licence/certificate for manufacture underground, it will have to be considered on a case-by-case basis, bearing in mind that there are many provincial/territorial requirements for underground workings. An applicant would have to present a strong case showing how persons not directly associated with the explosive manufacture would not be put at risk.

If an operation is to be located on Aboriginal land or may have an impact on Aboriginal treaty rights, consultations with affected parties may be necessary before a licence or certificate can be issued.

## **2.2 Grandfathering**

All new sites must comply with these minimum requirements or the company may exceed them if deemed of value. There are situations in existing licensed locations that would not meet current requirements, but they 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<sup>1</sup> change in the facility.

---

<sup>1</sup> "Significant" 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.

## **2.3 Definitions and Limitations**

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

### **2.3.1 PROCESS VEHICLE/PROCESS UNIT**

The definitions in the Regulations are as follows:

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

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

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

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

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

#### *ANFO Pneumatic Delivery Systems*

Pneumatic delivery systems used for cartridge explosives and those used for ANFO, with a carrying capacity of less than 100 kg, such as blast hole chargers, ANOLOADERS, etc., are not subject to these guidelines. All others, including POG,<sup>2</sup> are considered to be process vehicles and are regulated as such.

---

<sup>2</sup> POG is an acronym for the name of the person who developed the use of this equipment. It is a pressurized blow case commonly used underground.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### 2.3.2 BASE FACTORY

The base factory is a licensed factory and the base of operations, with all the facilities necessary to clean, decontaminate and repair vehicles; it may support factories without a washbay, satellite sites, customer sites and temporary factories, and trials and demonstrations may be conducted from it.

#### 2.3.2.1 FACTORY WITHOUT A WASH BAY

A factory without a wash bay is a licenced factory close enough to a base factory to be able to function without a wash bay. It may support customer sites, and trials and demonstrations may be conducted from it. It should be within 250 km from a base factory with a wash bay. The distance to any customer still has to meet the 450 km distance requirement from the base factory.

A maximum of two process vehicles are allowed. The maximum amounts of AN and emulsion allowed on the site are subject to Q-D limitations. Fuel storage must meet provincial requirements.

The following operations are allowed at a factory without a wash bay: storing of process vehicles, storing of explosives (bulk and non-bulk), storing of raw materials, transferring of explosives and raw materials. Factories without a wash bay may be used for ANFO bagging, emulsion manufacturing and cartridging of emulsion to produce product for sale. Similar to satellite sites, the operations allowed at customer sites are as follows: approved chemical gassing as required, doping with AN or ANFO, and discharge with or without mixing or blending into a borehole.

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

#### 2.3.3 TEMPORARY FACTORY SITES (LICENCE)

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

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

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

preliminary decontamination at the temporary factory. Preliminary decontamination means the removal of all visible explosives from the vehicle. Piping and equipment do not necessarily need to be dismantled.

Whether an EA is required will depend on the nature of the facilities. Contact ERD early in the project development to determine when an EA is needed.

Certain privileges, such as fire permissions, of the base factory are not applicable to the temporary site. Multiple customers may be served from a temporary factory if all the customers are associated with one project.

### 2.3.4 MECHANICAL ANFO CERTIFICATES

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

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

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

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

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

#### *Non-Mechanical ANFO Certificates (Permissions)*

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

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

ANFO Certificates, but they can provide useful information.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### 2.3.5 SATELLITE SITES (CERTIFICATES)

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

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

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

Only the following operations are allowed: at the satellite site – storing of a process vehicle, storing of bulk explosive and/or raw materials, transferring of explosive or raw material; and at the customer site – approved chemical gassing as required, doping with AN or ANFO, and discharge (with or without mixing/blending) into a borehole. Transfer sites are to be licensed as satellite sites.

The base factory and the satellite site cannot be separated by a body of water other than that which can be crossed by bridges permitting the transport of explosives or by the use of barges or boats chartered specifically to move explosives.

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

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

#### *Active and Inactive Satellite Sites*

An active satellite site meets the above requirements; fees are paid on a monthly basis.

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

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

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### 2.3.6 DEMONSTRATIONS (CERTIFICATE)

Demonstrations are trials at new customer locations with existing technology and products. These are allowed at satellite sites whose maximum duration is two months, but where the distance requirement from a base site is waived. The same limitations apply as in the case of the satellite site, except those regarding distances form the basis for approval. Unique requirements, differing from the satellite site limitations, will be considered on a case-by-case basis.

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

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

### 2.3.7 CUSTOMER SITES AND DISTANCES (BASE FACTORIES OR SATELLITES SITES)

Customer sites are sites serviced by a vehicle either from a base factory or from a satellite site. Customer sites must be no further than 450 km from a base factory or 200 km from a satellite site.

For sites located further than 300 km from a base factory, companies must submit a description of the working day (load, drive, unload, drive) showing how they will abide by the 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 customer site and the base 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.

### 2.3.8 TRIALS (PERMISSIONS)

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

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

Trials will only be allowed from existing licensed factories.

### 2.3.9 AUTHORIZED PRODUCTS

Authorized products are those that appear on the *List of Authorized Explosives*. Only authorized products (with very limited exceptions, see Trials above) may be manufactured, stored,

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

transported, possessed, or used. The authorization process comprises the following steps: submission of drawings and specifications, review by ERD, decision on sampling by ERD, testing by the CANMET Canadian Explosives Research Laboratory (CERL) if required, review of testing results by ERD, and decision on authorizing and issuing the transport classification.

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

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

### 2.3.10 HEEL

“Heel” refers to the quantity of explosive product or raw material left in the vehicle that cannot be removed by pumping or augering (note that running a pump dry must be avoided). When citing the quantity of explosive remaining on a process vehicle stored, the quantity of “heel” allowed cannot be greater than 250 kg (NEQ). All vehicles must be able to off-load unused explosives. In the case of vehicles from which AN cannot be unloaded without being contaminated, the quantity remaining must be allowed for on the licence and secure storage must be provided.

### 2.3.11 CLEAN

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

### 2.3.12 DECONTAMINATED

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

### 2.3.13 OCCASIONAL AND TEMPORARY

Certificates might be issued for sites that are occasional and temporary. “Occasional” is a site that is not in operation frequently, or now and again, not constantly, e.g., a site that is used no more than 2 days per week or no more than 20 days per year. “Temporary” 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, or is so occasional (less than 10 days per year) that operation could be considered as restarting anew each time.

### **2.4 General Background Information**

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

#### **2.4.1 DISPOSAL OF SCRAP**

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

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

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

#### **2.4.2 Q-D, D2, D4, D5, D7**

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

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

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### 2.4.3 RISK ASSESSMENT

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

- What can go wrong?
- What are the consequences and effects, and are these acceptable?
- Are the safeguards and controls adequate to render the risk acceptable?

Quantified risk assessment answers the following additional questions:

- How often might it go wrong?
- What are the chances that the consequences will materialize?
- How dependable are the safeguards and controls that protect against the risk?

A well-prepared risk analysis may be needed to support arguments for 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. This often occurs when the licensee is constrained by a location.

The other circumstance in which risk analysis is undertaken involves new operations involving the delivery of bulk explosives. One of the most effective safeguards or controls against explosive risks is the Quantity-Distance principle. Q-D takes no account of how often things might go wrong, but is a control working 100% of the time, protecting as far as reasonably possible against the consequences of an explosion during manufacturing processes or the storage of explosives. See Appendix C for a discussion of risk assessment-based derogation from Q-D requirements for bulk delivery.

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

### 2.4.4 AMMONIUM NITRATE (AN)

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

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

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### *Transport*

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

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

### 2.4.5 MAGAZINES

This information pertains to any limitations or restrictions on magazines at bulk explosives sites. Information on magazine standards can be found in the previously cited *Storage 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. If this is the case, the information on the magazines, including licence number, is supplied on Forms 4 and 7, but not on Form 6.

#### *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.

### 2.4.6 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.

### 2.4.7 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. In recent years there have been as many, if not more, such explosions that involved ammonium nitrate, often in 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.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### 2.4.8 ENVIRONMENTAL ASSESSMENT (EA)

Under the *Canadian Environmental Assessment Act* (CEAA), an environmental assessment (EA) is required if a federal authority exercises one of **several** functions in relation to a project, **one of which is** “Exercises regulatory duty in relation to a project, such as issuing a permit or licence, that is included in the Law List prescribed in CEAA regulations.” The Law List cites the *Explosives Act* Section 7(1)(a) licences for manufacture or storage. Therefore, before ERD issues a licence, it must first consider whether an EA is required and, in order to do that, needs to decide whether there is a project.

A project can be either:

- An undertaking in relation to physical work, such as any proposed construction, operation, modification, decommissioning, abandonment or other undertaking; or
- Any proposed physical activity not relating to a physical work that is listed in the CEAA Regulations.

In order for something to qualify as a physical work, two conditions must be satisfied:

- It is a physical thing, which has, or will have, a fixed location; and
- It is, or will be, constructed.

The typical bulk explosives factory qualifies as a project under the CEAA.

Given the above, if it is determined that there is a project, but the project is on the Exclusion List, then an EA is not required. The Exclusion List applies to ERD as follows:

#### *Exclusion List (Insignificant Physical Works)*

1. Proposed maintenance or repair of existing physical work.
2. Proposed operation of an existing physical work that is the same as an operation for which an EA has previously been conducted and where the environmental effects were determined to be insignificant, taking into account mitigation measures, and the mitigation measures have been implemented. (This allows one company to take over a factory that belonged to another without doing an EA, provided the conditions are met.)
3. Proposed construction or installation of a building with a footprint (area of land occupied by a building or structure at ground level) of less than 100 m<sup>2</sup> and a height of less than 5 m that would not:
  - (a) be carried out within 30 m of a water body; and
  - (b) involve the likely release of a polluting substance into the water body.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

3.1 Proposed construction or installation of a building with a footprint (area of land occupied by a building or structure at ground level) of less than 25 m<sup>2</sup> that would not:

- (c) be carried out within 30 m of a water body; and
- (d) involve the likely release of a polluting substance into the water.

The typical bulk explosives factory will have at least one structure that has a footprint that exceeds 100 m<sup>2</sup> and thus cannot be excluded under the CEEA.

The above Exclusion List means that an EA is not required for the renewal of licences for which the EA requirement has been assessed and addressed. If a modification to the existing factory licence is being considered, then it would have to be examined as to whether it met Exclusion List criteria and, if not, an EA would be needed.

When a proponent has made ERD aware of a new factory licence or a factory licence that is being modified and requires an EA, ERD sends a letter to the proponent outlining the information that the proponent must supply in order to conduct the EA.

When the information has been submitted, the information regarding the project must be posted on the Canadian Environmental Assessment Registry, publicly available, for at least 14 days before the project can be approved. A licence may not be issued until the EA has been approved by the Chief Inspector of Explosives. Approval of an EA does not guarantee that a licence application will be approved.

There are a number of large projects, typically large mines, dams, etc., that undergo Comprehensive Study or Panel Review EA involving several agencies. If an explosives factory has been declared to be part of the project, then it would have been included in the EA and it would not be necessary to do a separate EA for the explosives factory. ERD would not be allowed to issue a licence pertaining to this project until the EA for the whole project had been completed.

When an explosives factory has been approved as part of a larger project EA, the description of the factory (location, layout, etc.) proposed by the proponent must be adhered to by the company applying for an explosives factory licence. If the proposal cannot be adhered to, then the project proponent must approach the EA Responsible Agency to obtain approval for the change.

### **3. DOCUMENTATION, FEES AND PROCESSING TIME**

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

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

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

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

#### **3.1 Forms, Fire Permissions and Environmental Assessment**

##### **3.1.1 PLANS, LICENCE OR CERTIFICATE FORMS**

The plans, licence and certificate forms describe the operation. Once approved, they become part of the conditions for the legal operation of a site, and the approval is based on meeting the requirements of these guidelines. However, situations can occur where approval may be granted even when a certain requirement is not met. The best way to accomplish this is to declare the deviation/non-conformance to the guideline as per article 7 in the header of Form 4, “For bulk and satellite sites, any deviation from the current ERD Standard for Bulk Explosives must be described here.” There is a similar statement on Form 6. When a deviation has been approved by a letter, this must then be recorded on the appropriate form (4, 5, 6 or 7); 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 1 must be dated with revision numbers.

##### *3.1.1.1 Plans and Drawings*

Several types of plans or drawings are listed on Form 1. These are Area Plan, Site Plan, Building Layout, Process Schematics and Process Flow Sheets, and Piping and Instrumentation. The area and site plans are the two that can be considered mandatory.

Each type of plan should be supplied with at least two copies, unless submitted electronically.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

Engineering drawings to scale, with the scale indicated on the drawings, are preferred. The drawings should carry a standard scale since copy reduction may occur. Small and simple sites (less than 10 items on the plan) can be described by a sketch. All drawings or sketches must be identified with a title, revision number, and applicable date.

The area plan is to 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 metres.

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, and should include a proper legend. When applicable, layout sketches or plans should show emergency exits, and storage and workplace areas for individual magazines and buildings.

**IMPORTANT:** The building 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, flow diagrams, or P&I drawings are not usually needed for most simple operations.

### *3.1.1.2 Form 1*

The form must include the legal company name and a recognized location name for the site. The latter name must remain constant in all correspondence and references to the site. A letter authorizing an individual to sign on behalf of the company must be included for a new company or when there is a change in a licensing officer at an existing company.

Upon renewal, include one copy of Form 1 with amended forms and/or updated reference documents for both the base site and all satellite sites.

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

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

The same amendment numbers will be applied to the base factory and satellite site.

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

When procedures referenced on Form 1 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 1.

### *3.1.1.3 Forms 2 and 3*

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

### *3.1.1.4 Form 4: Plant, Buildings and Equipment*

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

Form 4 also describes any deviation, derogation, or grandfathering provisions that apply to the licence, e.g., Q-D reduction based on quantified risk assessment or hazard and operability review.

Form 4 should start with a site description that looks at access roads, gates, fencing, security, and other such general issues. Then specific buildings and operations can be addressed. It is on Form 4 that geographical coordinates should be provided. The header of Form 4 clearly describes the type of information required.

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.

Do not use terms like approved magazine or approved equipment. For example, in describing electrical installations, DO state “meets NEMA/CEMA 4X” (if that is the case). DO NOT state “approved electrical installations” or “explosion-proof,” etc.

When documentation regarding equipment has been submitted to ERD for approval, please reference it by a date, e.g., “information on heater submitted to ERD May 31, 2001.” If you reference it by stating “submitted with this application,” then when the application is renewed or amended, that statement will no longer be valid.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

Magazines should be described as a minimum by giving the dimensions in metres (L x W x H) and magazine type vs. ERD standards, e.g., Type 6 magazine complying with 1982 standard, Type 4 magazine complying with May 2001 standard. Magazines complying with the latter standard will have an 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 7 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 4 is also used to identify the location of AN unloading at rail sidings. The following is acceptable wording:

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

- **Authorized Process Vehicle:**

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

- **Authorized Process Vehicles List:**

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

Form 4 refers to the list as follows: e.g., “two vehicles from the Location List for Authorized Vehicles.”

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

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### *3.1.1.5 Form 5: Authorized Explosives Manufacture and Storage*

The information required on Form 5 is:

- Part I: Authorized Explosives:

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 Act* 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.

- Part II: Customer Information:

Provide the customer name (where explosives are being manufactured for loading into boreholes), location, and contact information to allow ERD to visit or contact the site. Include the licence number (federal or provincial) in order to comply with section 117 of the Regulations. Include distances by road from the factory or from the satellite site to the loading operations at the customer site. Where applicable, describe special situations such as marine transport.

*Note: If explosives do not change hands, i.e., if broken rock is provided (\$Z per tonne of rock rather than \$Y worth of explosives), Section 117 does not apply. 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.*

In the case of customers further than 300 km from the base factory, indicate how the customer can receive service while abiding by provincial or federal regulations regarding driving time restrictions.

- Authorized Customer List:

In order to avoid amendment of Form 5 each time a customer site(s) is added or changed, companies with extended lists of customers must list client sites on an Authorized Customer List and refer to this list on Form 5. Whenever a change occurs in the list, the amended list, showing the new customer information, is sent to ERD. Only client sites within 300 km of a base or 200 km of a satellite site may be on this list. Sites further away than 300 km must be approved on the licence by inclusion on Form 5. In cases where the customer site(s) are not expected to be added or changed during the term of licence, no list is required and customers can be identified on Form 5. Form 5 refers to the list as follows: e.g., "customers according to the Authorized Customer List."

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### *3.1.1.6 Form 6: Authorized Operations and Processes*

Form 6 must describe the operation and state the type and quantity of the explosive and personnel limits with references to specific process units or magazines, as given on Form 4. The operations of the vehicle at the approved site (with regard to number of personnel allowed, explosives on board, and distances to be observed) and at the customer site must be described as per Form 6R (Appendix A). In the case of operations at a mine or quarry, the description can state: “as per Form 6R.”

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

- Permitted Operations:

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

- Quantities:

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

- Personnel

The number of people is listed either as workers or visitors (casuals or transients). Workers are considered by 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.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### *3.1.1.7 Form 7: Distances to be Maintained Between the Buildings and Process Units of the Site(s) and Other Buildings and Works Outside the Site or Operations*

In the left-hand column of Form 7 entitled “Designation of magazine, building or process unit on plan,” the building/operations with explosives are listed and are regarded as potential donors to the vulnerable 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 from vulnerable features on site such as AN storage and fuel storage, as well as dwellings.

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

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

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

### **3.1.2 FIRE PERMISSIONS (SMOKING, MATCHES, LIGHTERS, WELDING [INCLUDING ELECTRIC])**

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

### **3.1.3 ENVIRONMENTAL ASSESSMENT AND SPILL CONTINGENCIES**

An environmental assessment must be undertaken for any licence that involves a project as defined in the *Canadian Environmental Assessment Act* as per Section 2.4.8, Environmental Assessment (EA). A minimum of 30 days should be allowed for its processing.

However, in the case of certificates and permissions, as well as the licences that do not require an environmental assessment, contingency plans for spill control and disposition are still required to be submitted.

### **3.2 Supporting Documentation**

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

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

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

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

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

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

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 familiar with them. Explosive inspectors may examine records and question personnel to determine how well the rules are known and applied; e.g., are special safety-related procedures and records kept and followed (i.e., pump and control preventive maintenance)?

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### 3.2.2 INSPECTIONS AND AUDITS

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

### 3.2.3 TRAINING

Employees must be trained to carry out normal tasks and have the knowledge to make quick and sound decisions in an emergency. A formal training program must be prepared: training requirements identified, courses prepared (both theoretical and practical), safety critical procedures and controls identified in the course, trainers chosen and trained, and records of all training kept. In addition to operations, the program should address needs related to first aid, general safety induction, and any other subject in support of operational safety. Training procedures and training records may be requested during inspections by 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 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 materials (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. Certification is valid for a maximum of five years. If a change occurs in the procedures for which the certification was issued, the workers must be retrained. Workers must be recertified or retrained within five years. Previously certified workers must be retrained if they have not conducted the activities in question in the preceding 12 months.

In 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.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### 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 for continuing applicability. The following procedures must be available:

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

When procedures referenced on Form 1 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 1; 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 entail dismantling or removing pumps and pipework or other equipment. The design of the equipment should allow this to be done safely. Tubular construction or hollow welded sections are very difficult to decontaminate and should be avoided. When the equipment is clean and free of explosives or other hazardous material, it can be tagged as decontaminated. The tag should be dated and signed by the person who has verified that the equipment is properly decontaminated.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### *3.2.4.3 List of Permitted Maintenance Tasks*

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

### *3.2.4.4 Explosives Disposal and Burning Ground*

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

### *3.2.4.5 Emergency Response*

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

The plan should develop reasonable credible scenarios of possible events, including vehicle collision, fire, explosion, fire encroaching on the site, spills, storms, and power failure, as well as any security. It should establish the criteria needed to trigger the response; give procedures, chronologically organized, to use during the response, including directing personnel to safe locations; list the resources available and needed during the response, including contact information such as names and phone numbers; and provide site plans showing safe locations.

### *3.2.4.6 Control of Changes*

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

*Note: When procedures referenced on Form 1 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 1; however, the latest procedures must be always available at the site.*

### *3.2.4.7 Maintenance Procedures*

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

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### *3.2.4.8 Miscellaneous Safety Procedures*

Companies must develop 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 be familiar with them, know them when they are required, and know where they can be accessed.

### 3.2.5 MEMORANDUM 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 MOU is to clarify the ownership and responsibilities of the site and facilities/operations, 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.

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 used, bank cheques must be made payable to "Receiver General for Canada." All forms of payment must make reference to the licence or certificate number to which they are to be applied. The fee structure may be subject to change following consultation with the industry. Contact ERD for a listing of fees.

### **3.4 Processing Time**

The target processing time at the ERD is as follows:

New factories and ANFO certificates: maximum of 60 working days

*Note: For applications involving an environmental assessment, it is recommended that a minimum of 60 working days be allowed for planning purposes.*

Renewals and amendments: maximum of 30 working days

Satellite sites, demonstrations and trials: maximum 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 1.1/1.5 hazard classification. The following are used for most situations:

- D2: from a donor magazine to another magazine,\* or from a donor process unit to a magazine\*;
- D4: from a donor process unit to another process unit,\* from a donor magazine to a process unit,<sup>3</sup>\* 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.

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.

---

\* These distances require protective barricades and the barricades must be identified on Form 4. Consult the Quantity-Distance Principles for details.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### 4.1.2 CONTROLLING ACCESS TO THE SITE (FENCING, OTHER BARRIERS)

Access to the factory or certificate site must be restricted. 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 4. If any of the measures stipulated in this section have not been implemented, the alternative must be described and justified on Form 4.

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 "No Trespassing" signs that 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 the wording is:

DANGER – EXPLOSIVES  
NO TRESPASSING  
PENALTY - SECTION 18  
CANADA EXPLOSIVES ACT  
NO SMOKING – NO MATCHES

DANGER – EXPLOSIFS  
ACCES INTERDIT  
PENALITE - ARTICLE 18  
LOI SUR LES EXPLOSIFS DU CANADA  
NI FUMER – NI 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.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### 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

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

### 4.1.6 HEATED WASHING FACILITIES

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

### 4.1.7 CODES

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

The National Building Code contains the requirements with respect to health and fire safety, which depend upon the use to which a building is put and its type of occupancy. Unless highly combustible

## Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010

and flammable materials are present, this will usually mean complying with Group F, Division 2<sup>4</sup> classification (medium hazard industrial occupancy), which is typical for repair garages and service stations. Process buildings and larger sites may be classed as Group F, Division 1 (high hazard industrial occupancy), with the requirements for structural fire protection generally not applicable as fires involving explosives are not to be fought; as a result, water sprinklers are not called for.

Proof that installations comply with all appropriate codes may be requested during inspections by 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.

---

<sup>4</sup> 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 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

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

“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 temporary factories, but that was a concession that was never meant to be applied at regular factory sites.

Temporary factory sites need not have 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 “Standard for Flame Tests of Flame-Resistant Fabrics and Films” and NFPA 701 “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 main door(s) must be provided with panic hardware. Exceptions may be granted in the case of small buildings such as sheds. Escape routes must be kept clear of obstruction. Safety exits should lead directly to the outside.

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 *Storage Standards for Industrial Explosives*.

### *Provided as Information*

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

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

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### 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. 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 process vehicles, including ANFO units and POGs, must be provided. This may be indoors or outdoors. Given that the following sections require that parking be at least 25 m from explosives and 25 m from any source of potential fire, it is therefore difficult to have indoor parking with explosives in the building.

#### **4.3.1 LOCATION**

A process vehicle with no more than a heel on board can be regarded as having 0 (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.

Unattended overnight parking of a loaded process vehicle (a vehicle with more than a heel) is not allowed.

##### *4.3.1.1 Parking of ANFO Process Units at Customer Sites*

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

##### *4.3.1.2 Parking at Isolated Areas*

Parking of a loaded vehicle at an isolated construction site will be allowed if the site obtains a Satellite Site Certificate or when attended. An isolated area is one that has sufficient distance from vulnerable sites to meet Q-D requirements.

#### **4.3.2 NUMBER OF UNITS AND EXPLOSIVES QUANTITY**

For satellite sites and demonstrations, only two “active” process vehicles are allowed (including POGs). 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.

#### **4.4 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 packaged product that must be stored in a magazine.

##### **4.4.1 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.

##### **4.4.2 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. Bulletin #40, which addressed this, is replaced by B620-03, 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.

##### **4.4.3 CONSTRUCTION**

Silos and tanks must meet industrial specifications and be in good condition. All highway tankers, unless permanently installed, must conform to Transport Canada CSA B620 standards as referenced in CAN/CGSB 43.151 97 EP17 and must be in good mechanical condition and have met the annual periodic leak test requirements.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

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. 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.

### **4.4.4 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.

### **4.5 Combustible Liquids**

This section deals with combustible liquid which, per the National Fire Code, is 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.

#### **4.5.1 STORAGE FOR FUELLING OR TRANSFER TO PROCESS VEHICLES**

The location of above-ground combustible liquid stored for transfer to process vehicles and for fuelling vehicles must be a minimum of 25 m away from AN, from explosives storage, or from manufacturing buildings. 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. 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.

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

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

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

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

#### **4.5.2 COMBUSTIBLE LIQUID AS PROCESS RAW MATERIAL FEED**

The location of combustible liquid stored for transfer as a raw material feed to a process (e.g., ANFO manufacture) within a structure may be located as close as, but no closer than, 8 m from that structure. This storage must also be a minimum of 25 m from AN or explosive storage. This is permitted if the quantity stored does not exceed 10 000 litres, the storage is not used for transfer to vehicles, and no AN is kept unattended in the structure. If these conditions are not met (e.g. more than 10,000 liters are being stored), then the storage must be 25 m from the structure.

Under no circumstances must the combustible liquid flow towards the structure 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

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

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).

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.

### **4.5.3 COMBUSTIBLE LIQUID AS FUEL FEED TO EQUIPMENT**

The location of combustible liquid stored for transfer as a fuel feed to equipment (e.g., furnace, fuel-fired washer) may be located as close as, but no closer than, 8 m from a structure in which explosives are processed (this includes a wash facility). This storage must also be a minimum of 25 m from AN or explosive storage. This is permitted if the quantity stored does not exceed 10 000 litres, if the storage is not used for transfer to vehicles, and if no AN is kept unattended in the structure. If these conditions are not met, then the storage must be 25 m from the structure.

Under no circumstances must the combustible liquid flow towards the structure 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).

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 4.18, Equipment Powered by Internal Combustion Engine.

### **4.5.4 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 1995, 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.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### 4.5.5 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 lubricating 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 base 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.

#### **4.6 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 4.5.4 and that they must 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.

#### **4.7 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. A preferable solution is the use of CSA-approved flammable storage cabinets.

#### **4.8 Ammonium Nitrate Prill Storage and Handling**

This section deals with the storage of solid ammonium nitrate prills and, in this section, any reference to AN 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.

Ammonium nitrate is a water pollutant and many explosive sites are near sensitive areas.

##### **4.8.1 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.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

Appendix E is 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).

The first consideration is to choose 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.

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.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### 4.8.2 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 in contact with AN.

### 4.8.3 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 as follows, 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 the explosions of AN trapped in places to which a welding torch was applied.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### *4.8.3.1 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. In addition, these must pass the periodic leak and pressure tests as outlined in B620 in a similar manner as for the specific coded vessel type to ensure the integrity of the tank.

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

### *4.8.3.2 Silos*

Mild steel is corroded by nitrate salts. Some silos have been 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.

Stainless steel stands up well to AN.

### *4.8.3.3 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.

### *4.8.3.4 Buildings or Warehouses*

Buildings or structures must meet the requirements laid out in Section 3.2.9, "Indoor Storage of Ammonium Nitrate," of the National Fire Code of Canada 2005.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### **4.8.4 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 report, and Appendix E. 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.

### **4.8.5 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).

## **4.9 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.

#### **4.10 Washing Facilities**

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

Each base factory must have permanent washing facilities in a building to ensure cleanliness and proper decontamination of process vehicles and other explosives equipment. Temporary factory sites 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.

##### 4.10.1 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 concurrent operations with washing a contaminated vehicle, even if only a heel is present.

##### *4.10.1.1 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.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### *4.10.1.2 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 temporary factory

### *4.10.1.3 Separate Maintenance Facility*

If a contaminated 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.

### *4.10.1.4 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.

### *4.10.1.5 Mechanical ANFO Certificate*

For washing/maintenance facilities operating under a Mechanical ANFO Certificate, 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 vehicle 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 Form 4 of the certificate application.

## **4.10.2 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.

## **4.11 Washing System**

### 4.11.1 LOCATION

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

#### *4.11.1.1 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 - 2005, Appendices A and D, for the appropriate wall/ceiling configuration.*

#### *4.11.1.2 Electric Wash System, Other Than CEMA 4X*

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

#### *4.11.1.3 Electric Wash System, CEMA 4 or 4X*

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

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### 4.11.2 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 permitted under or through an open doorway.*

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

### 4.11.3 PERFORMANCE

The washing system must be proven to be effective to clean vehicles of oil and grease and to decontaminate vehicles of all explosives under all climatic conditions of operation. The exact design is left to the company. The following is required: a source of water, detergent, collection and proper disposal, and a pressure system. Pressure, hot water, or steam is preferred. If a cold washing system proves to be ineffective, the hot-water pressure system will be imposed.

### 4.11.4 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.

#### **4.12 Lunchroom and Welfare**

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

##### 4.12.1 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 Form 6.

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

#### **4.13 Office**

Office space may be provided as required.

##### 4.13.1 LOCATION

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

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

#### **4.14 Other Storage – Inert Material, Chemicals and Contaminated Parts**

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

##### 4.14.1 LOCATION

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

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### 4.14.2 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.

### 4.14.3 CONTAMINATED PARTS

This sections refers to equipment or parts contaminated with explosives or residues thereof.

Contaminated pieces such as pumps must be locked away (not in an explosives magazine) 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 (not in an explosives magazine) until decontaminated.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

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.

### **4.14.4 WASTE AND SCRAP**

All waste and scrap materials must be handled according to the principles of good housekeeping, i.e., label containers for contents. When on public roads, all wastes and scrap materials must abide by the TDG regulations.

### **4.15 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 CEMA 4X requirements. (Consult ERD for appropriate modifications.)

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

### **4.16 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.

### **4.17 Electrical Requirements**

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

Typically, for garage/maintenance facilities, the classification of CEMA/NEMA 4X is appropriate.<sup>5</sup> The International Standards= IP Protection Classification equivalency is IP66 (totally protected against dust and strong jets of water).

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

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

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

#### **4.17.1 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

---

<sup>5</sup> A full description of the requirements will be found in Appendix F, currently in preparation.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

operational controls via programmable logic controllers (PLCs) located in the MCC. This arrangement must be comprised of a one-hour rated firewall, a fire-rated door with auto-closure, and a 5-cm raised curb along the wall, including a 5-cm sill across the door opening.

### **4.17.2 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.

### **4.17.3 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.

### **4.17.4 SEPARATE ROOMS FOR ELECTRICAL EQUIPMENT**

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

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

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

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

Where permitted by 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

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

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.*

### **4.17.5 CONTROLS**

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

### **4.18 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 fueled before use away from explosives or oxidizers. The equipment is not allowed inside an explosives building if it is gasoline or propane powered. Fire extinguishers must be located nearby.

### **4.19 Hydraulic Systems**

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

## **4.20 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.

Records may be requested during inspections by ERD 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.

### **4.20.1 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. 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 50 millimetres 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.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

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.

### **4.20.2 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 Pumping Guidelines. Refer to the Guidelines for the Pumping of Water-based Explosives available from ERD for a nominal fee. They are also available electronically upon request from ERD.

### **4.21 Augers**

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

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

### **4.22 Heating and Furnaces**

All furnaces, no matter what type, must be equipped with redundant high-temperature limiting controls (often built-in) to prevent a runaway situation should the thermostat fail. If oil or gas 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

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

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 comply with the conditions issued with a Fire Permission (see section 3.1.2).

Electrical heating must comply with the electrical requirements (see section 4.17). Electrical heating can be done in two ways. One may be a convection heater mounted horizontally or an electric air heater blower unit, commonly known as a unit heater. The other may be a heat exchanger outside the building that circulates a hot water/glycol solution into unit heaters mounted in the building. In all cases, the heaters must be mounted above any possible explosive materials (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 one-on-one basis. One general precaution to note with propane is that it is heavier than air, so a leak will accumulate in low areas, e.g., sumps, and pose a vapour phase explosion risk there.

### **4.23 Process Vehicles (Portable Process Units, ANFO Mix Vehicles or Pneumatic Delivery Systems)**

This section is to be removed from this guideline and incorporated in a separate guideline for process vehicles that includes “Process Vehicles - Guidelines for Licensing Using Form 4.” Until this has been done, this section and the aforementioned guideline will remain ERD’s guideline regarding process vehicles.

Process vehicles must be readily identified with the company name and unit number. Process vehicles must meet federal and provincial requirements. Provincial workplace safety requirements cover user safety, including ladders and guardrails, the guarding of rotating equipment, and pinch points. Canadian Motor Vehicle Safety Standards cover the running gear of the vehicle, including brakes, tires, general roadworthiness, and daily vehicle checks. ERD requires all to meet all appropriate aspects of the CMVSS and B620 tank requirements whether on public or private roads, such as mines.

All process vehicles’ large means of containment are expected to meet TDG standards for construction and placarding, even on closed and gated sites. All new process vehicles coming into service must meet TDG large means of containment standards and placarding, even on closed and gated sites, e.g., mines, unless permitted by the terms of the licence (refer to section 4.23.8 for “grandfathering” of non-coded large means of containment).

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

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

### 4.23.1 FIRE EXTINGUISHERS

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

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

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

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

### 4.23.2 ELECTRICALS

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

#### 4.23.2.1 Wiring

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

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

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

All wiring must have overcurrent protection.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### *4.23.2.1.1 Class 2 Circuits*

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

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

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

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

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

### 4.23.3 FUEL TANKS AND LINES

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

### 4.23.4 BRAKES AND STEERING

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

### 4.23.5 TIRES

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

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### 4.23.6 EXHAUST

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

### 4.23.7 COMPRESSORS

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

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

### 4.23.8 MOBILE PROCESS VEHICLE EMULSION TANK

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

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

In addition to complying with the requirements of B620-03 for all coded vessels, ERD will also ensure all vehicles, assembled or altered in multiple stages, conform to the applicable Canadian

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

Motor Vehicle Safety Standards (CMVSS) that came into effect in February 2003. This Transport Canada (TC) requirement calls for appropriate lighting, demonstration of centre of gravity calculations, correct selection of chassis for GVWR and GAWR ratings concerning weight distribution, plus adequate braking for a fully loaded vehicle, to name a few of its provisions. It is part of the National Safety Mark (NSM) process administered by TC (reference [www.tc.gc.ca](http://www.tc.gc.ca)) and applies to all intermediate and final-stage manufacturers who assemble or alter a vehicle prior to its sale to the first purchaser, whether imported into or originating in Canada.

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

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

*Note 1: Reference to B620-03 requires engineering input and, in most cases, registration with Transport Canada for all aspects of design and assembly to permit the transport of dangerous goods on public roads. Process vehicles with coded emulsion tanks built to CFR 49 (MC/DOT) or TC equivalent 306, 406 or 412, residing in Canada prior to July 1999 will be “grandfathered” with no restrictions on usage. Process vehicles imported into Canada for use must meet standards with respect to tanks (B620), safety (CMVSS) and explosives requirements current on the day they are first imported. The vehicle may be subject to a total design review or inspection by a third party Transport Canada Authorized Design Agency to ensure compliance with the appropriate standards, all at the licensee’s expense. ERD should be contacted before even considering bringing into Canada any process vehicle for a short term trial or demonstration if the vehicle is not already approved as meeting standards.*

*Note 2: CFR 49, DOT 412 tanks will be accepted as an alternative once an independent third-party review is done by a Transport Canada Authorized Design Review Agency to show compliance with the applicable standard. Non-specified emulsion tanks, as part of mobile process vehicles residing, and in use, in Canada prior to July 1999, will be “grandfathered” until January 1, 2010, under the following conditions: (i) the non-coded tank must be initially inspected externally and if possible, internally, plus hydrostatically tested to 3 psi and marked with a permanently attached plate bearing the words “Non-spec tank” and “Not for Dangerous Goods Use after January 1, 2010;” (ii) the date of the first test and the name of the registered facility that performed the initial test is to be included; (iii) the non-specified tanks will be subject to the same periodic inspections as required by Transport Canada for a TC 306 tank; (iv) the tanks must display the familiar V, I, P, K markings with the appropriate inspection dates.*

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

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

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

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

### **4.23.8.1 Hatch on Emulsion 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.

### **4.23.9 AMMONIUM NITRATE BIN**

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

### **4.23.10 PROCESS FUEL OIL TANK**

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

Section 5.14 of the TDG Regulations states that the containers must be selected and used in accordance with the requirements of standard CAN/CSA B621-98, “Selection and Use of Highway Tanks, Portable Tanks, Cargo Compartments and Containers for the Transportation of

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

Dangerous Goods, Classes 3, 4, 5, 6.1, 8 and 9.” This standard prescribes that diesel tanks built after December 31, 2002, must conform to the TC 406 tank specification under CSA B620-98, or its CFR 49, DOT 406 equivalent, when permanently mounted on the frame of a truck or trailer.

### *4.23.10.1 Venting*

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

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

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

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

### 4.23.11 GASSING SOLUTION TANK

The gassing solution tank must be made of material compatible with the solution and have overpressure relief. Hosing is not to be used as relief.

### 4.23.12 ALUMINUM BIN

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

### 4.23.13 DELIVERY HOSE REEL

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

### 4.23.14 AN PNEUMATIC DELIVERY SYSTEMS, AN BLOW LOADERS, POGS

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

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### *4.23.14.1 Pneumatic Hoses for Delivery of ANFO*

Pneumatic ANFO deliveries must be made using semiconductive hose. The hose must have an electrical resistance high enough to limit the flow of stray current to safe levels, yet not so high as to prevent drainage of static electric charges to ground. A hose of not more than 2 000 000  $\Omega$  resistance over its entire length and of not less than 1000  $\Omega$  per foot meets the requirement. A system resistance of 10 000  $\Omega$  and 2 000 000  $\Omega$  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.*

### 4.23.15 LOADING OF PROCESS UNITS

#### *4.23.15.1 Reloading of Process Units*

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

#### *4.23.15.2 Reloading of 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 the AN behaves as explosive.

#### *4.23.15.3 Loading ANFO Process Units at Rail Sidings*

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

- Site applications must include a map providing the general location and distances to nearest buildings and roads (if within 1 km). The application will reference the designated factory licence or satellite site to which the process vehicle is attached.
- Only sites approved by the rail carrier may be used, and written permission of the rail carrier must be provided to 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.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

- Only one process vehicle may be at the site (defined as within 100 metres of the rail car being unloaded) at any time. Vehicles must contain no explosives. Augers must be cleaned out before loading by running AN through them. Oiling systems must be fitted with check valves to prevent oil leaking into the augers. Gas-powered vehicles and gas-powered motors are not allowed at the transfer site during loading.
- No other activities may take place within 100 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.

### **4.24 Forklifts and Pallet Movers**

#### **4.24.1 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.

##### *4.24.1.1 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.

#### **4.24.2 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 – 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.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

### *4.24.2.1 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.

### *4.24.2.2 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.

### *4.24.2.3 Operations*

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

### 4.24.3 PROPANE FORKLIFTS

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

## **Appendix A - Additional Terms<sup>6</sup>**

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

### **A. PROCEDURAL REQUIREMENTS**

#### **1. Prior to Leaving the Licensed Base of Operation (Including Base Factory, Temporary Factory, Mechanical ANFO Certificate)**

The following requirements must be met:

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

#### **2. TRANSPORT ON HIGHWAYS AND OTHER PUBLIC ROADS**

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

#### **3. TRANSPORT ON MINE OR QUARRY PROPERTY**

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

---

<sup>6</sup> This Appendix is also found as Form 6R, attached to bulk explosives base factory licences and ANFO mechanical certificates.

#### **4. WHILE AT THE MIX SITE**

The following requirements must be met:

- a) During operations in the field, the area within 15 metres of the vehicle must be free of all operating equipment and of any personnel not associated with the operation.
- b) The appropriate explosives placard and/or sign must be displayed and visible.
- c) The blended ANFO, aluminized ANFO, slurry, watergel or emulsion must be loaded directly into prepared boreholes. The unit must not be used for packaging any product unless so noted within the licence document.
- d) The distances from the operation of a process vehicle to other activities or sites that are to apply<sup>7</sup> are described below and must be calculated based on the carrying capacity of the vehicle.
  - i) The Operating Site (Personnel and Workers Associated with the Site):

**Within 15 metres:**

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

**From 15 Metres to D4 Distances (From 1.1/1.5 Q-D Tables):**

Only personnel directly involved with the project and not directly involved with explosive loading may be present. The man-limits and all operations within D4 distance of loading, at other than mines or quarries,<sup>7</sup> are to be recorded in Form 6.

**From 15 Metres to D7 Distances (From 1.1/1.5 Q-D Tables):**

A joint Emergency Response Plan and letter of understanding with the contractor or mine/quarry operator regarding approved operations must be developed. This letter is to be recorded on Form 1 and personnel limits are to be recorded in Form 6, at other than mines or quarries.<sup>7</sup>

---

<sup>7</sup> Dispensation from these requirements will be considered when it has been demonstrated that the risk of an accident is comparable to the level of protection offered by the Quantity-Distance Principles or when precautions acceptable to the Branch have been implemented to mitigate possible consequences of an incident, e.g., stopping vehicular traffic. Certain restrictions will apply.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

ii) Dwellings (General Public):

D7 distances from loading are to be maintained at other than mines or quarries.<sup>7</sup>

iii) Highways (General Public):

D4, D5 or D7 (from 1.1/1.5 Q-D Tables) distances based upon vehicular traffic are to be maintained. Natural topography may be used to influence required distances.

e) The vehicle should not be driven over loaded holes whether the holes are primed or not. However, if exceptional operating conditions prohibit normal access, the vehicle may drive over the loaded boreholes provided that:

- i) a procedure jointly prepared by the mine or quarry and the explosives manufacturer is available; and
- ii) the procedure addresses the accidental ignition of the hole.

### **5. PRIOR TO STORING OR REPAIRING THE VEHICLE**

The following requirements must be met:

- a) The ingredient tanks and hoppers containing oxidizer(s) and explosive must be as empty as is practical at the end of the operating day.
- b) The vehicle must not be stored overnight in a built-up area such as a town or in an office or workshop area, but at an acceptably safe distance as per Q-D principles whether at a licensed site or when attended.
- c) The ingredient tanks and hoppers, mixer, and discharge systems must be completely flushed out with water and decontaminated<sup>8</sup> and the fuel oil storage tank must be emptied before any hot work repairs are carried out. Decontamination is required before any prolonged<sup>9</sup> storage of the equipment.

---

<sup>8</sup> Free of all traces of explosives outside and inside all interior equipment, including explosive contamination of screw threads, pipes and pumps, the condition of which would permit safe maintenance.

<sup>9</sup> Prolonged storage of a process unit is defined as being idle within the previous 3 days or being idle for the next 30 days, unless special written permission of the Chief Inspector of Explosives has been obtained or unless allowed under the conditions of the licence.

## **6. MAINTENANCE**

Each vehicle must have a log detailing maintenance.

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

a) Decontamination:

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

b) Hot Work:

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

It is left to the management to ensure safe operations.

c) Maintenance on a Contaminated Unit:

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

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

## **B. ADMINISTRATIVE REQUIREMENTS**

1. The Chief Inspector of Explosives will be informed within two working days of a change in location of these units and of all mines and quarry sites where these units will operate in accordance with requirements for the List of Authorized Process Vehicles and the List of Authorized Clients.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

2. The Chief Inspector of Explosives will be notified immediately of any accident or incident, including theft of explosives, but particularly those that involve the ignition of materials associated with the unit, whether or not anyone is injured or property is damaged.<sup>10</sup>
3. This licence is granted subject to the approval of the provincial department of mines or labour that has jurisdiction.

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

---

<sup>10</sup> Fatalities must be reported immediately. Serious accidents/incidents (with injuries, or effects perceived outside the site) are to be reported within two hours. Any other accidents or incidents, particularly those that involve the ignition of materials, whether or not anyone is injured or property is damaged, must be reported within no more than 24 hours. The preferred method for serious accidents/incidents or those with possible serious consequences is by telephone (613-948-5200) followed by a fax (613-948-5195). E-mail may also be used, but as a follow-up to other means of communication. Other incidents may be reported by fax or e-mail. This is to be followed by a detailed investigation report with root cause identification, recommended actions, and deadlines for implementation.

**Appendix B - Electrical Schematic**

Rev. 22/01/01 A:\electrdwg

**GARAGE**

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

## **Appendix C - 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 depend upon safety systems, operating procedures, and the condition of vehicles.

A comparative risk assessment could be carried out between the use of packaged product (that required no 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 (1.1 Tables).*

At each site where derogation is applied for, the population exposed to the explosion risk is identified. For road jobs, there are normally good traffic density surveys that tell the traffic by day and by hour. This information is used to prove to 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.

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements – July 2010**

---

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 in Appendix A except for distances to the general public. Most risk assessments of the likelihood of bulk truck explosions identify fire as the main cause and find that there will be a considerable time between the outbreak of fire and possible explosion. The joint emergency response plan should take this into account and include provisions for quickly stopping road traffic. It is unlikely that there would be time to evacuate houses.

## **Appendix D -Table of Options**

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

<b>Requirements</b>	<b>Base Factory</b>	<b>Temporary Factory</b>	<b>Satellite Site</b>	<b>ANFO Mechanical Certificate</b>	<b>Demonstration</b>	<b>Trial</b>
<b>Prerequisite</b>	Competence in explosives	Base factory, proof of temporary nature	Base factory up to 800 km	For use within the owner quarry/mine	Base factory, proof of demonstration	Base factory
<b>Document Issued</b>	Licence	Licence	Satellite certificate	ANFO certificate	Satellite certificate	Letter of permission
<b>Customer Sites</b>	Any number, up to 450 km, Description day for over 300 km	One project, located near site	Any number, up to 200 km	Not applicable	One project may have multiple customers, up to 200 km	Not applicable
<b>Time Constraints</b>	Annual renewal; 12 months	Single renewal; 2 years maximum	Monthly; 1 month to base factory expiry period	Annual renewal	Two months maximum,	6 months
<b>Environment</b>	EA and Spill Contingency Plan	Possible EA, Spill Contingency Plan	Spill Contingency Plan	Spill Contingency Plan	Spill Contingency Plan	
<b>Allowed Process</b>	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	Blend ANFO at borehole	Bulk delivery as per licence	As per agreement
<b>Explosives</b>	As per licence	Processing Class 1.5 storage as per licence	Class 1.5	ANFO Class 1.5	Class 1.5	As per agreement

## Guidelines for Bulk Explosives Facilities - Minimum Requirements - September 2008

Requirements	Base Factory	Temporary Factory	Satellite Site	ANFO Mechanical Certificate	Demonstration	Trial
<b>Process Vehicles/Units</b>	As per licence and location list	As per licence and location list	2 Process units as per location list ANFO mix vehicle	1 Process unit	As per agreement	
<b>Buildings</b>	As per licence	As per licence	As per licence			
<b>Magazines</b>	As per licence	As per licence	As per licence	As per licence	As per licence	None
<b>Raw Materials, including AN and Fuel</b>	Stored on site	Stored on site	Stored on site	Stored on site	Stored on site	As per agreement
<b>Fuel Storage</b>	As per licence	As per licence	As per provincial regulations	1 tank	As per provincial regulations	As per agreement
<b>AN Storage</b>	As per licence	As per licence	1 unit: silo, tanker or tote	1 unit	1 unit	As per agreement
<b>Wash Facilities</b>	Permanent required, heated for winter, base sites within 250 km of another base site might have this requirement waived.	Temporary, covered, heated in winter	None	Within 200 km	Temporary or weekly return to base	As per agreement
Requirements	Base Factory	Temporary Factory	Satellite Site	ANFO Mechanical Certificate	Demonstration	Trial
<b>Garage</b>	Access required	Access required	Access required	Access required	Access required	As per agreement
<b>Processing Time</b>	30 days	30 days	10 days	30 days	10 days	10 days
<b>Fire/Smoking/Welding Permit</b>	May be granted	No	No	No	No	No

## **Appendix E - 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 subject to this Appendix.

However, there are situations where, 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.

It should be noted that 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 come under scrutiny.

Based upon well-documented catastrophic incidents involving large stockpiles of AN, most recently at Toulouse in France, ERD has previously recommended to various licensees 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, to the airport, camp, mill, roads, pits, mine operations and AN storage facilities; and
2. the quantity-distance requirements based upon 50% of the peak storage capacity of AN quantity and a scale factor of 9.6 to calculate the separation distances to the airport, mill and camp areas; the 9.6 scale factor was chosen based upon:
  - descriptions limiting damage and injuries to people, buildings and the airport;
  - AN not normally behaving as an explosive;
  - separation distances 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

## **Guidelines for Bulk Explosives Facilities - Minimum Requirements - September 2008**

10 000 000 kg, or 5 000 000 kg, a 1640-metre<sup>11</sup> 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.

In addition to the foregoing, ERD recommends that:

1. Community or mine site emergency response and evacuation procedures be reviewed 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, e.g., following of U.S. NFPA guidelines for storage of large quantities of AN.
3. That 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.

Refer to NFPA Standards 490 and 492, and *National Transportation Act - Railway Act - AN Storage Facility Regulations* for layout, building and equipment details; some of the items that must be stressed are as follow:

- no hollow equipment, drains, cavities, etc., where molten AN could collect;
- noxious NO-NOx fumes from a fire;
- equipment standards and ratings;
- building materials and ventilation needs, e.g., self-ventilating in event of a fire;
- recommend capacity limit for AN storage of 2268 tonnes unless sprinklered;

Go to the Justice web page and type <http://laws.justice/en/>, then type in ammonium nitrate and choose consolidated regulations. Choose the storage regulation (for railways) - it provides good guidance on what needs to be done.

---

<sup>11</sup> Safety distance [metres] = scale factor x ( net explosive quantity kg).<sup>1/3</sup>