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Guidelines for Division 1 Licences for Bulk Explosives Facilities

Explosives Regulatory Division
Explosives, Regulatory, and Business Services Branch
Lands and Minerals Sector

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1 Introduction

1.1 Purpose

These guidelines are intended to be used as a guide on how to meet the requirements of the *Explosives Regulations, 2013* (hereinafter the "Regulations") for bulk explosives facilities licensed under PART 5, Division 1.

A holder of a licence must comply with all applicable sections in the Regulations. These guidelines do not serve to substitute the Regulations, and in the event of any disagreement between these two documents, the Regulations shall prevail. These guidelines do not supersede any other regulation or law, be it federal, provincial, or municipal, or any codes specified in such legislation.

These guidelines might also be used by the Explosives Regulatory Division (ERD) to assist in evaluating licence applications and conducting compliance verifications of licensed sites.

1.2 Scope

These guidelines cover PART 5, Division 1 factories and satellite site certificates for bulk explosives classified as Type E.1 (blasting explosives).

These guidelines are for bulk explosive operations that are located above ground. Some guidance may be applicable for underground operations. Some manufacturing activities underground are subject to regulatory requirements of PART 5, Division 3 (which exempts these types of operations from requiring a licence under certain conditions).

1.3 Supporting Documents

These guidelines should be used in conjunction with the Regulations, the *Explosives Act* and the following supporting documents (or their equivalents):

- G03-07: Classification and Authorization – General and Detailed Requirements for Type E Explosives
- G05-05: Determination of Potential Effects for Explosives;
- G08-02: Guideline for Applying for an Approval Letter;
- G06-08: Guideline for Determining Storage Compatibility for Explosives;
- G05-06: Guidelines for the Pumping of Water Based Explosives (available upon request);
- G06-06: Key Control Plan Guideline;
- National Standard of Canada, CAN/BNQ 2910-510/2015, entitled Explosives – Quantity Distances;
- National Standard of Canada, CAN/BNQ 2910-500/2015, entitled Explosives – Magazines for Industrial Explosives;
- G05-02: Requirements for Bulk Mobile Process Units;
- G05-04: Security Plan Guideline;
- G05-25: Sample Security Plan (available upon request); and
- G09-01: Transporting Detonators with Other Explosives.

There may also be other pertinent federal, provincial or municipal legislation or codes by which companies would have to abide. The following list is presented as a guide to other documents or jurisdictions that should be considered (it is not meant to be exhaustive):

- Canadian Electrical Code (CEC)
- Canadian Environmental Assessment Act and other federal and provincial environmental legislations
- National Building Code of Canada (NBC)
- National Fire Code of Canada (NFC)
- Municipal requirements
- Provincial labour and/or safety acts and regulations
- Transportation of Dangerous Goods Act and Regulations

1.4 Definitions

Applicable definitions include the following:

- "Client Site" – means a blast site at which a mobile process unit is used to manufacture explosives away from a factory or satellite site.
- "Competent Person" – means a person who has been certified as trained in accordance with section 83 of the Regulations.
- "Decontaminate" means to completely remove, clean or purge an explosive substance from a building, room, area, vehicle, equipment or container.
- "Division 1 Factory Licence" – means a licence that is issued under paragraph 7(1)(*a*) of the *Explosives Act* and authorizes the manufacture of explosives at a factory.
- "Division 1 Worker" – means a person who is at a factory or a satellite site to carry out a manufacturing operation or other kind of work (e.g., maintenance of facilities or repair of equipment) for the holder of a Division 1 factory licence.
- "Heel" refers to the quantity of explosive product left in a mobile process unit, tanker, tank, silo, or contaminated equipment that cannot be removed by discharging, pumping or auguring, or that is left in the mobile process unit, tanker, tank, silo, or contaminated equipment on purpose. Quantity to be considered as "heel" is usually understood to be 250 kg (NEQ) or less for mobile process units, tankers, tanks and silos.
- "Factory Magazine" – means a magazine that is located at a factory or a satellite site.
- "Mobile Process Unit" – means a vehicle or portable machine that is used at a factory, a satellite site or a client site to carry out an explosives manufacturing activity.
- "Process Unit" – means a building, structure, room, or place in which an explosives manufacturing operation is carried out at a factory.
- "Satellite Site" – means a site that is located away from a factory and at which explosives that are intended for use at a client site are manufactured and temporarily stored.
- "Satellite Site Certificate" – means a manufacturing certificate that is issued to the holder of a factory licence under paragraph 7(1)(*c*) of the *Explosives Act* and authorizes the manufacture of explosives at a satellite site.

2 General Information

This section provides information related to most licences and satellite site certificates for bulk explosives facilities.

2.1 Precautionary measures

Relevant regulations

> **20** *A person who is carrying out an activity involving an explosive must take measures that minimize the likelihood of harm to people or property that could result from the activity, including measures to*
> *(a) prevent an accidental ignition;*
> *(b) limit the spread of any fire or the extent of any explosion; and*
> *(c) protect people from the effects of any fire or explosion.*

Companies are expected to:

- understand and maintain the principles of good housekeeping and ensure that explosives equipment can be thoroughly cleaned in order to reduce risks of fires and explosions, control sources of initiation, and reduce the likelihood of a fire spread and of propagation of explosions;
- segregate explosive operations from other activities as much as possible to reduce risks of incidents (things that are not immediately required for an explosives operation should be effectively separated);
- keep the quantity of flammable and combustible material in explosives areas to the minimum necessary to safely and effectively perform explosives operations; and
- have systems in place to protect explosives from sources of ignition that could cause them to initiate (such as impact, friction, sparks, heat, temperature, electrical discharge, excessive pressure, and chemical incompatibility).

2.2 Acceptable Distances

Relevant regulations

> **63 (1)** *Every process unit, factory magazine and raw material storage facility must be located at an acceptable distance from surrounding structures and infrastructure and from places where people are likely to be present.*
> **(2)** *Acceptable distance is determined by the Minister on the basis of risk of harm to people or property, taking into account the quantity and type of explosives that are to be manufactured, the raw material to be used, the manufacturing operations to be carried out, the strength, proximity and use of surrounding structures and infrastructure and the number of people likely to be in the vicinity of the unit, magazine or facility.*

Unless otherwise specified in these guidelines, the Minister has determined that acceptable distances of subsection 63(2) refers to the separation distance stated in the National Standard of Canada Standard CAN/BNQ 2910-510/2015 Explosives - Quantity Distances (hereinafter QD Standard).

The Minister has also determined that:

- Generators, compressors or other equipment using fuel is to be at least 25 m from explosives.

- Mobile process units (MPU), empty tankers, tanks, silos, and contaminated equipment, each with no more than a heel contained, can be regarded as having zero NEQ for acceptable distance requirements to vulnerable locations that are part of the licensed operation. Distances to outside operations are to meet all requirements of the QD standard. A minimum separation distance of 25 m from the MPUs to manufacturing and storage locations for explosives and AN is required, unless approved by the Minister on the licence.
- An ANFO-only process vehicle with just residual explosive (washed auger) can be regarded as having zero NEQ for acceptable distance requirements.
- Personnel not directly involved in a particular hazardous operation at the licensed site (such as office clerks, accounting and sales personnel), are to meet D7 distances from any explosives operations.
- Separately licensed/permitted explosives magazines can be located at D2/D6 distances, or aggregated, if the access is controlled at least at a D4 distance (such that each party is aware of the presence of the other party), and there is a letter of understanding detailing how such access will be controlled. Process units from each site must be at least D7 distance apart from each other.

2.3 Magazines

Relevant regulations

> **63 (3)** *Every process unit, factory magazine and transport unit must be designed, constructed and installed to conform to good engineering practices. It must be constructed in a manner that prevents the accumulation of explosives or raw material in cracks and cavities and that minimizes the harm to people and property that could result from an ignition of the explosives or raw material. The construction materials must be compatible with the explosives to be manufactured, stored or transported and with the raw material to be used.*
>
> **63 (4)** *Every factory magazine must also be constructed so that it is well ventilated and resistant to theft, weather and fire.*

Magazines for industrial explosives built according to specifications detailed in the National Standard of Canada Standard CAN/BNQ 2910–500/2015 entitled Explosives — Magazines for Industrial Explosives (Magazine Standard) meet the intent of subsections 63(3) and 63(4) of the regulations (they are well ventilated, resistant to theft, weather, and fire, and are built to good engineering practices).

The intent of subsection 63(3) and 63(4) can also be met if the explosives are stored as described in the sections on MPU Parking and Storage; Tankers, Tanks or Silos; and Laboratories. In-process magazines might also be considered to meet the intent of section 63(3) and 63(4) as approved and licensed by ERD.

2.4 Personnel Limits

Relevant regulations

> **20** *A person who is carrying out an activity involving an explosive must take measures that minimize the likelihood of harm to people or property that could result from the activity, including measures to*
>
> **(c)** *protect people from the effects of any fire or explosion.*

One of the fundamental principles of operations involving explosives is to minimize the exposure of people by restricting the number of personnel to the minimum required to operate safely, for the minimum amount of time. Only people with jobs essential to a particular hazardous operation should be permitted access to explosive areas.

2.5 Use of Brass and Copper

Relevant regulations

> **20** *A person who is carrying out an activity involving an explosive must take measures that minimize the likelihood of harm to people or property that could result from the activity, including measures to*
>
> **(a)** *prevent an accidental ignition.*

Brass and copper should not be used where they could come into contact with ammonium nitrate or ammonium nitrate-based substances. An exception may be permitted for the use of copper grounding cable used on the exterior of buildings for lightning protection. If brass and copper are unavoidable (e.g., some fire extinguishing systems), they should be protected by a compatible paint (as to not interfere with the function, such as in the case of nozzles).

3 Types of Division 1 Factory Licences

Division 1 manufacturing operations for bulk explosives may occur at licenced factories, satellite sites, or client sites. Sites may or may not have full washing / maintenance facilities.

3.1 Factory With Full Washing / Maintenance Facilities

The basis for bulk explosives operation in Canada involving the use of mobile process units is a factory with full washing and maintenance facilities. Sites that are properly equipped with washing and maintenance facilities have the ability to ensure the safe operation of mobile process units. Mobile process units at such sites can be kept clean to reduce the risk of fire, can be decontaminated, as required, to avoid accidents during maintenance, and can be well maintained in order to be safe to operate.

This type of factory may support factories with limited washing / maintenance facilities, satellite sites, and client sites.

3.2 Factory with Limited Washing / Maintenance Capabilities

A factory with Limited Washing / Maintenance Capabilities will only be licensed if supported by a factory with full washing / maintenance facilities. The support of a factory with full washing / maintenance facilities is necessary so that decontamination and all required maintenance can be performed. MPU decontamination would not be permitted and would not be licensed at a site with limited washing facilities.

A factory that has limited washing / maintenance facilities will have to demonstrate acceptable operational capabilities for it to be licensed. Applicants will be asked to provide safe work protocols and procedures for MPU cleaning and maintenance, such as:

- Exterior dry cleaning of MPU’s;
- Exterior washing of MPU’s; and,
- Storage and disposal of any collected grease, oil, AN emulsion and AN prill as a result of the dry cleaning.

Removal of combustible materials, such as excess grease, oil or coal dust, from the outside of the vehicle, (e.g. undercarriage, wheels and engine compartment) and any exterior spillage of AN emulsion or AN prill is to be carried out to the greatest extent possible using dry cleaning methods (rags and towels). MPU cleaning via water should only be performed upon completion of the dry-cleaning methods.

Maintenance and decontamination procedures and protocols to ensure compliance with the Regulations (such as cleaning procedures, schedules, and records) need to demonstrate safe operations and maintenance of process units to minimize the likelihood of accidental ignition.

This type of factory may support satellite sites, and client sites.

Sites located in remote or northern areas (e.g. fly-in / fly-out) without full washing / maintenance facilities and without road access to a factory with full washing / maintenance facilities, would not be normally considered for licensing. Also, factories with limited washing / maintenance capabilities would not be licensed if separated by a body of water from the supporting factory site (other than a body of water that can be crossed by bridges permitting the transport of explosives, by the use of barges or boats chartered specifically to move explosives, or by a ferry if involving dedicated Dangerous Goods crossings).

3.3 Satellite Site Certificates

Certificates are issued for sites that are occasional and temporary, as outlined in paragraph 7(1)(c) of the *Explosives Act*. “Occasional” might be interpreted as a site that is in operation infrequently or at irregular intervals. “Temporary” might be interpreted as a site that is operated for a period of time, but not permanently, for example, a site that does not operate longer than 6 months.

Satellite sites are considered to be extensions of a factory. Satellite site certificates may be issued for a maximum duration of 6 months. During this period, there would be no limit to the days of operation. Only one continuous 6-month period of operation would be permitted per location. After this time, a second satellite site certificate would not be issued for the same location. Operations extending beyond 6 months at the same location would require a factory licence.

However, for a situation where a site operates no more than 15 days during the six-month period, a new certificate can be issued for the same location again in the future. Examples of such sites are transfer sites where bulk water-based explosives or raw ingredients are transferred to an explosives mobile process unit. Equipment may be present at the site only when in-use, i.e. during the 15 days of the six-month period. Applicants need to be able to demonstrate adherence to the 15-day condition by providing details relating to the days of operation on site. Examples include, but are not limited to: Invoices, Bills of Lading, GPS tracking, etc.

A satellite site would not be licensed if separated by a body of water from the associated factory site (other than a body of water that can be crossed by bridges permitting the transport of explosives, by the use of barges or boats chartered specifically to move explosives, or by a ferry involving dedicated Dangerous Goods crossings.)

Satellite sites would not be licensed for bagging or cartridging operations. Limited bagging at a

satellite or a client site is allowed for the purpose of removing explosives for decontamination, sampling, calibration and carrying to hard-to-reach boreholes as per section 100 of the Regulations.

4 Sites, Facilities and Equipment

4.1 Signs

Relevant regulations

> **70** *A sign that warns against unauthorized entry must be posted at each entrance to a factory or satellite site in a clearly visible location. The sign must also warn of danger from explosives and indicate the precautions that must be taken to eliminate the possibility of an accidental ignition.*

A sample of suitable wording:

DANGER – EXPLOSIVES	DANGER – EXPLOSIFS
NO TRESPASSING	ACCÈS INTERDIT
PENALTY – SECTION 18	PÉNALITÉ – ARTICLE 18
CANADA EXPLOSIVES ACT	LOI SUR LES EXPLOSIFS DU CANADA
NO SMOKING – NO MATCHES	INTERDIT DE FUMER AUCUNE ALLUMETTES

Signs should also be displayed on the fence around structures with explosives or the vicinity so that a sign is clearly visible from any possible direction of approach. Such warning signs should also be placed on the access road at D7 distances, or D5 when D7 is impractical. For a site that is unfenced, signs warning against unauthorized entry should also be posted along the perimeter of the site (barriers described in section on Controlling Access to the Site will not be as effective in preventing access by persons on foot or with ATVs, motorcycles, snowmobiles, etc.).

4.2 Controlling Access to the Site (Fencing, Other Barriers)

Relevant regulations

> **76 (1)** *Only people authorized by the holder of a division 1 factory licence may have access to the factory or a satellite site.*

As per 76(1) access to a factory or a satellite certificate site is to be restricted and controlled. The measures in place to control site access must be described on the licence application form(s) and security plan as per 60(3)(c) and 60(7).

The intent of subsection 76(1) is typically met when:

- Road access is restricted with a lockable gate at the entrance to the site perimeter and there are barriers to prevent access at any other site access points. The barriers may be artificial barriers (such as chain-link fences or page-wire) or natural barriers (such as trees, difficult terrain). A snow fence may be acceptable barrier for some situations; and
- Site gates are kept locked unless the site is attended and the person or persons at the site can observe persons entering the gate.

Note 1: Lockable gates and barriers erected around process locations rather than the perimeter of a large site may still meet the intent.

Note 2: Lack of fencing in remote areas or areas in which the terrain makes erection of a fence problematic may be considered for licensing.

In the case of sites located at surface mines or quarries, when there is fencing and security for the entire site over which the licensee does not have a full control, the explosives operation should be clearly delineated from the rest of the mine. A written agreement signed by all parties would be required to ensure good communications between the mine/quarry and licensee and clarify the security of the licenced site.

Exact licensing conditions may vary based on the type of operation, and appropriate security measures may be taken depending on the site's location.

4.3 Control of Fire-Producing Devices

Relevant regulations

79 (1) *Smoking must be prohibited at the factory and any satellite site.*

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

4.4 Buildings in General

4.4.1 Construction

Relevant regulations

63 (3) *Every process unit, factory magazine and transport unit must be designed, constructed and installed to conform to good engineering practices. It must be constructed in a manner that prevents the accumulation of explosives or raw material in cracks and cavities and that minimizes the harm to people and property that could result from an ignition of the explosives or raw material. The construction materials must be compatible with the explosives to be manufactured, stored or transported and with the raw material to be used.*

Companies need to be aware of any applicable federal, provincial or municipal legislation and codes such as the Canadian Electrical Code (CEC), National Fire Code of Canada (NFC), the National Building Code of Canada (NBC).

Buildings containing explosives should be non-combustible, durable, and suitable for the local climate. The installation of any insulation, be it rigid or a spray-on, should meet a flame spread rating of 25 or less as defined in the NBC, and should have a mechanical protection or cladding on all walls and the ceiling of the building to facilitate the washdown of the building.

The use of "fire-resistant fabric" buildings would normally not be licensed for buildings with explosives as they are combustible.

Buildings should be equipped with two safety exits in addition to the roll-up doors or truck doors. The safety exit doors should be equipped with panic hardware. As per subsection 63(6), escape routes from every process unit, factory magazine, and raw material storage facility must permit all the people in a process unit, magazine, or facility to egress quickly and easily in an

emergency (be kept clear of obstruction).

Tires, flammable and combustible material, and contaminated parts should be stored in separate areas away from explosives equipment.

4.5 Washing / Maintenance Facilities

Relevant regulations

> **65 (7)** *Any building or equipment that is no longer being used to manufacture explosives must be decontaminated as soon as the circumstances permit. The building or equipment must be inspected by a supervisor to verify that it no longer contains any explosives.*
> **68 (1)** *Every process unit, factory magazine and transport unit and all equipment that is used to manufacture explosives must be maintained in good operating condition.*
> **98 (1)** *Every mobile process unit must be maintained in good operating condition.*

A factory with process vehicles will be licensed if it has full washing / maintenance capabilities, or it is linked to another licensed factory with full washing facilities / maintenance capabilities (that is indicated on the licence), to ensure vehicles are well maintained, are in good operating condition, and can ensure proper decontamination of mobile process units and other explosives equipment.

The washing facilities should have hot water and heating capabilities and have an impermeable floor/base to allow wash water and residues from washing to be collected and dealt with as per applicable legislation. The facilities should be protected from the elements to avoid additional volumes of water from precipitation that might become contaminated and require disposal.

Washing facilities may be separated from or located together with maintenance facilities. Locating washing and maintenance facilities together might reduce operational flexibilities.

The storage of bulk explosives under the same roof as maintenance or washing facilities will be considered on a case-by-case basis. This might entail restrictions on the operations (such as minimum one-hour firewall separations, one operation occurring at a time, etc.). Designs for such arrangements are to consider ignition and spread of fire and the possible consequences of an explosion during one activity.

4.5.1 Requirements for Separate Room for Washing Equipment

The following specification would typically meet the intent of section 20 and subsection 63(3) of the Regulations for a separate room.

The door from a separate room that is opening into the washing area would be fire-rated for a minimum of one hour and have an auto-closure installed. Separate rooms adjacent to hazardous operations (Class II Zone 2) should be suitably separated in accordance with the applicable codes (such as self-closing, tight-fitting, approved fire door), to ensure that they are not considered hazardous locations. A small opening, the size of a hose only, could be permitted through the wall to allow the wash hose(s) to pass through provided it is constructed in a manner compliant with the applicable code. The electrical classification between rooms would not be compromised (for example, a hose would not pass through an open door between rooms of different electrical classifications).

4.5.2 Wastewater and Scrap

Wastewater and scrap explosives should be collected and disposed of in a manner that meets any applicable provincial, territorial, or other responsible environmental authority.

4.6 Electrical Requirements

Relevant regulations
63 (7) *The lighting, electrical fixtures and wiring systems that are used in a process unit, factory magazine, raw material storage facility or transport unit must not increase the likelihood of an accidental ignition.*
63 (8) *Precautions that eliminate any possibility of an accidental ignition of electrostatic sensitive material (for example, grounding and control of humidity) must be taken in every process unit, factory magazine, raw material storage facility and transport unit.*
63 (9) *Every process unit or building in which a process unit is located must be protected from lightning strikes if it would not be safe to shut down manufacturing operations in the process unit during a thunderstorm.*

The following specification would typically meet the intent of subsections 63(7)-(9). A schematic for the electrical classification is given in Appendix A as a guide. It is important to note that the licensee needs to assess the particular types of risks involved in their operations to determine the appropriate electrical classification.

Typically, for washing / maintenance facilities, the classification would be EEMAC 4X. The International Standards (IP Protection Classification equivalency) is IP66 (totally protected against dust and strong jets of water). Existing facilities built to the EEMAC 4 classification would have the EEMAC 4 enclosures painted and well maintained and not show signs of corrosion.

For process production areas and laboratories, the Class 2, Zone 2 electrical classification would be used when electrical heaters are installed inside the process area. When ingredients that could produce combustible dusts are handled as part of the process, then the lighting would also meet the higher Class 2, Zone 2 electrical classification for hazardous locations. When no combustible dusts are involved in the process, then the electrical classification for lighting may be reduced to the lower EEMAC 4X classification. Typically, where motors are used for pumps and agitators/mixers, these would be the Totally Enclosed Fan Cooled (TEFC) type, with no exposed arcing contacts. The attached electrical enclosure would meet the minimum EEMAC 4X classification for electrical enclosures. Specific situations may warrant area “zone” classifications of a higher electrical class, within an open-concept production area, to meet special situations.

Extension lights would meet the EEMAC 4X classification. If washers and dryers are located in a washing / maintenance area, the installation would be 5 cm above grade to meet hazardous electrical requirements.

If an office space is part of the process building, it would meet the specification outlined in section 4.6.7 (Separate Room for Electrical Equipment) if the offices contain electrical fittings not meeting the EEMAC 4X classification.

A lunchroom for process building workers may be located within the building provided it would meet the specifications outlined in section 4.6.7 (Separate Room for Electrical Equipment) if it contains electrical fittings not meeting EEMAC 4X classification.

4.6.1 Electric Wash System, EEMAC 4X

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

4.6.2 Electric Wash System, Other Than EEMAC 4X

A wash system using an electric heater that is not meeting the EEMAC 4X classification would be located in a separate room.

4.6.3 Electrical Forklifts and Pallet Movers

Electrical forklift and pallet movers with an EE rating may be used in a process building and magazines. ES-rated forklifts may be used with packaged explosives in magazines.

Areas for charging of forklifts would meet Canadian Electrical Code requirements for adequate air exchange, any excess hydrogen. The areas would be adequately vented, no other flammables would be present, and lights and fans would meet Class 1, Zone 1 electrical ratings.

Forklifts would be charged in a separate room with a minimum one-hour fire wall. The door, charger and ventilation fan would be wired to prevent charging while the door is open. The door of the charging room would be kept closed at all times.

4.6.4 Electrical Room

The supply of electricity to an explosive building, switchgear, and distribution boards would be controlled by one or more master switches located outside the building or in a plant electrical room (sometimes called the motor control centre). The electrical room would have access from the outside, that is, no entry from the manufacturing side, to avoid the risk of a fire originating in the electrical room and spreading to the side containing explosives. A minimum one-hour fire wall would be used between the room and the explosives areas.

However, it is recognized that some larger sites may require a direct entrance, usually due to operational controls via programmable logic controllers (PLCs) located in the electrical room. Electrical rooms should be suitably separated from hazardous operations in accordance with applicable codes.

4.6.5 Power Supply

The primary power supply would be located so that it can be cut off by switches at one or more central points away from the hazardous area. The switch gear would be located outside the building in a weather-proof enclosure or separate electrical room with entrance from the outside. Power source lead-ins would be located underground at least 15 m from the building with no overhead electrical (i.e., no masts) connections. There would be a main power cut-off switch located on the last electrical pole.

4.6.6 Grounding

All equipment in explosives process buildings, would be grounded as per the CEC. Grounding through the plug would not be equivalent. Grounding cables would be connected directly to the equipment and to ground bars outside the building. Facilities would have ground fault interruption systems for all receptacles in the washing / maintenance facility.

4.6.7 Separate Rooms for Electrical Equipment

A separate room may be required for other equipment not meeting the EEMAC 4X classification, such as a hot-water heater, deep-water well pump, compressor, or the main electrical panel.

The electrical panel may be mounted either inside or outside the washing / maintenance facility. When inside (and not within a separate room), the regulatory intent would be typically met with EEMAC 4X classification. When outside the building (outdoors), the regulatory intent would be typically be met when the panel is enclosed in a weather-tight enclosure. The separate room housing the equipment noted above may also contain a fuel-fired wash system.

Larger facilities incorporating process production area(s), facility heating systems, electrical room, and washing / maintenance facilities all under one roof would have separate designated areas with, at a minimum, a one-hour fire rating between them.

When separate rooms are used with higher and lower electrical classifications, the rooms should be suitably separated from each other in accordance with applicable codes.

4.7 Parking of MPUs

Relevant regulations

> **63 (4)** *Every factory magazine must also be constructed so that it is well ventilated and resistant to theft, weather and fire.*
> **94 (3)** *A mobile process unit that contains explosives must be attended in person except when it is at the factory or a satellite site.*
> **94 (5)** *The explosives and raw material in the tanks and hoppers on a mobile process unit must be unloaded if the unit will not be used for three consecutive days. However, the fuel oil tank and prill hopper do not have to be unloaded.*

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

When a vehicle with more than a heel of explosives is parked to store explosives, the intent of subsection 63(4) for resistance to theft is met when:

- all points of access (e.g., explosives bins, hoppers, manholes and discharge valves) are locked (not only with cam lock lug rings) when not attended,
- the battery is isolated, and
- the keys to the vehicles are kept in a secure place to prevent theft.

If MPUs are stored with more than 2,000 kg of explosives and are not in a locked building or a secure site (fenced, monitor, etc.), then the intent of subsection 63(4) for resistance to theft is

met when vehicles are equipped and monitored with a GPS tracking and communication system including an anti-theft system.

When MPUs are stored in a locked building or on a secure site (lockable gate, fenced, monitored, etc.) then this might also meet the intent of theft-resistant and be licensed as such.

Generally, MPUs should not be loaded sooner or with more product than is required. Sometimes an MPU might have to return to a factory or a satellite site with more than a heel on board and sometimes it may have to park fully loaded (e.g., if the blast is cancelled after the vehicle has been loaded and it may be safer to park the vehicle overnight with more than a heel than to pump off the excess product).

Vehicles with more than a heel are to be parked according to the section on acceptable distance requirements.

4.8 Storage of Bulk Pumpable Explosives

Relevant regulations

> **63 (3)** *Every process unit, factory magazine and transport unit must be designed, constructed and installed to conform to good engineering practices. It must be constructed in a manner that prevents the accumulation of explosives or raw material in cracks and cavities and that minimizes the harm to people and property that could result from an ignition of the explosives or raw material. The construction materials must be compatible with the explosives to be manufactured, stored or transported and with the raw material to be used.*
>
> **63 (4)** *Every factory magazine must also be constructed so that it is well ventilated and resistant to theft, weather and fire.*

4.8.1 Installation

If road tankers are used as a permanent installation (i.e. refilled on site), the intent of section 63 is typically met if the tires are removed and concrete or steel pads are provided for dollies.

4.8.2 Security

Empty tankers, tanks, silos with a heel of less than 250 kg NEQ may be kept on a licensed site as though they were empty (but not decontaminated).

When more than a heel of explosives is stored, the intent of subsection 63(4) is typically met when all points of access (e.g., manholes and discharge valves) are locked (not only with cam lock lug rings) when not attended, and the king pin is locked, or the unit is immobilized (e.g. with the air access locked).

When tankers, tanks, silos, or IBCs are stored in a locked building or on a secure site (lockable gate, fenced, monitored, etc.) then this might also meet the intent of theft-resistant and be licensed as such.

4.8.3 Construction

The intent of subsection 63(3) is typically met if highway tankers being used for transport

conform to Transport Canada CSA B620 standards as referenced in CAN/CGSB 43.151, are in good mechanical condition, and have periodic inspections (refer to CSA B620 for the frequency of each test).

The intent of subsection 63(3) is typically met if the surface of the tank, that is in contact with the explosive, is able to withstand the constituents of the explosive and is non-porous and easily cleaned. Stainless steel is a good material for most emulsion or water gel explosives. Mild steel is corroded by the nitrate salts in the explosive and should be avoided. Polyethylene is a suitable material for water-based explosives, but it should be structurally able to withstand the elevated temperatures at which emulsion explosives are manufactured and stored.

As per subsection 63(3) any material used in or around the tanks must be compatible with the explosive. No brass or copper should be used in contact AN-containing mixtures.

As per subsection 63(3), emulsion storage tanks must be constructed in a manner that prevents accumulation of explosives and raw material in cracks and cavities. There should not be any enclosed containment areas such as framing support pockets. Any pocket area should be provided with a vent and drain or weep area to allow for decontamination.

The use of double-walled or multiple-walled tanks would not meet the intent of subsection 63(3) and would not be licensed. Emulsion silos with heated water/glycol jackets are not considered double-walled if they are designed, constructed and installed to conform to good engineering practices and constructed in a manner that prevents the accumulation of explosives or raw material in cracks and cavities and that minimizes the harm to people and property that could result from an ignition of the explosives or raw material.

4.9 Storage and Control of Raw Materials

Relevant regulations

63 (5) *Every raw material storage facility must be designed, constructed and installed to conform to good engineering practices. The construction materials must be compatible with the raw material to be stored in the facility.*

Storage areas for AN, fuel oil, or other raw materials should be located within the fence of either licensed factory or satellite sites. AN storage may be licensed to be outside the fenced area on a secure mine site.

Drums of petroleum products or chemicals should 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 should also be kept in a dry building, shed, or container.

4.10 Combustible Liquids, Explosive Fuel Phase, and Flammable Liquids

Relevant regulations

20 *A person who is carrying out an activity involving an explosive must take measures that minimize the likelihood of harm to people or property that could result from the activity, including measures to*

(a) *prevent an accidental ignition;*
(b) *limit the spread of any fire or the extent of any explosion; and*
(c) *protect people from the effects of any fire or explosion.*

The intent of section 20 is typically met if the storage tank for combustible liquids is located at a lower elevation than explosives or AN storage, and there is no possibility of combustible liquids to flow towards buildings with explosives. The fuel supply should have two independent shut-off valves between the storage tank and the point of discharge in the structure.

Feeds should be by means of a pump with automatic shut-off valves to prevent loss of contents in the case of siphoning. Shut-off valves should fail in the closed mode (shut in the event of power failure).

As per subsection 194(3), MPUs must be fuelled before explosives are loaded. If fueling is conducted at a mine or quarry located outside of a factory site, a written agreement, signed by all parties, is required to ensure good communications between the mine/quarry and licensee and clarify the emergency response procedures, and this must be described on a licence as per paragraph 60(6)(a).

When fuel is used as a process feedstock, it may be located in the operating building. Small quantities of flammable liquid should be in a CSA-approved flammable liquids storage cabinet.

The intent of section 20 is typically met if a fuel-fired wash system (employed as part of a washing / maintenance facility) is contained in a separate room with, at a minimum, a one-hour rated dividing firewall and a one-hour rated ceiling between it and all other facilities. The separate room may be located inside the washing / maintenance facility itself or attached to the main washing / maintenance structure.

Systems using gasoline or other flammable liquids would generally not be licensed.

4.11 Contaminated Parts and Materials

Relevant regulations

65 (1) *All raw material, explosive substances and explosives waste must be kept in closed containers that prevent spills and contamination. The contents of each container must be clearly identified on a label attached to the container.*

Contaminated pieces, such as pumps, should be locked away in a suitable location until decontaminated. Pieces should be as clean as possible before storage. The storage container should be made of material that is easy to clean or lined with an impervious lining.

Contaminated material, such as bags or cases, should be in locked away in a suitable location (an explosives magazine is not required for this) for subsequent disposal.
All contaminated pieces and waste containers must be clearly identified as per 65(1), and should be cleaned or decontaminated in a timely manner.

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

4.12 Laboratory

If small amounts of explosives are present, they must be stored in a manner that is resistant to theft (such as in a locked cabinet or in a locked room when not being handled) to meet the intent of subsection 63(4). Bullet-resistance is not required.

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

Internal combustion equipment using any fuel except diesel will be reviewed and licensed on case-by-case basis. The equipment should be equipped with fire extinguishers.

Gasoline or propane powered equipment would typically not be permitted and licensed inside a building with explosives. Fire extinguishers should be located nearby.

4.14 Hydraulic Systems

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

4.15 Pumps

Relevant regulations

> **60 (3)(d)** *a description of the principal manufacturing equipment to be used and its safety features;*
> **68 (8)** & **98 (10)** *For each progressive cavity pump, a separate logbook that sets out the operating history of the pump and the maintenance and repair work done to it must be kept at the factory for the life of the pump.*

Companies should consult the Guidelines for the Pumping of Water Based Explosives (available upon request). A hazard review and/or testing of the pump and explosives combination may be required prior to issuing a licence. Each progressive cavity pump must have its own log to record all maintenance and any work done on it as per 68(8) and 98(10), and a log is recommended for other pumps as well.

4.15.1 Progressive Cavity Pump (Fixed and Mobile Locations)

If a progressive cavity (PC) pump is used for pumping explosives, it should have:

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

- five-minute timer.

Rupture discs are not normally regarded as a safety shut-down system. A worn pump, when deadheaded, may not generate enough pressure to rupture the disc. Rupture disks are designed to provide protection against initiation caused by adiabatic compression.

Thermofuses are encouraged but may not protect against dry running.

Other protection against no-flow pumping might be acceptable if it has been demonstrated to be effective. If a temperature trip is used, it should be within 5 cm of the end of the rotor. If the PC pump will be operating above 400 psi, protection from initiation caused by adiabatic compression might be required.

A documented testing program should be in place for all the safety shut-down systems. Maintenance and/or repairs that require disassembly of progressive cavity pumps used to pump explosives must be carried out by competent person as per subsection 68(3). A pump logbook / maintenance record must be readily available for review at the factory as per subsection 98(9).

4.15.2 Other Emulsion or Water Gel Pumps

Pumps other than progressive cavity pumps may require less instrumentation, however, they should be instrumented in accordance with their potential for self-heating when deadheaded or dry running. The exact nature of the instrumentation should be based on a hazard analysis, testing, and/or ERD's Guidelines for the Pumping of Water Based Explosives.

4.16 Augers

Augers should have outboard bearings with 25 mm spacing between the end of the auger and the bearing. The 25 mm spacing should be an air gap between the mounting bolts that secure the bearing to the end of the auger. That air gap allows for visual inspection of the integrity of the seal at the end of the auger and also allows AN prills not to be trapped and forced into the bearing and/or the grease of the bearing. For vertical auger arrangement, for the bottom bearing, a fling disc should be installed between the end of the auger and the bearing to ensure that if the seal fails, the AN will not fall into the bearing by gravity alone. The augers should also have reverse flights or paddle sweepers to keep product from the auger seals. Augers should have stainless steel contact surfaces, sealed shafts to prevent build-up of explosives inside, and drive guard(s), including at the free ends of the bearings. Mild steel augers should not be permitted if aluminum is present.

4.17 Heating and Furnaces

Furnaces and heating units should be installed in separate rooms with a minimum one-hour fire rating, unless designed for the hazardous location. The room should have no direct access from the building or part of the building that contains explosives. Alternatively, the unit is to be located in a building located at least 8 m from any building that contains explosives. The building that contains explosives should be protected by a fire damper activated by a fusible link or other safety device to close and seal the duct as near to the furnace as reasonable.

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

surfaces.

4.18 Forklifts and Pallet Movers

A type DS forklift (Underwriters Laboratories ratings) may be used inside and outside but should not be stored in the building or room where explosives are being handled. When the equipment is used inside, doors should be open to provide ventilation. When used in a process area, forklifts should also have spark arrestors, and the exhaust be directed away from the explosive.

Type D forklifts with additional safety features for the exhaust, fuel and electrical systems would be considered for licensing.

Only Liquefied Petroleum-Gas Safety (LPS) power-rated propane forklifts with additional safeguards for the exhaust, fuel and electrical systems, would be considered for licensing.

Type D and Type LPS forklifts would be considered for licensing for outdoor operations.

There should be an easily accessible manual battery disconnect switch located within 30 cm of the battery, or as close as possible to isolate the battery. The disconnect switch should be labelled. A non-spill safety vent valve of sufficient size to prevent a pressure increase under fire conditions on the oil tank(s) should be provided.

Information on electrical requirements is located in section 4.6.3.

4.19 Ammonium Nitrate Prill

This section deals with the storage of solid ammonium nitrate prills and any reference to AN here means ammonium nitrate prills. AN is to be stored according to requirements in section on acceptable distance.

4.19.1 Handling and Storage of AN

Relevant regulations

> **63 (5)** *Every raw material storage facility must be designed, constructed and installed to conform to good engineering practices. The construction materials must be compatible with the raw material to be stored in the facility.*
> **64 (2)** *Every thing that is in a process unit, factory magazine, raw material storage facility or transport unit must be made from materials that are compatible with the explosives and raw material in the unit, magazine or facility.*
> **64 (3)** *However, a thing that is not compatible with an explosive or raw material in a process unit, factory magazine or raw material storage facility but is required for manufacturing or maintenance (such as a cleaning fluid or solvent) may be brought into the unit, magazine or facility for immediate use. It must be removed as soon as the circumstances permit after its use unless the division 1 factory licence or satellite site certificate authorizes its storage in the unit, magazine or facility.*
> **65 (2)** *Any spill of explosives, raw material or other material must be cleaned up as soon as the circumstances permit so as to eliminate any possibility of an ignition.*

The storage areas should be clearly indicated and delineated to prevent any accidental incursions.

Any areas on which AN is transferred should be fitted to provide a catchment area for spilled AN from which the AN can be readily collected. Spilled AN should 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 should be underlaid by a water-impermeable cover that collects and stores any runoff water. This water should then be disposed of in an environmentally acceptable manner. In some instances, it is possible to use the AN for re-processing.

AN transferred via dumping (e.g., from a trailer or tanker to an auger or bucket elevator feed hopper) should be protected from exposure to liquid 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 should not be powered by a gasoline engine.

Equipment used to transfer AN is to be in good working order in order as not contaminate the AN (for example, equipment that may leak oil) and cleaned if it has been used for other materials.

Controls should be in place to keep the AN dry and free from contamination, and storage should be vented. Threaded fittings and places where AN can be trapped should be avoided. The integrity of mild steel silos should be inspected regularly.

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 should be blocked, the king pin should 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 should be removed.

Companies should evaluate the risks of possible explosions of ammonium nitrate. For storage of large quantities of AN, ERD recommends that companies consider the information in the Good Practice Guide for the Safe Storage of Solid Technical Grade Ammonium Nitrate GPG 02 rev. 2 (March 2014) document by SAFEX International.

4.19.2 Security

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

AN prill storage located on secure, access controlled mine sites are considered to be locked by secure location.

Other requirements, as per Part 20 of the Regulations, might apply if the AN is being sold.

4.20 Ammonium Nitrate Solution

AN solution storage should be dyked and located separately from combustibles so that, in case of a fire involving the fuel phase material, the fire does not propagate to the other materials.

Appendix A

Electrical Schematic Guideline

Washing / Maintenance Facilities

LIGHTING: EEMAC 4X
HEATING Class I. Zone 2

Assumes no hazardous vapours or dusts.

MAIN AREA: EEMAC 4X
TEFC MOTORS

- Electrical room outside washing / maintenance facility or enclosed in a minimum1-hr. fire-rated separate room.
- All receptacles EEMAC 4X.
- All extension cords and portable electrical equipment, EEMAC 4X
- Ground fault for all receptacles.
- Building grounding.
- Poly coated flexible armoured cable wiring.
- Cable buried last 15 m with main power cut-off switch on last pole.

EEMAC 1

- Separate room for wash systems, compressor, etc.
- Minimum 1-hr. fire-rated walls/door and ceiling

FLOOR AREA: Up to 5 cm; Class I, Zone 2

SUMP AREA:
Class I, Zone 1

PRODUCTION (PROCESS) AREA

LIGHTING: EEMAC 4X when no combustible dusts are present; Class II, Zone 2 when handling combustible dusts
HEATING: Class II, Zone. 2

Assumes dusting on lights a problem, re: temperature of AN dust.

MAIN PROCESS AREA: EEMAC 4X
TEFC MOTORS

- As above for washing / maintenance facilities. MCC panel(s) would be enclosed in a minimum 1-hr. fire-rated separate room.
- Hazardous “Zones” may need to be established.
- Cable buried last 15 m with disconnect at last pole.

FLOOR AREA: Up to 5 cm; or Class I, Zone 2

SUMP AREA:
Class I, Zone 1