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Guidelines for Mobile Process Units Manufacturing Bulk Explosives (Division 1 & 2 Factory Licences)

Explosives Regulatory Division
Lands and Minerals Sector
Natural Resources Canada

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Canada



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1. INTRODUCTION

1.1 Purpose

These guidelines describe how stakeholders can meet the intent of the *Explosives Regulations, 2013* (the Regulations) for Mobile Process Units (MPUs) that manufacture bulk explosives at licensed sites. These guidelines will also be used by inspectors of the Explosives Regulatory Division (ERD) to assist in evaluating licence applications and conducting compliance verifications.

A holder of a licence must comply with all applicable requirements of the Regulations. These guidelines do not serve as a substitute to 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.

1.2 Scope

These guidelines cover all MPUs operating under factory licences or satellite site certificates issued according to Part 5, Division 1 or 2 of the Regulations. These MPUs manufacture bulk explosives classified as Type E.1 blasting explosives under the Regulations.

Some principles stated in this document may not be applicable for all types of MPUs (for example, exhaust system protection, MPUs operating on private sites, etc.).

These guidelines do not apply to pneumatically transferring explosives at a mine or a quarry where the device used for pneumatic charging has a maximum capacity of 100 kg and the explosives used in the pneumatic charging are in bags, each with a maximum capacity of 30 kg.

1.3 Other Documents

These guidelines should be used in conjunction with the Natural Resources Canada's *Explosives Act*, Regulations, and the following supporting documents (the latest versions or their equivalent):

- G05-01 - *Guidelines for Division 1 Licences for Bulk Explosive Facilities*; and
- G05-06 - *Guidelines for the Pumping of Water-Based Explosives*.

See the Explosives Regulatory Division's (ERD's) website for a list of all the latest publications.

The following list is also presented as a guide to other documents that should be considered (the latest versions or their equivalent):

- Standard CAN/CGSB 43.146: Design, manufacture and use of intermediate bulk containers for the transportation of dangerous goods, classes 3, 4, 5, 6.1, 8 and 9;
- Standard CAN/CGSB 43.150 Design, manufacture and use of UN Standardized drums, jerricans, boxes, bags, combination packaging, composite packaging and other packaging for the transport of dangerous goods, classes 3, 4, 5, 6.1, 8, and 9;

- Standard CAN/CGSB 43.151: Packaging, handling, offering for transport and transport of Explosives (Class 1);
- Standard CSA B620: Highway tanks and TC portable tanks for the transportation of dangerous goods;
- Standard CSA B621: Selection and use of highway tanks, TC portable tanks, and other large containers for the transportation of dangerous goods, Classes 3, 4, 5, 6.1, 8, and 9;
- Standard CSA B625: Portable tanks for the transport of dangerous goods;
- Canadian Motor Vehicle Safety Standards (CMVSS); and
- National Safety Code Standard 10: Cargo Securement.

The list is not meant to be exhaustive. There may be other pertinent federal, provincial, or municipal legislation or codes by which companies may have to abide.

1.4 Definitions

Applicable definitions include the following:

Ammonium Nitrate Emulsions (ANEs) are ammonium nitrate-based emulsions, suspensions or gels classified as UN3375 and meeting the requirements of Special Provision 309 of the *Model Regulations on the Transport of Dangerous Goods*, published by the United Nations.

Bulk explosives are water-based explosives such as emulsions, slurries, water gels (typically classified as UN0332), and ANEs (classified as UN3375) that are stored, manufactured, transported, or used in bulk state. The term includes ANFO (classified as UN0331) and ANFO blends with water-based explosives (classified as UN0332) in a bulk state. Bulk explosives are classified as Type E.1 blasting explosives under the Regulations.

Manufacturing includes the following activities:

- a) Making or manufacturing an explosive substance from raw material or from another explosive substance;
- b) Making or manufacturing an explosive article, including the assembly of an article from explosive and non-explosive components;
- c) Altering or remaking an explosive substance or explosive article by modifying its chemical composition (for example, by gassing or blending) or by subjecting it to physical processes with the input of energy (for example, pneumatic handling, pumping, shearing or thickening);
- d) Dividing an explosive into its components or unmaking, breaking up or in any manner destroying it;
- e) Packaging explosives; and
- f) Testing an unauthorized explosive or testing an explosive to assess its potential for a use other than its authorized use.

Mobile process unit (MPU) is a vehicle or portable machine that is used at a factory, satellite site or client site to carry out an explosives manufacturing operation. The term mobile process unit includes portable process units which may not necessarily be wheel-mounted but can also include borehole loading devices mounted on trailers or skids.

2. MPUS AND THEIR EQUIPMENT

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.*
- 93 (1)** *Every mobile process unit must be designed and constructed 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 and transported and with the raw material to be used.*
- (3)** *All tools, equipment, hoses and hydraulic systems in or on a mobile process unit must be designed, constructed and installed to conform to good engineering practices.*
- (4)** *Every thing that is in or on a mobile process unit must be made from materials that are compatible with the explosives and raw material with which they could come into contact during manufacturing operations.*
- (5)** *All equipment designed to control safety-critical parameters on pumps, and on other process equipment that puts energy into explosives, must be installed and maintained in good condition so that the equipment operates while the pumps and process equipment are in use.*
- 98 (1)** *Every mobile process unit must be maintained in good operating condition.*
- 193 (1)** *The carrier must ensure that the following requirements are met:*
- (a) the vehicle to be used to transport explosives is in sound mechanical condition and capable of safely transporting explosives, meaning that any dangers including those related to gasoline engines, heaters and lights, refrigeration and climate control systems and hot components of the exhaust system have been addressed; and*
 - (b) the vehicle is fuelled, the oil level and tire pressure are checked and all required servicing of the vehicle is carried out before the loading of explosives begins.*
- (3)** *The driver must ensure that the vehicle, while transporting explosives, is inspected daily to verify that the following requirements are met:*
- (a) the fire extinguishers are filled and in good working order;*
 - (b) the electric wiring is completely insulated and firmly secured;*
 - (c) the fuel tank and fuel lines have no leaks;*
 - (d) the chassis, engine, pan and bottom of the body are clean and free from excess oil and grease;*
 - (e) the brakes and steering apparatus are in good condition; and*
 - (f) the tires are not worn smooth or visibly defective.*

MPUs built according to principles in these guidelines would typically meet the intent of section 93, 98(1), and 193(1) and (3) of the Regulations.

2.1 General

Only UN0332 and UN3375 Type E.1 explosive and raw materials (such as gassing solution or ammonium nitrate and fuel for making UN0331) may be transported in a MPU for the manufacture of unsensitized and sensitized bulk explosives.

A MPU delivers bulk explosives directly into boreholes or transfers bulk explosives. These are defined as manufacturing activities and, therefore, must be done in accordance with a manufacturing certificate or a factory licence approved by ERD (unless exempted under Division 3 of Part 5 of the Regulations).

Transporting and manufacturing explosives with a MPU can be hazardous and should be undertaken with due attention to truck design, tank design, pump design, etc., to meet the intent of the Regulations. Augers, pneumatic hoses, pumps and their safety devices need to be carefully selected for the intended purpose.

Brass and copper should not be used where they could come into contact with ammonium nitrate (AN) or ammonium nitrate-based substances. 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).

MPUs should be clearly marked with the company name and unit number.

2.2 Chassis

The chassis of a MPU should be selected to provide sufficient robustness, stability, and safety for the intended purpose. ERD has determined that a vehicle built to meet the requirements of Transport Canada (TC) CSA B620, B621, and Canadian Motor Vehicle Safety Standards (CMVSS) would meet the intent of subsection 93(1) of the Regulations. It is recommended to select the chassis by working in conjunction with the process equipment manufacturer.

TC's requirements call for appropriate lighting, demonstration of center of gravity calculations, correct selection of chassis for Gross Vehicle Weight Rating (GVWR) and Gross Axle Weight Rating (GAWR) concerning weight distribution, adequate braking for a fully loaded vehicle, and other applicable provisions. These requirements are part of the National Safety Mark (NSM) process administered by TC and apply to all intermediate and final-stage manufacturers who assemble or alter a vehicle prior to its sale to the first purchaser, whether imported to or originating in Canada.

All shops that assemble or alter used process equipment, or re-install it on a new chassis for their own use, should demonstrate that the final assembly meets all applicable CMVSS. The applicant is to provide final stage CMVSS confirmation (document, label or letter for chassis). Where additional verification is necessary to verify compliance for MPUs travelling on public roads, ERD might also request engineering drawings, center of gravity calculations, and/or a statement from a professional engineer proficient with the standards, as to compliance with CMVSS.

2.3 Exhaust

The exhaust should 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 pipes should be positioned so that no explosives storage or explosives handling components are above them. Horizontal portions of exhaust pipes that could be exposed to drips of hydraulic fluid, oil or emulsion should be shielded.

2.4 After-treatment devices

There are typically four vehicle mounting configurations available for after-treatment devices (ATDs) used by the original equipment manufacturers (OEMs). Two of these would extend well behind the truck cab – see Figures 1 and 2. The location of these ATD systems would be under or beside any process equipment, thus posing a potential fire or explosion risk as a result of spills of emulsion or process diesel fuel or when in close proximity to rubber hose reels. ERD has determined that such configurations would not meet the intent of sections 20 and 93(1) of the Regulations.

The only vehicle exhaust configurations that would be typically licensed without reconfiguring the process equipment on a single chassis are:

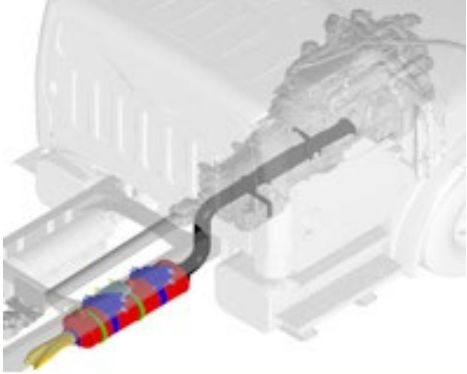
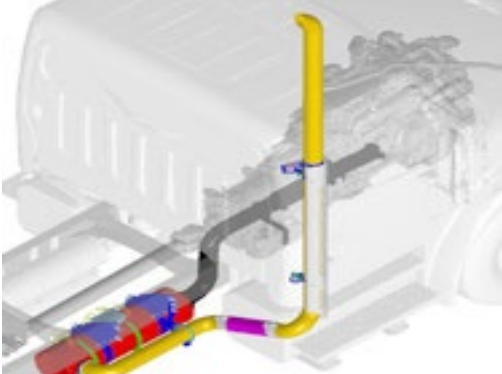
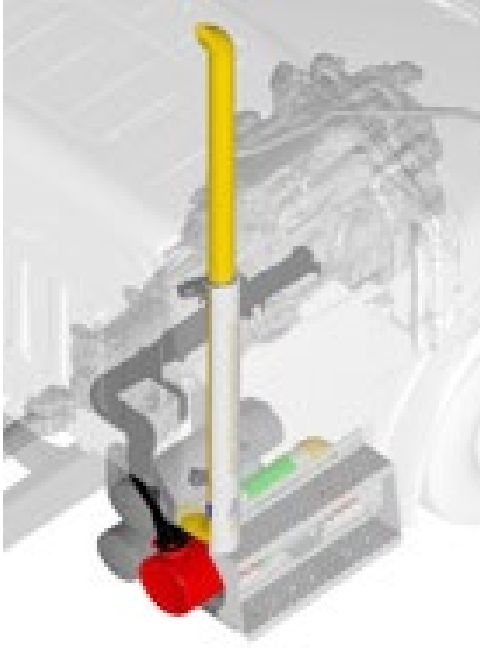
- a) Under step mounted, horizontal after-treatment device (ATD) with a pillar mounted vertical tailpipe behind the cab – see Figure 3; or
- b) Outboard frame, vertical mounted after-treatment device (ATD) with a top stack, all mounted directly behind the cab – see Figure 4.

If either of the other two configurations extending behind the cab is installed by the OEM, i.e.:

- a) Inboard frame mounted horizontal after-treatment device with horizontal tailpipe (see Figure 1); or
- b) Inboard frame mounted horizontal ATD with pillar mounted vertical tailpipe routed under the frame (see Figure 2)

then the process equipment should be set back on the chassis frame rail so that all of it is aft of the ATD system, or the process equipment should be reconfigured so that no portion is located in, under, beside or over the ATD system, i.e., vertical clearance should be maintained for the full height of the process equipment located directly above the ATD. In the presence of explosives, a minimum clearance of 30 cm (12 inches) in all directions is highly recommended for all options above.

Note: OEMs typically stress the need to maintain adequate clearances from wood, rubber, cloth, electrical wiring, brake hoses and tubing due to the high temperatures. Therefore, a portable fire extinguisher should be installed in close proximity to the ATD so as to be readily available to an operator in the event of a problem. A metal shield between the ATD and the power take-off (PTO), hydraulic pump and associated hydraulic hoses is strongly encouraged to prevent hydraulic fluid from spraying onto the ATD at any time if a hose delaminates. Additionally, it is highly recommended to locate and direct at least one nozzle of an after-market engineered fire suppression system in the area of the ATD and PTO to suppress a potential fire.

	
<i>Figure 1 - inboard frame mounted horizontal after-treatment device with horizontal tailpipe</i>	<i>Figure 2 - inboard frame mounted horizontal ATD with pillar mounted vertical tailpipe routed under the frame</i>
	
<i>Figure 3 - under step mounted, horizontal after-treatment device (ATD) with a pillar mounted vertical tailpipe behind the cab</i>	<i>Figure 4 - outboard frame, vertical mounted after-treatment device (ATD) with a top stack, all mounted directly behind the cab</i>

2.5 Tires

As per subsections 193(1) and 193(3)(f) of the Regulations, the driver must ensure that the vehicle, while transporting explosives, is in good mechanical condition, and is inspected daily to verify that the tires are not worn smooth or visibly defective.

2.6 Engine fuel tanks and lines

Transfer lines between dual tanks should have a shut off valve at each tank. The shut-off valves should be accessible to the operator and secured against chaffing, kinks or other causes of mechanical damage.

2.7 Electrical

The battery should be enclosed in a battery box. To isolate the battery, a labelled and easily accessible manual battery disconnect switch, a manual reset breaker, or a factory installed battery isolation device should be located close to the battery. The switch or breaker should be located on the positive line.

Note: The factory installed battery isolation device should meet the same intent as the manual devices, i.e., isolate the battery when the MPU is not in use and disconnect the battery in an incident/accident situation.

Where possible, the switch should be conveniently located on the driver's side of the vehicle. The switch should be no more than 30 cm from the positive battery terminal and the line to the switch should be protected from rubbing and abrasion that could cause a short circuit.

If it is necessary to keep the truck's engine management system or part of the control system energized most of the time, the battery cut-off switch may be bypassed by a circuit protected by a low amperage fuse. This must be indicated on the Form F05-MPU application.

Note: When operating near electric detonators, it is recommended to consult document SLP 20: Safety Guide for the Prevention of Radio Frequency Radiation Hazards in the Use of Commercial Electric Detonators (Blasting Caps) by the Institute of Makers of Explosives (IME) to evaluate possible hazards.

2.7.1 Wiring

MPU wiring behind the cab should 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 should be sealed, and entry fittings designed for the purpose should be used. Sealed wire entries into motors or equipment should meet EEMAC/NEMA 4x or IP 65. A short flexible connection is allowed from the motor to a junction box.

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

All wiring should be protected by bushings and supports if mechanical damage is likely when it passes through bulkheads or is close to sharp edges. All wiring should have overcurrent protection. All exterior electrical boxes should be EEMAC/NEMA 4X with sealed wire entries.

Notwithstanding 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.

2.7.2 Wiring for low amperage

Class 2 circuits can be used for very low amperage wiring, such as is often used for control circuits. Class 2 circuits are limited voltage and current. Class 2 circuits of 0-20 volts are limited to less than 5 amps. These

circuits are usually suitable for instrumentation and control. On MPUs, these circuits could be used for solenoid valves, sensors and transducers and possibly LED lighting. Overcurrent protection of different ratings should not be of an interchangeable type.

Class 2 circuits meeting the requirements of section 16 of the *Canadian Electrical Code* are acceptable on MPUs.

2.8 Fire extinguishers and fire suppression system

A minimum of two fire extinguishers of at least 4-A:40-BC rating must be present on explosives vehicles as per subsection 191(8). MPUs should also have an engineered fire suppression system for the engine compartment. If aluminum is used as part of the formulation, a fire extinguisher compatible with aluminum should be present.

Fire extinguishers should be inspected monthly, and records of inspection kept. Engineered fire suppression systems should be inspected every 6 months (or sooner if required by another authority having jurisdiction).

MPUs currently licensed with a third extinguisher mounted to discharge onto likely fire sources in the engine compartment, such as the alternator or hydraulic pump, can continue to be licensed until the end of life of the cab and chassis.

2.9 Process Bins and Tanks

2.9.1 Small means of containment

A small means of containment for dangerous goods (capacity of 450 L or less) should be designed, constructed, filled, closed, secured, and maintained so that under normal conditions of transport, including handling, there will be no accidental release of the dangerous goods that could endanger public safety. Small means of containment for dangerous goods, other than explosives, should conform to CGSB 43.150.

All sight glass material on small means of containment should be a strong, resilient (non-brittle) material. There should be a shut-off valve at both ends of the sight glass. Sturdy guards should protect the sight glass on all sides. The container itself may constitute one or more of the guards. A sturdy guard should be installed on the visible side of the sight glass (such as expanded metal).

Note: Some ingredients used for the manufacture of explosives may not be classified as dangerous goods. However, the means of containment must still be designed, constructed and installed to conform to good engineering practices.

2.9.2 Large means of containment

A large means of containment for dangerous goods (capacity greater than 450 L) should be selected in accordance with:

- Standard CAN/CGSB 43.151: Packaging, handling, offering for transport and transport of Explosives (Class 1);

and constructed and marked as per:

- Standard CAN/CGSB 43.146: Design, manufacture, and use of intermediate bulk containers for the transportation of dangerous goods, classes 3, 4, 5, 6.1, 8 and 9;
- Standard CSA B620: Highway tanks and TC portable tanks for the transportation of dangerous goods;
- Standard CSA B621: Selection and use of highway tanks, TC portable tanks, and other large containers for the transportation of dangerous goods, Classes 3, 4, 5, 6.1, 8, and 9; and
- Standard CSA B625: Portable tanks for the transport of dangerous goods.

Sight glasses should not be present on large means of containment.

Physical protection and shut off valves should be designed and maintained for all process tanks to minimize chances of a spill in the event of an accident or rollover.

After any accident that involves TC 406, TC 407, TC 412, or TC 423 tanks, a tank inspection should be conducted, as per CSA B620 before the tank returns to service. Any repairs to a tank should be made in compliance with its original design by a registered repair facility. Overlay tank patches should not be used. This is to ensure the means of containment on a MPU still meets the intent of being constructed and installed to conform to good engineering practices.

Modifications to the tank, as per specifications set out in CSA B620, should be done by a company registered with TC to modify tanks. A chassis remount is considered a modification and is covered in B620.

Highway tanks should meet the appropriate design and working pressures for the particular TC (or MC/DOT) standard, venting and pressure relief, rollover and spill protection plus an appropriate discharge valve meeting the standards.

Note: As per subsection 98(5) of the Regulations, a mobile process unit must be decontaminated at a factory before it is taken outside the factory for maintenance or repair.

Note: Some ingredients used for the manufacture of explosives may not be classified as dangerous goods. However, the means of containment must still be designed, constructed and installed to conform to good engineering practices.

2.9.3 Ammonium nitrate bin

AN bins should be stainless steel or aluminum where in contact with the product and should have 25 mm (one-inch) stainless steel grating in the hatch openings. All points of access (e.g. hatches, hoppers, manholes, outlets, hoses, and discharge valves) should be lockable and locked when required by the Regulations. The hatch design should prevent water ingress. All nuts used to assemble the bin should be tack-welded to the bin or locked to prevent them from coming loose. If mild steel is used, AN bins should have a protective finish.

2.9.4 Process fuel oil tank

Process fuel oil tanks should be selected and used in accordance with B621.

Process fuel oil tanks should be of metal construction, have a non-spill air vent with filter, a fusible fill cap, and shut-off valves at all outlets. Non-spill fusible tank caps minimize spills in a rollover situation and vent to prevent a pressure rise when exposed to fire.

The tanks should be inspected periodically in accordance with Appendix A.

Proper venting, sized for the volume of the process fuel tank, should be provided as per CSA B620.

Safety venting is used to prevent tank internal pressure from rupturing the tank body, seams, or bottom opening if exposed to fire. Non-spill air vents (such as a ball check or spring release) are used to ensure that, in a rollover situation, fuel is confined to the tank and will allow air in to prevent the tank from collapsing when the fuel is pumped out. The air vent may be combined with the safety vent or be a separate item. Both mechanisms should be able to withstand the hydraulic pressure exerted from within during normal operation, as well as in a rollover situation.

2.9.5 MPUs using highway tanks

ERD has determined that MPUs with highway tanks used for the transport and pumping of bulk explosives would meet the intent of subsection 93(1) if the highway tanks follow TC 407, TC 412 or TC 423 specifications in accordance with Standard CSA B620, (as referenced in CAN/CGSB43.151 under explosives packing method CEP 02) and TC's Equivalency Certificate 13715. This includes the appropriate design and working pressures, venting and pressure relief, rollover and spill protection, in addition to guarding the discharge valve and providing a substantial bumper.

Surfaces in contact with product would be made of stainless steel. Where insulation is used, the insulation requirement for TC 423 in accordance with CSA B620 would be followed. The exterior of the tank would be covered by insulation, a vapor barrier, and a metal jacket. The vapor barrier would protect the insulation from weather and spills. The barrier would be smooth and flexible and would have a flame spread rating of 25 or less.

The insulation should be compatible with the lading. It should be rigid and non-porous. It should be at least 2 in. (5 cm) thick and not separate from the tank, as separations would create spaces where product could be trapped. The insulation would meet at least one of these requirements:

- a) It would be non-combustible in accordance with ASTM/ULC/CAN;
- b) It would have a fire endurance rating of at least 15 min; or
- c) It would have a flame spread rating of 25 or less.

As per CSA B620, TC 407, TC 412 or TC 423 tanks would be mounted to a new chassis and be reviewed by an engineer registered with TC for tank design. TC 412 and TC 423 tanks would be inspected periodically in accordance with Appendix A.

The applicant is to provide a coded tank certificate showing Manufacturer's Design Identification Number (MDIN), tank serial number, vehicle identification number (VIN) and tank capacities. Where additional verification is necessary to verify compliance for MPUs travelling on public roads, ERD may request to have

the entire design reviewed by a third-party TC Authorized Design Review Agency to ensure compliance with the CSA B620 (the assembly shops are registered with TC, with the reviewer considering the entire design package, not just the tank by itself). ERD may also request the stakeholder to have the assembly inspected by a third-party reviewer to ensure the vehicle is in compliance with TC's tank specifications.

Note: Highway tankers used for the transport of emulsions/water gels/slurries/ANEs (not MPUs) are addressed separately in CAN/CGSB-43.151, CEP 02).

2.9.6 MPUs using Intermediate Bulk Containers (IBCs)

The intermediate bulk containers (IBCs) should meet CAN/CGSB-43.146 and be selected as per CAN/CGSB-43.151. These are Code 31 IBCs that are tested every 30 months as per CGSB 43.146 section 12.6 at a registered facility.

Typically, only one IBC with a maximum capacity of 3,000 L would be licensed to be transported on a MPU. The IBC should be properly fixed to the vehicle, i.e., not strapped but bolted or clamped with properly engineered attachments that meet Cargo Securement Standard 10.

The applicant is to provide a certification by an engineer declaring that the chassis, IBC and other equipment is suitable for the intended use (addressing risks of no rollover protection, no pressure testing, no guarding the discharge valve and not providing a substantial bumper, etc., that do not meet TC requirements for highway tanks). The certification is to be renewed annually, and records of the certification kept.

2.9.7 MPUs using UN portable tanks

The addition of mixing equipment and pressure relief valves to UN portable tanks would make them unsuitable for use as a means of containment on a MPU and would not be licensed.

2.9.8 MPUs with no installed means of containment

The explosives are transported to the site separately from the MPU with the pumping equipment, and they are connected at the point of use. The pumping equipment should be cleaned (remove as much explosives as practical, including any spills or excess explosives that could spill easily during transport or could increase the risk of accidents during transport) before returning to public roads.

2.9.9 Hatch on explosives tanks and points of access

All points of access (e.g. hatches, hoppers, manholes, outlets, hoses, and discharge valves) should be lockable and locked when required by the Regulations. When on mine or quarry roads and attended, this is not required. Hatches should be designed as per CSA B620. There should be a 25 mm (one-inch) wire mesh basket in the opening and adequate drainage around the hatch.

2.9.10 Gassing solution tanks

The gassing solution tank should be made of material compatible with the solution. Proper pressure relief should be fitted as necessary. Hosing should not be used as relief.

2.9.11 Aluminum bin

The bin holding the raw material aluminum should be non-rusting and sealed against water.

2.10 Delivery Equipment**2.10.1 Pumps**

Pumps (make, model and safety devices) used for pumping explosives or AN liquor are approved by ERD via the F05-MPU application form. A quantified risk assessment (QRA) or pump hazard and operability review (HAZOP) should be included with the application for any manufacturing operation that has not previously been used in Canada to manufacture that explosive. Companies should consult ERD's G05-06 *Guidelines for the Pumping of Water-Based Explosives* for details on selection, operation, and maintenance of pumps.

2.10.2 Delivery hose reel

There should be a drip tray under the delivery hose reel, a holder for the loose end of the delivery hose to catch product dripping from the hose, and a hydraulic counterbalance valve to prevent free-wheeling. It should have appropriate safety guards attached.

2.10.3 Augers

Augers should have outboard bearings with 25 mm spacing between the end of the auger and the bearing. The 25 mm spacing should have 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 arrangements, the bottom bearing should be equipped with a disc 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 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 used for aluminized product.

2.10.4 AN or ANFO blowers for pneumatic loading

Vane (star) feed pneumatic systems feed the AN or ANFO through an airlock valve into the blow hose for loading the holes. An air blower is normally used instead of a compressor.

Semi-conductive hose should not have metal wire in its construction. It should have a resistance of at least 10,000 ohms and less than 2,000,000 ohms over its entire length, with a resistivity per foot of at least

1,000 ohms. Such hose will bleed off static slowly without giving a shock to the operator or, more importantly, to the detonator in the borehole. All flanged joints should maintain electrical continuity.

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. Appropriate precautions should be taken by grounding vehicles and loaders and using static-resistant conductive or dissipative liners. For more information refer to the ISEE Blasters Handbook, Chapter 18, Control of Static Electricity in Pneumatic Loading.

2.11 Markings

Marking of means of containment should conform to the Transportation of Dangerous Goods (TDG) Regulations, even when the vehicle is on a closed site. This includes CSA B620 tank marking as well as safety marks on large and small means of containment.

2.12 Placarding

As per subsection 191(12) of the Regulations, any dangerous goods safety marks that are required by the TDG Regulations to be displayed when the vehicle is transporting explosives on a public highway must also be displayed when the vehicle contains explosives and is not on a public highway.

3. MPUS NOT TRAVELLING ON PUBLIC ROADS

When feasible, the principles described in this document should be followed even when MPUs do not travel on public roads. However, MPUs that do not follow the principles of these guidelines (such as vehicles not having coded tanks or not meeting CMVSS) may still meet the intent of the Regulations and be licensed to operate. For MPU's that do not comply with TC's public roads safety requirements, ERD will ask the following information as part of an application and compliance verification:

- a) Details of the maintenance and inspection programs for the MPU, which confirm that the chassis, tanks, and other equipment, are suitable for use. The programs should be performed at least annually, and records of the reviews be kept; and
- b) Confirmation of a regular verification program for all dangerous goods tanks on the MPU.

4. DOCUMENTATION

4.1 General

Relevant Regulations

165 (1) *A holder of a licence, permit or certificate may carry out any activity involving an explosive that is authorized by the document and must do so in the manner specified in it.*

New MPUs and changes to existing MPUs need to be approved by ERD before the equipment can operate under a factory licence or certificate. Any modification to the MPU that would result in changes to what was originally approved on the licence or certificate, must be re-approved and licensed by ERD before the MPU can operate.

MPUs are first reviewed and approved-in-principle for licensing acceptance via an application Form F05-MPU. The MPU can then be attached to an explosives factory licence or certificate via amendment to the factory or certificate.

4.2 Review for licensing acceptance

ERD will issue a “T” number for each MPU following review of the application information. One copy of the reviewed application will be retained, and a second copy will be returned to the applicant for their records.

All correspondence regarding a MPU must reference this “T” number. The MPU Form F05-MPU does not constitute a stand-alone licence or a certificate to operate.

4.3 Incorporating a MPU into an explosive licence

Upon ERD’s review of Form F05-MPU, the MPU can then be assigned to the site licence where it will be operating via the licence amendment. All of the information from the form F05-MPU does not have to be transferred to the site licence. Only the ERD “T” number and the company unit number have to be incorporated to the site licence. All MPUs attached to the site must be listed on the appropriate site licence forms.

Copies of the approved MPU form F05-MPU must be available at the site where the MPUs are based.

Any changes to the MPU that result in changes to what was approved by the licence, must be approved and licensed by ERD before the MPU can operate.

5. APPLICATION FORM F05-MPU

Relevant Regulations

60 (1) *An applicant for a division 1 factory licence or a satellite site certificate must complete, sign and send to the Chief Inspector of Explosives the application form provided by the Department of Natural Resources.*

(3) *The application must include the following information about the factory or satellite site:*
(e) a description of each mobile process unit to be used;

Information to be submitted, as applicable, to ERD are:

- a) F05-MPU: Application for mobile process unit review;
- b) A QRA, or HAZOP for all the pumps;

- c) Pictures of the MPU;
- d) Final stage vehicle CMVSS document, label, or letter for chassis for MPUs travelling on public roads;
- e) Coded tank certificates showing MDIN, tank serial number, VIN, and tank capacities for MPUs travelling on public roads; and
- f) Details of the maintenance and inspection programs for the MPU, which confirm that the chassis, tanks, and other equipment, are suitable for use for MPUs not travelling on public roads (if there is no final state CMVSS document and coded tank certificates).

Many sections on the Form F05-MPU have “Yes” and “No” checkboxes. Please select “No” when something is not applicable and provide details in the section for “Description, notes, comments”. The pictures should show: right side, left side, front, back, and top of the MPU and a picture of any tank specification plates. Additional photographs, flow diagrams or a general assembly should be attached for complex MPUs to assist with the description. Annotated photos and/or detailed drawings of the pump safety system or any other unusual or complicated equipment should also accompany the Form F05-MPU.

5.1 Vehicle and products

- a) Licence plate number if applicable;
- b) Make, model, serial number, and year of chassis;
- c) Gross Vehicle Weight Rating (GVWR), kg;
- d) Type of process (e.g., ANFO, pump truck with gassing, ANFO blends with water-based explosives, straight pumping);
- e) Products transported (list by UN dangerous goods number);
- f) Products manufactured/pumped (list by UN numbers).

5.2 Automotive

- a) Is final stage CMVSS confirmation (CMVSS document, label, or letter for chassis) attached?
- b) If no CMVSS confirmation (not on public road), is certification by a qualified person - declaring that the chassis, tanks and other equipment are suitable for the intended use - attached?
- c) Is the exhaust extended vertically behind the cab and discharged above the vehicle production equipment and is it further protected with a heat shield so as not to cause burning, charring or damage to the electrical wiring, fuel system, ingredient hoppers, fuel tanks or any combustible part of the vehicle?

- d) Does the exhaust have an ATD?
- e) Is there a protective shield between the under-chassis exhaust system and any hydraulic pumps in close proximity?
- f) If dual fuel tanks are fitted, does the line between the two tanks have shut off valves at each end?
- g) Are the electrical wiring and lighting systems aft of the truck cab completely enclosed in sealed conduit or comprised of TECK 90 cable with connectors directly into the fixtures? If not, are the exceptions Class 2 circuits? Is all wiring adequately supported and bushed when passing through metal holes to minimize abrasion?
- h) Is the battery enclosed, equipped with a well labeled manual disconnect switch, easily accessible to the operator, connected to the positive side of the battery and located within approximately 30 cm of the battery?

5.3 General safety

- a) Are there two fire extinguishers of at least 4-A:40-B,C rating present on explosives vehicles?
- b) Is there an engineered fire suppression system for the engine compartment?
- c) Are applicable *TDG Regulations* safety placards on all four sides of vehicle?
- d) No brass, bronze or copper in contact with AN or AN-based explosives?
- e) Are wires and hoses protected from rubbing and impact?
- f) Is there a unit number on vehicle?

5.4 Ammonium nitrate bin

- a) The number of AN bins and capacity for each bin.
- b) The material used to make the AN bins, i.e., mild steel, stainless steel, aluminum. If mild steel, note the protective finish.
- c) All points of access are lockable?

5.5 Process fuel oil tank

- a) Tank capacity;
- b) TC tank specifications (coded tank certificate, showing MDIN, tank serial number, VIN and tank capacities);

- c) When not on public road, and no TC coded tank, provide a certification by a qualified person declaring that the tank is suitable for the intended use;
- d) Are there shut-off valves at all outlets for tanks over 450 L?
- e) Is non-spill and pressure release venting fitted to tank over 450 L?
- f) Are manual or self-closing valves fitted on all sight gauge level indicators for tanks 450 L or less?
- g) Describe fuel pump and nozzle oil injection system.

5.6 Explosives tank or IBC

- a) Tank capacity;
- b) Construction material;
- c) TC tank specifications (coded tank certificate, showing MDIN, tank serial number, and VIN);
- d) When not on public road, and no TC coded tank, provide a certification by a qualified person declaring that the tank is suitable for the intended use;
- e) When on public road, describe the standard/design of an IBC and certification by an engineer declaring that the chassis, IBC and other equipment is suitable for the intended use (addressing risks of no rollover protection, no pressure testing, no guarding the discharge valve and not providing a substantial bumper, etc. that do not meet TC requirements for highway tanks);
- f) All points of access are lockable?

5.7 Gassing solution tank

- a) Tank capacity;
- b) Material of construction.

5.8 Other tanks/bins

- a) Tank capacity;
- b) State the type of tank and materials contained;
- c) Provide tank details.

5.9 Progressive cavity pumps

- a) State the make, type, size and model number;

- b) Describe the pump and list all the safety features of the pump safety systems, including details of controls used, set points, bursting disk pressures, RPM limits, locations, etc. Include QRA, or HAZOP to demonstrate that the pump system is safe for the application if that operation has not previously been used in Canada to manufacture that explosive.

5.10 Other Explosives Pumps

- a) State the make, type and model number;
- b) Describe the pump and list all the safety features of the pump safety devices, including details of controls used, set points, bursting disk pressures, RPM limits, locations, etc. Include QRA or HAZOP that demonstrate that the pump system is safe for the application if that operation has not previously been used in Canada to manufacture that explosive.

5.11 Delivery Hose Reel

Give general details including reel and hose size.

5.12 Augers

- a) State size and construction materials.
- b) Describe the auger location, i.e., overhead (installed at front or rear) or side discharge.
- c) Is there is a minimum of 25 mm open exposed off-set for auger stub shaft bearings?
- d) For vertical auger arrangements, is the bottom bearing equipped with a disc installed between the end of the auger and the bearing?

5.13 Pneumatic AN or ANFO blowers

- a) Describe the blower ((e.g. make, model and capacity);
- b) State the discharge hose size and confirm that it is semi-conductive.

5.14 Controls

- a) Are the process controls in *EEMAC 4 (CEMA 4)* enclosures or better with sealed wire entries?
- b) State the location of the controls and its operation. If pump operation is controlled remotely via RF, a hazard review by an electrical specialist is to be provided.

5.15 Hydraulics

- a) State the location of the hydraulic reservoir and any other significant details.

5.16 Other information

- a) Provide any other information necessary to describe the truck.
- b) Describe other equipment not on the MPU which is required to operate the system (such as portable pumps or dewatering equipment).
- c) Include pictures of right side, left side, front, back, and top of the MPU and a picture of any tank specification plates. Additional pictures, flow diagrams or a general assembly should be attached for complex MPUs to assist with the description. Annotated photos and/or detailed drawings of the pump safety system or any other unusual or complicated equipment should also accompany the Form F05-MPU.

APPENDIX A - PERIODIC INSPECTION AND TEST INTERVALS

This below table is a reproduction of Table 7.2 from CSA B620-20. The latest version of CSA B620 should be used as the official reference. Some requirements from Table 7.3 of B620-20 may also be applicable (for example, all insulated tank trucks and trailers require annual inspection).

Table A.1 - Periodic inspection and test intervals

Description of tank	Clause 7.2.1 External inspection	Clause 7.2.2 Internal inspection	Clause 7.2.3 Lining inspection	Clause 7.2.5 Leakage test	Clause 7.2.7 Pressure test, hydrostatic or pneumatic	Clause 7.2.11 Structural inspection
TC 306 or TC 406 tanks	1 year	5 years ²⁾	—	1 year	5 years ³⁾	—
TC 306 Crude or TC 406 Crude tanks	2.5 years	5 years	—	2.5 years	5 years ³⁾	—
TC 307 or TC 407 tanks	1 year	5 years	—	1 year	5 years	—
TC 312 or TC 412 tanks	1 year	5 years	—	1 year	5 years ³⁾	—
TC 423 tanks	1 year	1 year	—	1 year	5 years	5 years ⁸⁾

Notes:

1) Where a tank, other than a TC 341 tank, is not equipped with a manhole or inspection ports, a hydrostatic or pneumatic pressure test shall be performed at the interval for internal inspections. See also Note 5).

2) Highway tanks used only to refuel aircraft and that operate only on airport property shall be exempt from internal inspection, provided that they are clearly marked "Restricted to Use on Airport Property" in letters not less than 25 mm (1 in) high in a contrasting colour on each side of the tank where they will be clearly visible from the ground.

3) For TC 306, TC 406, TC 306 Crude, TC 406 Crude, TC 312, or TC 412 tanks, the pressure tests specified in Clause 7.2.7 shall not be required for uninsulated lined tank trucks and trailers with a design pressure or MAWP of 103 kPa (15 psi) or less, if an external inspection and a lining inspection have been performed annually.

- 4) TC 331 tanks in chlorine service shall have a leakage test as specified in Clause 7.2.5 and pressure tested as specified in Clause 7.2.7 every two years. Pressure tests shall not be required on TC 331 tanks when in sodium metal service.
- 5) As an alternative to the inspection and test requirements of this Table for TC 341 tanks, owners may perform the tests and inspections described in Annex C.
- 6) The internal inspections specified in Clause 7.2.2 do not apply to TC 11 tanks that are less than 2350 L (620 US gal) and that do not have inspection openings.
- 7) The external inspection period for tanks described in CSA B622, Clause 6.3, Specific Requirement 55, is one year.
- 8) The structural inspection "S" for a TC 423 tank shall only be required for a tank trailer.
- 9) A TC 51 portable tank and/or a tank described in CSA B622, Clause 6.3, Specific Requirement 55 that is loaded and unloaded without being removed from the vehicle shall be inspected and tested according to the requirements for TC 331 tanks specified in this Table.
- 10) The pressure test period for tanks described in CSA B622, Clause 6.3, Specific Requirement 54 and Specific Requirement 55, is three years, except that it shall be every 5 years if it can be demonstrated that: it has been post-weld heat-treated and a MAWP 265 psi; and it has been post-weld heat-treated and a MAWP 250 psi and can be demonstrated to have been designed for anhydrous ammonia use.
- 11) TC 331 and TC 51 tanks shall be subjected to an internal inspection by the wet fluorescent magnetic particle method in accordance with Clause 7.2.8 when the conditions of Clause 7.2.8a) are met.
- 12) TC 331 tanks shall be used in dedicated propane service; be less than 13 250 L (3500 US gallons) water capacity; and constructed of one or more of the following materials: non-quenched and tempered (NQT) SA-612 steel; or, non-quenched tempered (NQT) SA-202 or SA-455 steels and have full-size equivalent (FSE) Charpe-vee notch (CVN) energy test data that demonstrate 75% shear-area ductility at 0 °C (32 °F) with an average of 3 or more samples > 20 joules FSE (15 ft-lb FSE), with no sample < 14 joules FSE (10 ft-lb FSE).