Natural Resources Canada | Ressources naturelles Canada

G05-21

Storage, Sorting and Assembly of Fireworks

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Explosives Safety and Security Branch
Explosives Regulatory Division
www.nrcan.gc.ca/explosives

Canada

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1. INTRODUCTION

1.1 Purpose

The aim of this document is to provide guidelines for the minimum requirements for sites where fireworks are handled and picking/sorting and/or assembly operations occur. It provides guidelines for the safe storage, preparation and packing of assortments of pyrotechnic articles; and preparation (assembly) of fireworks for use in displays. Licensing of these sites is required by Part 5, of the Explosives *Regulations, 2013,* under Division 2 manufacturing certificates or factory licences.

1.2 Intent

A review of accidents in the fireworks industry indicates that many accidents are associated with handling of fireworks, so for safety reasons no activity other than storage and the handling of closed boxes will be allowed inside a magazine and any activity involving opening of boxes or handling of individual articles (e.g. handling to sort, assemble and/or re-pack of the fireworks) must be done in a location separate from the magazine(s), where a limited number of cases can be opened, articles selected and re-packed for shipment, or prepared for displays. All cases must always be closed prior to returning to the storage magazine.

It should be noted that when probable causes are listed for initiation of the event causing accidents at locations where fireworks are handled, the following come up repeatedly as probable causes:

- Electrical shorts;
- Friction;
- Impact;
- Heat source (e.g. fire); and
- Spark (from the use of sparking tools) and static.

Minimizing these hazards is in part the aim of these guidelines.

The type of activities that has been associated with accidents includes the following:

- Mishandling / rough handling of materials;
- Packing / loading / transferring operations;
- Cutting of fuse;
- Installing fuses in fireworks.

Operating instructions for activities associated with the handling of fireworks should address minimizing risks associated with the sensitivities of the compounds used.

1.3 Other Documents

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

- Explosives Act and Regulations;
- Documents issued by and obtainable from the Explosives Regulatory Division (ERD):
  - Display Fireworks Manual (G18-01);
  - Authorization Guidelines for Consumer and Display Fireworks (G03-03);
  - Quantity-Distance Principles Manual (S05-01);

    - Classification by PE (Potential Effects) (G05-05);
    - ERD Directives, issued as required;
    - Auxiliary Explosives Storage Guide – High and Low Hazard Fireworks and Pyrotechnics, Propellant Powders, Rocket Motors and Ammunition (G06-01);
- National Building Code of Canada (to be used as a guide to permit conformance with good engineering practice)
- Canadian Electrical Code
- National Fire Code of Canada
- Transportation of Dangerous Goods Act and Regulations
- Provincial labor and/or safety acts and regulations
- Municipal by-laws and ordinances

1.4 Using the Guidelines

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

Applications and their approval can be broken down into three elements: the licence or certificate forms, the authorized locations and equipment, and a company-s internal procedures and documentation.

THE LICENCE

Forms F05-02A, F05-02B, F05-02D and F05-02E and the site and building drawings are the basis for approving an application. The forms and drawings describe the site, facilities, equipment, and operations. The forms and drawings are approved if they and their content meet the requirements of the guidelines. Any exception to the guidelines on which there was agreement must be recorded in these forms. Only the structures and operations described on the licence are allowed on a site. An amendment to the licence is required for any changes to the structures and/or operations on a site.

COMPANY PROCEDURES AND DOCUMENTATION

A company must show that its operations are controlled through formal, written procedures and internal documents. These must meet minimum requirements described under Section 3 (Documentation). Procedures and documentation must be in place before a licence will be issued. As a term and condition of the licence, a company must implement them and ensure they are being followed.

2. SCOPE AND GENERAL BACKGROUND INFORMATION

2.1 Scope

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

The fireworks articles allowed under these guidelines must be authorized products.

A company is expected to know the properties and behavior of products and articles found on the site, whether as final products (e.g., classification for transport) or under processing conditions (e.g., assembly operations).

The basic principles of minimizing the amount of fireworks in process areas, minimizing the number of people and the amount of time they spend in the vicinity of the fireworks and adequately separating fireworks locations to prevent sympathetic detonation, must be considered for all locations where fireworks may be found on a site.

2.2 Definitions

The preparation of display fireworks at a location other than the site of the display is covered by Part 5, Division 2 of the *Explosives Regulations, 2013.* This Part of the *Regulations* also covers the preparation and packaging of assortments of explosives for the purpose of sale by a person who does not hold a vendor magazine licence. Sections 106 through 132 of Part 5, Division 2 explain out how to obtain a Division 2 factory licence or a manufacturing certificate. It also outlines the requirements for holders of the license or certificate and for the workers at, and visitors to, the workplace.

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

Definitions:

"Manufacturing" for the purpose of activities that could take place at these sites include the assembly of an article from explosive and non-explosive components; and packaging of explosives.

"Division 2 Factory Licence" – means a licence that is issued by the Minister of Natural Resources under paragraph 7(1) (a) of the *Explosives Act* and authorizes a manufacturing activity referred to in Section 107 of the *Explosives Regulations, 2013,* at a workplace.

"Manufacturing Certificate" – means a certificate that is issued by the Minister of Natural Resources under paragraph 7(1) (c) of the *Explosives Act* and authorizes an activity referred to in section 107 of the *Explosives Regulations, 2013,* at a workplace.

"Workplace" – means a building, room or area where an activity involving the manufacture of explosives, including their storage, is carried out.

APrprocess Unit@ - means a building, structure, room, or place in which an explosives manufacturing operation is carried out.

AFactory Magazine@ - means a magazine that is located at a factory or a manufacturing certificate site.

"Division 2 Worker" – means a person who is at a workplace to carry out a manufacturing operation or other kind of work (for example, maintenance of facilities or repair of equipment) for the holder of a Division 2 factory licence or manufacturing certificate.

Definition associated with fireworks:

Firework: A device containing a pyrotechnic composition(s) that — upon functioning — will burn and/or explode to produce a visual or audible effect (or a combination of such effects) and is intended as a form of entertainment.

2.3 Activities and Storage Areas

This section provides information on items or activities related to fireworks licences or certificates.

Picking / Sorting:

The process of selecting or grouping individual pyrotechnic articles for sale according to type, variety and destination by making kits or packs. This process includes repacking for transport. These two processes constitute the "preparation and packaging of assortments of explosives" referred to in the *Explosives Regulations, 2013,* subsection 107(k).

Assembly:

The process of linking pyrotechnics together by chain fusing or making set pieces for the purpose of using in a display. This process includes repacking of the assembled fireworks for transport. These assembly operations fall under the "preparation of display fireworks" referred to *in the Explosives Regulations, 2013,* subsection 107(i).

Picking/sorting Area:

The process unit or location where the picking/sorting takes place. This cannot be located in a magazine.

Assembly area:

The process unit or location where the assembly operations take place. This cannot be located in a magazine.

Packaging Area:

The area where the packaging of the assorted and/or assembled articles takes place. This cannot be located in a magazine.

Magazines:

These are licensed fireworks storage containers or structures.

Free space:

The amount by which a storage container falls short of being full (i.e. the unfilled space in a container).

It should be noted that the storage of fireworks articles will be included in a manufacturing certificate or factory licence, and that a separate storage licence will not be required.

2.4 Manufacturing Certificates vs. Factory Licences

Certificates are issued for sites that are occasional and temporary.

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

ATemporary@ is a site that is operated for a period of time, but not permanently, e.g., a site that does not run longer than two years, or is so occasional (less than 10 days per year) that operation could be considered as restarting anew each time.

2.5 Disposal of Scrap

All fireworks waste and fireworks-contaminated material must be destroyed in a manner that does not increase the likelihood of an accidental ignition during or after the destruction. It should be noted that such products have not been authorized and therefore may not be transported. Arrangements will need to be in place to properly store and dispose of such scrap.

2.6 Authorized Products

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

2.7 Quantity - Distance

Quantity-Distance (or Q-D) principles are outlined in the Quantity-Distances Principles Manual issued by ERD. In general, for fireworks articles, Table 1 (QD Table for Hazard Division PE1), Table 3 (QD Table for Hazard Division PE3) and Table 4 (QD Table for Hazard Division PE4) will apply. Certain of these categories require the presence of barricades, as indicated in the Quality-Distance Principles manual.

When the NEQ of fireworks are not known the following formulas can be used to estimate the NEQ from the Gross Mass:

- The default Net Explosive Quantity (NEQ) of display fireworks is 75% of Gross Mass. The NEEQ (TNT equivalency) for articles classified as 1.1 for transportation purposes is 50% of NEQ, with the exception of shells containing more than 25% flash powder, and salutes, for which the TNT equivalency is 70% of NEQ. If the amount of flash powder in a shell is not known, a TNT equivalency of 70% of NEQ will be assumed.

Potential Effects:

The United Nations classification of Class 1 dangerous goods (i.e. explosives) is based on the behavior of explosives as packaged for transportation. Potential effects consider their behavior in the form they occur during storage or production, which may not be the

same as their behavior in packaged form. For more details the document “Classification by PE” should be consulted.

Salutes (Sound, Flash Report):

These items will normally be considered as hazard class 1.1 for storage (unless packaged for a different classification) and also for application of the Q-D to process areas. They must be stored separately from other articles if not in a package that have been tested to show 1.3 behavior. A minimum of 40% empty space by volume is required around these items during storage.

Display Shells:

For storage purposes, packages of display shells may also include some packages which contain salutes as well as display shells; both are considered as hazard class 1.3 for Q-D purposes only when:

- stored in a facility having more than 40% empty space by volume;
- salute-display shell combination packages have been tested to show 1.3 behavior.

Otherwise the package will be regarded as 1.1 for QD purposes.

2.8 Personnel Limits

One of the fundamental safety principles involving explosives is to minimize the exposure of people by keeping the number of personnel exposed to hazards to the practical minimum. This means that only persons with jobs essential to a particular hazardous operation should be in the danger area. Personnel not directly involved with the fireworks, such as administration personnel, must be located outside the danger zone.

3. DOCUMENTATION, FEES and PROCESSING TIME

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

Forms F05-02A, F05-02B, F05-02D and F05-02E, plans and drawings must be presented. A spill contingency plan, emergency response plan, fire safety plan, key control plan and site evacuation plan is required, for both licences and certificates. Supporting documentation, such as operating or maintenance procedures must be shown to be available, where applicable.

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

3.1 Plans and Licence or Certificate Forms

The licence or certificate forms and the plans or drawings describe the operation. Once approved, they become part of the conditions for the legal operation of a site. The approval is based on meeting the requirements of these guidelines.

3.1.1 Plans and Drawings

Several types of plans or drawings are listed on Form F05-02A. These include the Area Plan, Site Plan, Building Layout, Process Schematics, and Piping, Instrumentation and Equipment layout drawings. For the manufacturing certificates and factory licences discussed in these guidelines, an area and a site plan will be required, and drawings of process building layouts may be required.

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

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

A site plan is required for each site. The plan must include: i) distances between operations, fences/barriers, and magazines; ii) distances to offices and welfare or administrative areas; iii) distances to roads and public thoroughfares; and iv) distances to dwellings and other assembly points. Distances must be in meters.

In some situations, the site plan can be used as an area plan as well, but it should identify all vulnerable sites such as dwellings or areas where the public may congregate within a D8 radius.

Building layout plans are required for buildings with multiple rooms and/or multiple areas used for different purposes.

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

IMPORTANT: The building identification (number or legend) used must be consistent throughout all the plans, forms, and other documents. Building layout plans are required for sites with multiple rooms or divisions, or to show equipment layouts.

Process schematics or Piping, Instrumentation and Equipment layouts will usually not be needed for fireworks operations.

3.1.2 Form F05-02A: Application – Factory or Manufacturing Certificate

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

Upon renewal, one copy of Form F05-02A should be included, with amended forms and/or updated reference documents if there are changes.

For each amendment request, a new Form F05-02A application is required to summarize and record the changes made to forms, drawings, and documentation.

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

When procedures referenced on Form F05-02A have been changed, the licensee/certificate holder may wait until annual renewal of the licence/certificate before making the changes to the information on Form F05-02A.

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

3.1.3 Form F05-02B: Site Description

Form F05-02B describes the physical aspects of the site, the site security, facilities and equipment. This includes storage magazines, picking/sorting, assembly and or packaging areas, or any other facilities (e.g. offices and/or washrooms) located on the site.

Form F05-02B also describes any deviation or derogation that applies to the physical aspects of the licence, e.g., Q-D reduction, approved by ERD.

Form F05-02B should start with a site description that includes access roads, gates, fencing, security, and other such general features. Following that, specific buildings and operations can be addressed. Geographical coordinates for at least one structure or building on the site should be provided on Form F05-02B.

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

Terms such as “approved magazine” or “approved equipment” should not be used. For example, in describing electrical installations, DO state “meets Class 2 Div 2” (if that is the case). DO NOT state “approved electrical installations” or “explosion-proof”, etc.

When documentation regarding equipment has been submitted to ERD for approval, the documentation should be referenced by a date, e.g., “information on heater submitted to ERD November 30, 2011”.

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

Barricades, berms, or other natural protective features against explosions must be described, especially when the distances or types of distances shown on Form F05-02E require barricades, e.g., D2 and D4 for Hazard Division PE1. For all buildings or operations that are mounded, describe the type of mound and the directions in which the mounding is effective.

3.1.4 Form F05-02D: Manufacturing Operations Description

Form F05-02D must describe the operation and state the type and quantity of the explosive and personnel limits with references to each specific process unit or magazine, as given on Form F05-02B.

Any special circumstances must be described on Forms F05-02B, F05-02D and, if applicable, F05-02E, e.g., circumstances that would allow an inspector to relax distances would be explained on Form F05-02B and described on Forms F05-02D and F05-02E.

Permitted Operations:

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

Quantities:

The type and quantity NEQ of fireworks that will be present in a particular area must be listed for each area.

Personnel:

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

When there are several operations at a site, each with their own personnel limit, there should also be a global site limit. For example, a site may have five

magazines or processes each with a limit of 3 operators and 2 visitors, but that does not mean a combined limit for the site of 15 operators and 10 visitors, but perhaps 5 operators and 2 visitors.

3.1.5 Form F05-02E: Distances

In the left-hand column of Form F05-02E, in the column entitled “Reference Number” each building/operations/location with fireworks is listed. These are regarded as potential donors to the vulnerable locations and explosives building/operations/locations listed in the other columns to the right. It is useful to record the quantity (NEQ) and hazard category (PE number) of fireworks in this column, to facilitate using the correct Table from the QD Manual.

The second set of columns on this form should be used to show distance to vulnerable features on site such as office(s), as well as features outside the site such as roads, hydro lines and dwellings, etc.

The third set of columns are used to show distance to all fireworks storage areas (i.e. magazines), and the fourth set of columns to all process areas (e.g. picking/sorting area, assembly area, packing area).

Form F05-02E must show the minimum distance to be maintained and the actual distance between a given building/operation/location, and the building/operation/location/ activity listed in the column headings (process, magazines, etc.). This distance will depend on the quantity of fireworks at the location listed in column 1 and can be found in the Quantity Distance Principles Manual.

When completing Form F05-02E, it is helpful to record the applicable Q-D type (e.g. D4, D7) used for the required distance so that misunderstandings can be quickly identified, e.g., the distances between process areas and magazines are sometimes directly affected by the presence or absence of barricades.

If the actual distance is less than that required by Q-D, the deviation must be identified on Form F05-02E and explained on Form F05-02B and, if needed, referenced on Form F05-02D. These annotations and explanations formally record the conditions under which a derogation has been approved, e.g., risk assessment.

3.1.6 Form F05-03: Licence & Terms and Conditions

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

3.1.7 Deviations from these Guidelines

Occasionally, situations can occur where approval may be granted even when a certain requirement is not met. The best way to approach this is to declare the deviation or non-conformance to the guideline on the appropriate form (F05-02B, F05-02D and/or F05-02E). When a deviation has been approved by a letter, this must then be recorded on the appropriate form (F05-02B, F05-02D and/or F05-02E). Reference should be made to the date it was approved, to the name of the inspector who first approved it, if this is known, and, as appropriate, to the conditions under which the derogation was allowed and any deviation or non-conformance information must be carried forward each year upon

renewal. Any documentation referred to in Form F05-02A must be dated with revision numbers.

3.2 Supporting Documentation

All manufacture and handling of any fireworks carries inherent risks. Unwanted dangerous events may be reduced by protecting people and facilities and/or by reducing quantities. The probability of initiation may be reduced by careful design of equipment and facilities and by hazard analysis, by understanding the risks associated with the products, by maintaining operations to the original design criteria, by controlling changes, by selecting and training personnel, and by preserving an acute awareness of general safety.

In support of the licence application, the documents or procedures set out below must be listed on Form F05-02A and shown to be available.

The Regulations require the preparation of procedures and special rules drawn up by the manufacturing certificate or factory licence holder which are designed to ensure the maintenance of proper discipline in the factory and the observance of the provisions of the Act, the Regulations, and the terms and conditions of the licence related to safety.

The format of these procedures is left to the individual companies. However, the documents must clearly detail the correct, acceptable and understandable way of accomplishing a task. They must be titled, dated, the pages numbered, and must approved by a responsible company employee.

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

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

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

3.2.1 General Safety Rules

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

3.2.2 Training

Every employee must be competent to carry out their duties at the site in a safe and lawful manner by a competent person. A formal training program must be prepared: training requirements identified, courses prepared (both theoretical and practical), safety critical procedures and controls identified in the course, trainers chosen and trained, and records of all training kept. In addition to operations, the training program should address needs related to first aid, general safety induction, and any other subject in support of

operational safety. Training procedures and training records may be requested during inspections by ERD or prior to the issuing of the licence.

All employees involved in the transportation of dangerous goods must be trained in the appropriate Transportation of Dangerous Goods regulations.

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

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

Note that when the new international system for hazardous products destined to replace WHIMS comes into force, this will include explosives.

A licence holder must certify workers as having been trained when the holder has reasonable grounds to believe that the workers are able to perform their duties and understand the hazards of the materials to which they may be exposed (as required by Section 124 of the *Explosives Regulations, 2013)*. An employee's training certification must expire not more than five years after the date of certification. If a change occurs in the operating procedures for which the certification was issued, the workers must be trained in the new operating procedures but the expiry date of the certification must remain the same. Workers must be recertified or retrained within five years. Previously certified workers must be reassessed if they have not conducted the activities in question in the preceding 12 months.

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

3.2.3 Procedures

Certain activities must be controlled by procedures in order to ensure the correct and acceptable way of accomplishing a task is clearly and understandably detailed. Procedures should be developed by qualified personnel and expressed in such a way as to avoid confusion and ensure control at all times. Procedures should be reviewed annually.

The following procedures must be available:

- Operating procedures for the site and processes, including any specialty or safety procedure;
- Burning ground and/or waste explosive disposal procedures;
- Emergency response and site evacuation plans;
- Maintenance procedures;
- Miscellaneous safety procedures for tasks that are not normally part of day to day operations, but that may be required occasionally.

When procedures referenced on Form F05-02A have been changed, the licensee/certificate holder may wait until annual renewal of the licence/certificate before making the changes to the information on Form F05-01A; however, the latest procedures must be available at the site. The intent is not that ERD approves procedures, but that changes are reflected in the licence and that inspectors can verify that the latest procedures are used.

3.2.3.1 Operating Procedures

The procedures must clearly identify the steps to be followed for a particular operation. Procedures must include sections on dealing with emergency situations, and must list the materials, tools and equipment, including personal protective equipment, to be used.

3.2.3.2 Maintenance Procedures

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

3.2.3.3 Scrap Fireworks Disposal and Burning Ground

Two operators must be present during disposal of fireworks or packaging that may be contaminated with fireworks. Initiation of disposal must be done remotely. A minimum of two burning pads must be provided or the time between burns must be specified to ensure a cold, clean area for a new burn. The burning pad must be raked and cleaned before a second burn is attempted.

3.2.3.4 Emergency Response Plan

All sites must develop formal emergency response procedures and site evacuation plans. This should be done in conjunction with local authorities where appropriate.

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

3.2.3.5 Miscellaneous Safety Procedures

Companies must develop the procedures required by ERD and/or provincial safety regulations for any potential hazardous tasks that an employee may be required to undertake. Employees need not know the details of each procedure, but must know when the safety procedures are required, and must be trained on the procedure prior to undertaking the task.

3.2.4 Smoking

Smoking is prohibited within all Division 2 licensed sites.

3.2.5 Memorandum of Understanding

When a company operates a site in a domain that is not under total control of the fireworks company, it is recommended that a Memorandum of Understanding (MOU) should be written and signed by all parties. The objective of a well-written MOU is to clarify the ownership of the domain/site, responsibilities of each party on the site, ensure good communications between all parties on the site, note the facilities/operations present on the site, describe the access/egress control and security of the licensed site, and the scope of the fireworks operations, and how they would affect each other. An MOU will usually include the development of a Joint Emergency Response Plan by all parties present in a domain.

3.3 Fees

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

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

3.3.1 Processing Time

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

- For new factories and certificates: maximum of 60 working days.
- For renewal and amendments: maximum of 30 working days.

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

4. SITES, FACILITIES and EQUIPMENT

4.1 Licence or Certificate Site

4.1.1 Location

Sites must comply with Quantity Distance (Q D) tables for the hazard classifications present on the site (which can include PE1, PE3 and PE4) for which the ERD Quantity Distance Principles Manual should be consulted.

4.1.2 Controlling Access to the Site (fencing, other barriers)

Access to the factory or certificate site must be restricted and controlled. Limiting and controlling access to the site enhances both public safety and security of fireworks by minimizing the exposure of persons who do not have any reason to be there. The measures in place to control site access must be described on Form F05-02B. If any of the measures stipulated in this section have not been implemented, the alternative must be described and justified on Form F05-02B.

All sites must restrict road access with a lockable gate at the entrance to the site perimeter. There must be barriers to prevent access at any other site access points. These may be man-made barriers or natural barriers such as trees, difficult terrain, etc. Page wire or chain link fences might be acceptable man-made barriers, but the exact fencing requirements might vary based on the types of operation and appropriate security measures to be taken due to the site's location. Barriers may be erected around process locations rather than the perimeter of a large site. Man-made barriers other than a fence will be considered on a case-by-case basis.

Site gates must be kept closed except when the site is attended and the person or persons at the site can observe persons entering the gate, the site gate must be locked when the site is not attended .

When fireworks sites are located on land that a fireworks company does not own or fully control, the fireworks operation must be delineated from the rest of the site.

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

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

DANGER – FIRE HAZARD	DANGER - INCENDIE
NO TRESPASSING	ACCES INTERDIT
PENALTY SECTION 18	PÉNALITÉ ARTICLE 18
CANADA EXPLOSIVES ACT CANADA	LOI SUR LES EXPLOSIFS DU CANADA
NO SMOKING - NO MATCHES	INTERDICTION DE FUMER – AUCUNE ALLUMETTE

Such signs must be displayed on the fence around these structures or at a distance of 30 m from them so that a sign is clearly visible from any possible direction of approach.

4.1.3 Control of Fire-Producing Devices

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

4.1.4 Services

A Division 2 licensed factory will usually have an electrical power supply and lighting. There may be a water supply to process buildings if the process buildings have washrooms associated with them.

4.2 Buildings in General

4.2.1 Location

Guidance on separation is provided in the Quantity Distance Principles Manual, available from ERD.

A process building may be located in close proximity to the storage area(s) (magazines) provided that the process site can be adequately separated from the storage area via a barricade, mound, or protective screen, i.e. no line of site via doors or windows between the process site and storage area(s). The type of separation required between the process site and the storage area(s) will be determined by both the quantity and nature of the products being handled at the process site. For example, a barricade or mound would be needed to protect against possible detonation propagation, whereas screens and shields could be used to prevent fireballs or fiery projections or secondary fragments from entering the storage area(s).

4.2.2 Codes

All standard industrial installations must comply with the Canadian Electrical Code (CEC), National Fire Code of Canada (NFC), and the National Building Code of Canada (NBC), or with any other code such as commercial industrial standards, or provincial or municipal requirements.

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

Proof that installation comply with appropriate codes may be requested during inspections by ERD or prior to issuing the licence.

4.2.3 Construction - General

The building construction must be aimed:

a) To reduce the likelihood of any firework initiation while people are present; and
b) To allow workers to escape as quickly as possible.

Buildings must meet good engineering practice. The structure must be adequate for the purpose, i.e., durable, suitable for the local climate, and able to meet the other requirements of these guidelines.

Noncombustible construction as defined in Section 1.4.1.2 and detailed in Section 3.1.5 of the Canadian Building Code (CBC) is preferred but not required.

There are exemptions from the CBC for buildings licensed under the explosives regulations but picking/sorting or assembly areas may be regarded as high hazard industrial occupancy (Group F, Division 1).

Fabric buildings will not be licensed for permanent installations.

Buildings and structures must be provided with adequate lighting for activities to be carried out, as specified by labor codes.

Buildings must be provided with at least two safety exits. Where fires have occurred in buildings containing fireworks, a fast and easy exit from the building has been the difference between life and death for workers inside the building. ERD will insist that there are quick, easy unobstructed exits from any work areas and these may be in excess of the requirements of the building code. Small buildings, such as sheds, may be exempted from having to have two exits. Safety exits should lead directly to the outside. Escape routes must be kept clear of obstruction. Safety exit door(s) must be provided with panic hardware and marked.

Buildings may also have roll up doors or truck doors.

4.2.4 Interior construction

Most important is to ensure that the inside of the building is easy to clean and that there are no cracks or crevices where explosive could accumulate. All cracks and crevices on floors, or workbenches (including where they meet walls) must be filled and sealed.

Thermal insulation on the walls or ceiling must be covered. Gypsum board or plywood is acceptable. If the building has steel interior cladding it may need to be covered with softer material. For some operations a concrete floor will need to be covered with softer material to reduce impact or friction.

Tool boards are recommended for brushes, dustpans and other tools required for use in the building.

4.2.5 Sprinkler systems

Some specific hazardous operations may be required to have sprinklers or deluge systems. In general sprinklers are not required for picking/sorting or assembly of fireworks.

4.3 Electrical Requirements for Picking/Sorting and Assembly Process Areas

The table in Appendix 1 details the specific electrical requirements for picking/sorting or assembly areas.

The following should be noted:

- A ground fault circuit interrupter must be incorporated for the entire wiring system to divert lightning, all overhead transmission lines must stop at least 15 meters from the building and proceed underground into the building.
- An emergency cut-off electrical switch and ground rod must be installed on or before the last pole of the transmission line.
- Any switch gear must be located outside the building in a weather proof enclosure or separate motor control center (MCC) with entrance from the exterior.

4.3.1 Grounding

All equipment in fireworks areas must be grounded. Grounding through a plug is neither equivalent nor acceptable. Grounding cables must be connected directly to the equipment and to ground bars outside the building.

4.3.2 Heating and Furnaces

For all hot air furnaces, no matter how they are powered, a high temperature limiting control must be included in the heater and in the hot air duct between the heater and the area where fireworks are present, in addition to the usual two thermostats in the area where fireworks are present. If oil or gas is used, a 10 lb dry chemical fire extinguisher must be mounted in the furnace room. A fire extinguisher is recommended in other electrical heating situations.

Oil-fired furnaces or boilers must be installed in separate rooms with a one hour fire rating. The room must have no direct access from the building or part of the building that contains fireworks. If this requirement cannot be met, then the unit must be located in a fire-resistant building sited at least 8 metres from the danger building. The building that contains fireworks must be protected by a fire damper activated by a fusible link or other safety device to close and seal the duct as near to the furnace as reasonable.

Electrical heating must comply with the appropriate electrical requirements (see section 4.3 and Appendix 1). Electrical heating can be done in a number of different ways:

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

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

Before installing any heating system, it is suggested that detailed plans and specifications, along with proof that the proposed installations comply with all appropriate codes, be submitted with the application for review and comment. Proof that the proposed installations comply with all appropriate codes may be requested during inspections by ERD or prior to the issuing of the licence.

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

4.3.3 Air Conditioning

When it comes to cooling, the options are more limited. The first and ideal option would be to find an A/C system that would meet the proper electrical classification. The second option is to follow similar guidance as an installation of oil or gas fired heating system.

The A/C system must be installed in a separate room with a one hour fire rating. The room must have no direct access from the building or part of the building that contains explosives. If this requirement cannot be met, then the unit must be located in a fire-resistant building sited at least 8 metres from the danger building.

A redundant high temperature limiting control must be included at the A/C unit and in the cold air duct between the A/C Unit and the building, in addition to the usual dual magazine thermostats.

In the event of a sudden temperature rise, the building must be protected by a fire damper activated via a fusible link or other safety device to close and seal the duct as near to the AC system as reasonable.

4.3.4 Static Electricity

If static sensitive material will be handled then appropriate precautions must be taken. This might include humidity control, static control *via* semi-conductive floor mats, conductive bench coverings, cotton or conductive clothing, and grounding straps worn by the operators.

4.3.5 Lunchroom and Welfare

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

ERD prefers that lunchrooms should be in a separate building from fireworks operations areas because there may be very little time to react to a fireworks fire. However, a lunchroom for workers may be located within a process building provided that it is separated by a 1 hour fire wall and auto closure fire doors. No special electrical rating is required in the lunchroom with this separation.

Such facilities may be located next to the operations if used only by the factory personnel or by visitors, such as delivery persons. The number of visitors must conform to the visitor licence limits approved on Form F05-02D.

If used by personnel not essential to a particular hazardous operation at the site operations (e.g., delivery drivers), they must be located at D7 distances.

4.3.6 Office

Office space may be provided as required. Where practical it should not be located in the process building. When it is in the process building electrical equipment must meet the process area standards unless it is separated from the process area by 1 hour fire walls and fire doors.

4.4 Process Areas

4.4.1 Picking / Sorting (and Packing) Area

The picking/sorting area is a designated location away from the licensed magazine where the selection and re-packing of fireworks takes place. Its location relative to surrounding magazines will depend on the quantity of articles being brought to the area for the selection repacking process and will be based primarily on the Q/D Tables.

The area can be sheltered by a tent or permanent building meeting the construction criteria described above. Closed TDG approved cases of fireworks are taken directly from the licensed magazine(s) to the picking/sorting area for picking/sorting and repacking.

Properly packaged boxes of sorted fireworks can be returned to a magazine for storage or may be loaded on a truck for immediate delivery. Any partially filled cases or bins can be left in the picking/sorting area overnight if the building's security is equivalent to that of a magazine. If bins are used to store fireworks in the picking area they do not need to have lids. If cases are returned to a magazine for storage, they must be closed, after filling voids created in the removal of articles within the individual cases/boxes with suitable inert stuffing in order to maintain the original integrity of the TDG shipping cases.

4.4.2 Assembly Area

The Assembly area is a place away from a licensed magazine where the fireworks are assembled for a given display. The Assembly Area can be the same designated area or structure as the Picking/sorting Area. However, when this is the case, it should be noted that the two activities cannot take place at the same time.

The types of activities performed, such as chain fusing (cutting and splicing), making set pieces and packaging must be done by a certified fireworks supervisor.

The working surface of the table or bench must be void of cracks/fissures where composition could accumulate. A catch rim about the perimeter of the workbench or table must be present so as to prevent the fall of articles to the ground. All tools must be non-sparking.

4.4.3 Primed/matched articles

The priming of fireworks with electric matches is prohibited at all times.

4.5 Magazines and Other Storage

Magazines must comply with the requirements of the Auxiliary Storage Standard.

4.5.1 Barricades

Barricades must be provided as required by the Q D Principles.

4.5.2 Storage in Magazines

Fireworks must be stored in licensed magazines meeting the Auxiliary Storage Standard's construction criteria and respecting the Quantity/Distance Principles. Cases or

boxes of fireworks within the magazine should be arranged so that they can easily be accessed and crushing of boxes prevented, shelving or racks should be used if necessary. Non-obstructed aisles of 1 meter minimum width must be maintained between stacked cases or shelves. At least 40% of the volume available for storage within the magazine should always be free space. Electric matches are not to be stored with other pyrotechnic articles within the magazine. They must be kept in a separate magazine or container properly identified for this use.

4.5.3 Other Storage - Inert materials, packaging, etc.

Sufficient and proper storage for inert materials, packaging materials, and any other materials required must be provided. Such areas must be located in a manner that does not increase risk to the fireworks operations.

4.6 Waste and Scrap

4.6.1 Fireworks waste materials

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

Arrangements to get rid of fireworks waste and scrap should be made to prevent the accumulation of this waste and scrap, and procedures documented.

4.6.2 Fireworks Packaging

Packaging that is no longer needed to re-pack unused fireworks materials must be inspected to ensure that it is free of explosive. It is good practice to flatten packaging and boxes prior to disposal. Packaging may be:

- Burned where permitted by local authorities,
- Recycled where permitted, or
- Land filled where permitted.

Explosive markings should be defaced prior to disposal to avoid subsequent undue concern by others about the presence of explosives.

4.7 Forklifts and Pallet Movers

4.7.1 Electrical Forklifts

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

Charging:

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

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

4.7.2 Diesel and Propane Forklifts

These will be allowed for outdoor use only.

APPENDIX A

Electrical Requirements for picking / sorting or assembly rooms

Type	Minimum Requirement	Notes
Enclosures	EEMAC/NEMA 4 for enclosures	Includes lighting, receptacles, interior control panels and any other electrics including security systems located within the assembly zone, excluding electrical heating.
Heating	Class 2, Division 2 for any electrical heating units located within the assembly zone.	1) Potential for dust layering, controlled exposed heater fin temperature, and limited ventilation is of prime concern. 2) Gas fired open flame heaters are not permitted within the assembly zone.
Lighting	Class 2 Division 2	
Wiring	Wiring must be in rigid threaded aluminium conduit or TECK 90 flexible conduit.	
Crane, Hoist, Fan or Delivery Door Motors	Meet TEFC requirements with EEMAC/NEMA 4 enclosures if located within assembly area.	Totally Enclosed, Fan Cooled (TEFC)
Receptacles	No receptacles permitted on or below the work bench area.	Receptacles and plugs must be EEMAC/NEMA 4. When not in use the receptacles must be closed.
Portable Luminaries	CEC 20-110(3)	Applies only to portable luminaries used on the work bench or floor areas above 50 mm. (due to possible presence of volatile fluid spills or heavy vapours at floor level).