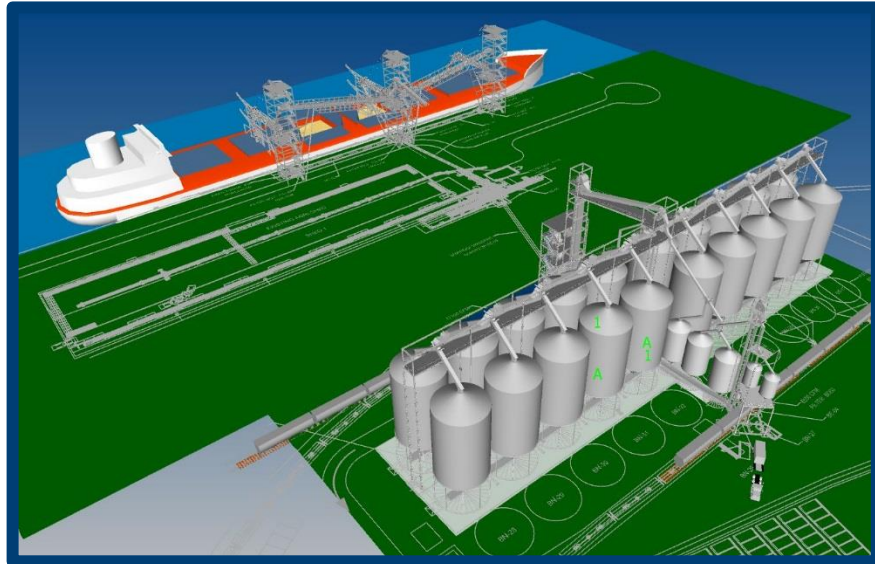




# FRASER GRAIN TERMINAL

## Fire & Explosion Plan

Parrish & Heimbecker Limited  
Fraser Grain Terminal Project  
May 24, 2018  
FWS Job # 08-17-115C  
Revision 17



The Confidence Builders

# **Fraser Grain Terminal**

## **Fire & Explosion Plan**

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# **TABLE OF CONTENTS**

- 0. EXECUTIVE SUMMARY**
- 1. FIRE & EXPLOSION PLAN**
  - 1.1. Applicable Codes**
  - 1.2. Reference Standards**
  - 1.3. Prevention Approach**
  - 1.4. Prevention Measures**
  - 1.5. Prevention Measures Summary – Buildings & Operating Areas**
  - 1.6. Prevention Measures Summary – Major Equipment**

# Fraser Grain Terminal

## Fire & Explosion Plan

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### 0. EXECUTIVE SUMMARY

Fire and explosion prevention measures for Fraser Grain Terminal (FGT) are designed in accordance with applicable standards of the National Fire Protection Association (NFPA), which do not require sprinklers or fire separations within the facility. While not required, some additional prevention features are provided in selected areas.

The Administration Office and Maintenance Building & Sample Storage are treated as separate buildings meeting National Building Code (NBC) requirements. The Canadian Electrical Code and National Fire Code are followed where applicable.

The risk of fire and explosion is reduced to the extent possible by these measures:

- containment and removal of combustible and explosive dusts
- elimination of ignition sources
- provision of deflagration venting where the risk cannot be eliminated
- hazard monitoring and automatic controls
- certification of equipment in hazardous locations
- housekeeping program (by Owner)

Exiting from buildings and operating areas meets NBC requirements. While not required, some additional features are provided to assist in firefighting operations.

There are no additions or changes to fire protection to the existing JV Shed or dock area.

# Fraser Grain Terminal

## Fire & Explosion Plan

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### 1. FIRE & EXPLOSION PLAN

#### 1.1 - Applicable Codes

- National Building Code of Canada (NBC) 2015
- Canadian Electrical Code (CEC) 2015
- National Fire Code (NFC) 2015

#### 1.2 - Reference Standards

The following reference standards are applied where national codes are not strictly applicable:

- NFPA 10 Standard for Portable Fire Extinguishers
- NFPA 14 Standard for Installation of Standpipe and Hose Systems
- NFPA 61 Standard for the Prevention of Fire and Dust Explosions in Agricultural and Food Processing Facilities
- NFPA 68 Standard on Explosion Preventions by Deflagration Venting
- NFPA 69 Standard on Explosion Prevention Systems

#### 1.3 - Fire and Explosion Prevention Approach

Due to the special and unusual nature of grain elevators, fire and explosion prevention measures for the elevator facility are designed in accordance with applicable standards of the National Fire Protection Association (NFPA). The elevator facility includes storage bins, conveyances, towers, receiving and shipping facilities, control room and MCCs. In addition to these NFPA requirements, rated fire separations and heat detectors are provided in selected areas as noted below.

The Administration Office and Maintenance Building & Sample Storage are treated as separate buildings meeting NBC requirements for fire protection.

The Canadian Electrical Code and National Fire Code are followed where applicable.

The risk of fire and explosion is reduced to the extent possible by control of combustible and explosive dusts, removal of ignition sources, and provision of deflagration venting where the risk cannot be eliminated.

Combustible and explosive grain dusts are controlled by completely enclosing storage bins and conveyance equipment to prevent dust from escaping. A dust collection system removes dust at key locations within the enclosed equipment, to prevent it from reaching a potentially explosive concentration.

Ignition sources are removed by the following measures, following applicable NFPA standards:

- Tramp metal which could cause sparking is removed by magnetic collectors at the inlet to each bucket elevator.
- Sensors are installed on major equipment to detect conditions which could cause overheating, and shut the equipment down before it can reach ignition temperature. These

# Fraser Grain Terminal

## Fire & Explosion Plan

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include temperature sensors on motors and bearings, alignment sensors on conveyor belts, and sensors to detect plugging with product.

- Equipment where deflagration is most likely to occur is equipped with deflagration vents, and provided with isolation devices to prevent a deflagration from propagating.
- Hazardous locations where explosive dust may be present are classified according to the zone system of the Canadian Electrical Code (CEC). Motors and electrical components in these areas are certified for the appropriate hazardous location.

### 1.4 - Fire and Explosion Prevention Measures

Fire and explosion prevention measures for operating areas and equipment are detailed below, and summarized in the following tables:

- **Bucket Elevators** are equipped with magnets, motor temperature sensors, bearing temperature sensors, belt alignment sensors plug sensors and deflagration vents. Rubber belting used in bucket elevators is non-conductive.
- **Belt Conveyors** are equipped with motor temperature sensors, bearing temperature sensors, belt alignment sensors and plug sensors. Rubber belting used in conveyors is non-conductive.
- **Motors and Electrical Components** are certified for the required hazardous location.
- **Dust Filters** connected to multiple pieces of equipment via a common plenum are equipped with deflagration vents, and isolation devices such as backdraft dampers and rotary valves. Activation of the backdraft damper by a deflagration will initiate a full plant shutdown.
- **Receiving, Central Conveyor Gallery, and Container Loading Towers** are constructed of non-combustible material and will be primarily open to the atmosphere. In enclosed areas of the receiving tunnel, reclaim tunnel and boot pit, horizontal surfaces that can collect dust are minimized.
- **Boot pit and enclosed tunnel** are protected from high dust concentrations by dust-tight enclosure of equipment, and dust collection at the inlet to each bucket elevator.
- **Administration Office and Maintenance Building & Sample Storage** are constructed in accordance with fire protection requirements of the National Building Code (NBC).
- The Owner shall create and maintain a strong **Housekeeping Program** to ensure dust accumulations are kept below explosion limits.

# Fraser Grain Terminal

## Fire & Explosion Plan

### 1.5 - Prevention Measures – Buildings & Operating Areas

<b>BUILDINGS &amp; OPERATING AREAS</b>	Fire Safety Standards	Non-Sprinklered	Rated Fire Separation	Dry Standpipe w/ FDC	Hazardous Area Classification
<b>Rail Unloading Building</b> Dry cars (drip shed), receive grain from rail cars	NFPA	●			
<b>Receiving Tunnel &amp; Boot Pit</b> Convey grain to transfer tower	NFPA	●			Class II Div 2 (Zone 22)
<b>Transfer Tower</b> Elevate and weigh grain for transfer to storage or shipping	NFPA	●		●	
<b>Storage Bins &amp; Conveyor Galleries</b> Receive, store and discharge grain	NFPA	●			
<b>Transfer Conveyor Tunnel</b> Convey grain from storage to transfer towers	NFPA	●			Class II Div 2 (Zone 22)
<b>Ship Loading Towers</b> Convey grain to shiploader	NFPA	●			
<b>MCC Buildings</b> House electrical distribution and motor control centres	NFPA	●	●		
<b>Main Control Building</b> Control facility operation, grade grain samples	NFPA	●			
<b>Rail/Truck Shipping Structure</b> Load rail cars and containers	NFPA	●			
<b>Container Control Building</b> Control loading of trucks and containers	NFPA	●			
<b>Server Rooms (in Main Control Building and/or Administration Bldg)</b> House computer servers	NFPA	●			
<b>Administration Building</b> Administrative functions	NBC	●			
<b>Maintenance Building &amp; Sample Storage</b> Equipment maintenance	NBC	●			

# Fraser Grain Terminal

## Fire & Explosion Plan

### 1.6 - Prevention Measures – Major Equipment

MAJOR EQUIPMENT	Applicable Fire Safety Standards	Non-Sprinklered	Dust Collection	Hazard Monitoring	Magnetic Separator	Deflagration Vents	Isolation Devices	Hazardous Location Classification – Interior of Equipment
Central Dust Filters	NFPA	●		●		●	●	Class II Div 1 (Zone 20)
Point Source Filters	NFPA	●		●				Class II Div 1 (Zone 20)
Bucket Elevators	NFPA	●	●	●	●	●		
Conveyors	NFPA	●	●	●				
Bulkweighers	NFPA	●		●				Class II Div 1 (Zone 20)

### 1.7 - Exiting and Firefighting Measures

- **Exits** are provided in accordance with the National Building Code, with consideration given to the special and unusual nature of the facility, and low occupancy loadings. Elevated or subgrade areas are provided with a primary access and egress via stairs with a secondary emergency escape ladder.
- **Portable Fire Extinguishers** are provided as required by the National Fire Code and the Authority Having Jurisdiction.
- **Heat detectors** are provided in the Main Control Building, Server Rooms (located in the Main Control Building and/or Administration Office), and MCCs. Heat detectors will trigger a local alarm.
- **A Dry Standpipe** is provided for fire department use on the transfer tower. Standpipe is provided with connections for fire department pumper at the bottom, and fire department hose at the top.
- Current shiploading operations at the JV Shed utilize conveyor belts to load ships similar to new shiploaders, thus no new **International Shore Connection** is contemplated.

# Fraser Grain Terminal

## Fire & Explosion Plan

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- **A fire hydrant** loop around the FGT site will provide water supply to Fire Departments for firefighting. No additional hydrants are being added to the shiploader/berth area. See Appendix 4e – ISL Drawing 32022-C-16.
- **Dust Filters** serving multiple pieces of equipment are installed at ground level for firefighter access. Point source dust filters serving a single piece of equipment are mounted on the equipment, with no provision for automatic fire suppression. All dust filters are interlocked with the conveyance equipment to ensure dust control is operating during any material handling activities. All dust filters are fitted with pressure monitors reporting back to the PLC, to ensure proper operation of the filters.

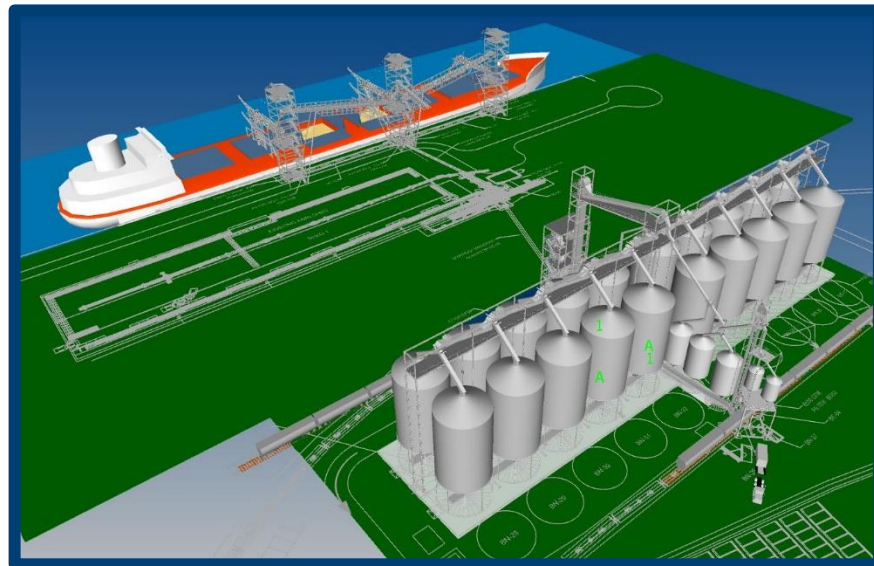




# FRASER GRAIN TERMINAL

## Preliminary Dust Hazard Analysis

Parrish & Heimbecker Limited  
Fraser Grain Terminal Project  
May 28, 2018  
FWS Job # 08-17-115C  
Revision 6



The Confidence Builders

# **Fraser Grain Terminal**

## **Preliminary Dust Hazard Analysis**

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# **TABLE OF CONTENTS**

- 0. EXECUTIVE SUMMARY**
- 1. PRELIMINARY DUST HAZARD ANALYSIS**
  - 1.1. Process Equipment**
  - 1.2. Buildings and Operating Areas**
  - 1.3. Preliminary DHA Summary**

# Fraser Grain Terminal

## Preliminary Dust Hazard Analysis

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### 0. EXECUTIVE SUMMARY

A preliminary Dust Hazard Analysis (DHA) has been completed to establish design parameters for the project. This preliminary DHA reviews the process equipment and buildings, identifies the location of fire and explosion hazards, and indicates how these hazards are mitigated. Results of the preliminary DHA are summarized in a table. A detailed DHA will be performed by a fire protection engineer prior to proceeding to detailed design.

The Fraser Grain Terminal (FGT) is designed to handle wheat, barley, oil seeds and pulses. All of these products are combustible, and their grain dust can be explosive when suspended in sufficient concentration. Of these products, wheat will be the product most commonly handled, and wheat dust is the most explosive type of dust. The preliminary DHA, and the design of fire and explosion mitigation measures, is based on wheat dust.

Grain dust becomes airborne when grain falls through the air or is agitated. In this facility, the primary locations for grain dust generation are: rail car hopper discharges, bucket elevator inlets, belt conveyor discharges and shipping spout discharges.

# Fraser Grain Terminal

## Preliminary Dust Hazard Analysis

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### 1. PRELIMINARY DUST HAZARD ANALYSIS (DHA)

#### 1.1 - Process Equipment

##### Rail Receiving Hopper:

Potential Dust Hazard:

- Dust is generated when grain falls from railcar hopper discharges, through a grating and into the receiving hopper.

Dust Hazard Mitigation:

- Gravity dampers are provided on the grating to minimize dust rising from the hopper into the building.
- Dust collection is provided within the receiving hopper.

##### Belt Conveyors:

Potential Dust Hazard:

- Dust is generated at conveyor discharges as grain leaves the belt and falls

Dust Hazard Mitigation:

- Fully enclosed to prevent fugitive dust release
- Dust collection is provided at conveyor discharges
- Possible ignition sources are monitored for overheating: bearings, motors and misaligned belts
- Discharges are monitored for plugging to prevent overload
- Self-cleaning and reloading tail sections to prevent carryback material buildup

##### Bucket Elevators:

Potential Dust Hazard:

- Dust is generated at bucket elevator inlets as grain is agitated by the buckets

Dust Hazard Mitigation:

- Fully enclosed to prevent fugitive dust release
- Dust collection is provided at bucket elevator inlets
- Magnetic separators remove tramp metal at inlets, to prevent ignition by sparking
- Possible ignitions sources are monitored for overheating: bearings, motors and misaligned belts
- Discharges are monitored for plugging to prevent overload
- Deflagration vents are provided to minimize the effect of any deflagration
- Bucket elevator boots are fitted with cleanout gates to prevent buildup, and maintained as part of housekeeping program

# Fraser Grain Terminal

## Preliminary Dust Hazard Analysis

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### Bulkweighers:

Potential Dust Hazard:

- Dust is generated at top of bulkweigher, by grain falling into the upper garner and by internal venting from the weigh hopper and lower garner

Dust Hazard Mitigation:

- Internal hoppers and garners are internally vented to the upper garner to limit fugitive dust emissions
- Dust collection is provided at upper garner bulkweigher inlet vents

### Dust Collection Systems:

Potential Dust Hazard:

- Dust collection systems maintain sufficient airflow to keep airborne dust below an explosive concentration until it reaches the filter

Dust Hazard Mitigation:

- Dust concentration within dust filters will reach explosive concentration
- Deflagration vents are provided to minimize the effect of any deflagration
- Backdraft dampers and rotary valves provided to prevent any deflagration from propagating through the dust collection system and other equipment
- Fans, filters and associated equipment are fitted with hazard monitoring devices such as hot bearing sensors and speed sensors

### Storage Bins:

Potential Dust Hazard:

- Dust is generated as grain falls from the conveyor discharge into the bin, but it is impracticable to provide dust collection because the height of the grain pile is constantly varying

Dust Hazard Mitigation:

- Bin roof panels are designed to blow out in a deflagration to prevent structural damage and direct the blast upward
- Bins are passively vented.

### Shipping Spouts:

Potential Dust Hazard:

- Dust is generated at spout discharges as grain falls in to the receiving ship, container or truck

Dust Hazard Mitigation:

- Bulk ship, rail and truck loading will use telescoping cascade chutes or choke fed dust suppression spouts
- Spouts are retractable, to reduce the height of drop as much as possible, generally to less than 1m in drop height
- Dust collection is provided at both container loading spout discharges

# Fraser Grain Terminal

## Preliminary Dust Hazard Analysis

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### 1.2 - Buildings and Operating Areas

Rail Unloading Building:

- Rail receiving building is left open to atmosphere at both ends, to prevent any fugitive dust from reaching explosive concentration

Receiving Tunnel, Boot Pit & Transfer Conveyor Tunnel:

- All equipment in these locations is fully enclosed, with dust collection provided
- These areas are classified as Zone 22 hazardous locations, and all electrical equipment in these areas is certified to this standard
- A small central vacuum system is provided for regular housekeeping in these areas

Transfer Tower, Ship Loading Towers, Conveyor Galleries, Rail/Truck Loading Structure:

- All of these areas are open to atmosphere, to ensure fugitive dust does not reach explosive concentration
- A dry standpipe is provided on the Transfer Tower to enable fire fighting

Administration Building, Maintenance Building and Sample Storage, MCCs & Container Control Booth:

- No dust is generated in these buildings, and no significant accumulation of grain dust is expected
- No special mitigation of grain dust in these buildings
- Although not required, heat detectors, connected to local fire alarms, are provided for the control room, motor control centres (MCCs) and server rooms

