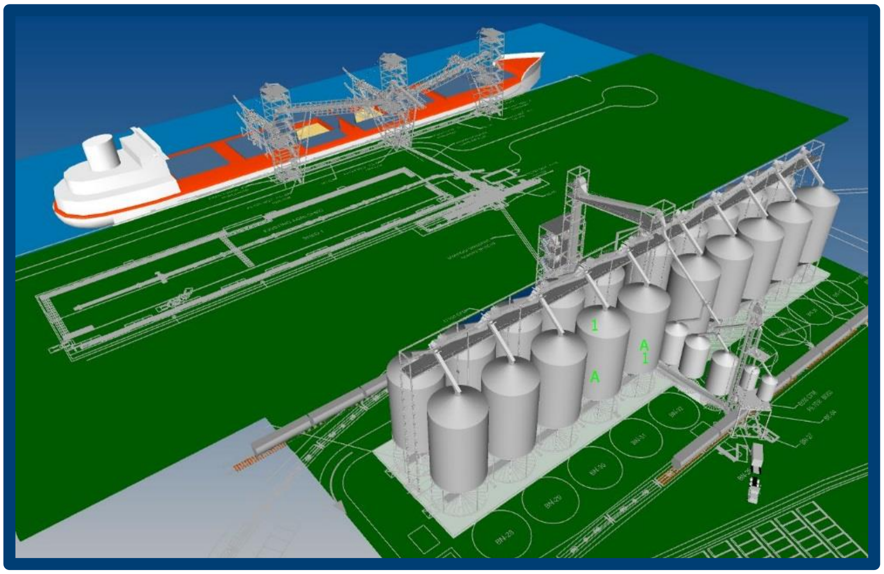
FRASER GRAIN TERMINAL

BATNEC Report

Parrish & Heimbecker Limited
Fraser Grain Terminal Project
July 3, 2018
FWS Job # 08-17-115C
Revision 13



The Confidence Builders

TABLE OF CONTENTS

0- EXECUTIVE SUMMARY

This report replaces the BATNEC Report submitted as Attachment 12 of the Fraser Grain Terminal Construction Permit Application submitted June 2017 (PER No. 15-041).

The proposed design for Fraser Grain Terminal (FGT) features a streamlined process and optimized layout, which maximizes production efficiency and minimizes project cost, energy consumption and overall dust emissions.

The FWS design meets industry standards for grain handling and export shipping. Fully enclosed conveyances, careful design of loading spouts, and efficient dust collection will ensure atmospheric dust emissions are less than in the previous design.

The rail unloading is based on handling 14-car strings, which is the maximum that can be achieved with the current yard configuration and rail traffic restrictions. The design allows for continuous unloading of entire unit trains in future, after necessary changes to the rail yard configuration. Overall time to unload a 112-car unit trains is less than 8 hours.

Due to constraints on facility placement caused by contaminated soil and car string length, the rail unloading building is located as high as possible to allow rail clearance over the Metro Vancouver Annacis No3 Water Main. Rail car and truck loading are combined into a single structure for increased efficiency and economy.

The FWS design complies with the energy efficiency requirements of the National Energy Code for Buildings (NECB) and the current National Building Code (NBC). The FWS design also minimizes the number and size of motors, for additional energy savings.

Aspects of fire and explosion control which were detailed in the previous BATNEC report are addressed in the Fire and Explosion Plan and the Preliminary Dust Hazard Analysis.

1- GENERAL PLANT DESIGN PHILOSOPHY

The Fraser Grain Terminal (FGT) plant design is focused to:

- Minimize overall plant footprint
- Maintain overall production targets and throughputs
- Minimize impacts on the environment including noise and dust emissions
- Minimize energy requirements.

A consolidation of the overall plant footprint allows the facility to be placed on densified soil near the proposed unloading pit. The ground is densified using Rammed Aggregate Piers (RAP) which are commonly used in the seismic zones, and allow this plant to meet National Building Code (NBC) 2015 requirements.

Galvanized hopper bottom steel bins, on steel support legs, are optimized to minimize the number of bins while providing the required storage capacity:

- 20 -3,500 MT silos
- 4 – 400 MT silos
- 1 – 700 MT silo

The design minimizes the number of pieces of conveying equipment, while ensuring that each has flexibility to perform multiple functions. Reducing the amount of equipment leads to:

- Fewer noise emission sources
- Reduced overall power requirements
- Fewer dust emission sources

The Fraser Grain Terminal includes design provisions to contain and collect grain dust and minimize fugitive emissions. Provisions for prevention and mitigation of grain dust explosions are explained in detail in the Fire and Explosion Plan and Dust Hazard Analysis submitted as Appendices to the Permit Application.

2- MATERIAL HANDLING EQUIPMENT

The FWS design uses economical standard equipment designs, which can be used effectively with dust control measures. Dust control measures are described in Section 3 - Dust Control.

FGT will have all electrically operated equipment, except for three individual pieces of equipment with their own hydraulic operating systems. The number of dust filters is minimized, which results in a smaller compressed air requirement.

3- DUST CONTROL

3.1 – FILTER TYPES & APPLICATION

All conveyors and bucket elevators will be fully enclosed and sealed to prevent grain dust emissions. Dust, which is typically generated at bucket elevator inlets and belt conveyor discharges, is removed from the enclosed equipment using dedicated dust collection systems maintaining a slightly negative air pressure inside the equipment whenever it is operating. Grain dust collected in this way is returned to the product stream in compacted form.

Where bucket elevators and conveyors are located together, they are efficiently served by central baghouse filter systems. Where this is not practical, individual pieces of equipment are served by point-source filters, either pleated or baghouse type, mounted directly on the equipment. All dust filter fans are equipped with silencers to minimize environmental noise.

3.2 – POTENTIAL DUST SOURCES

3.2.1 – RAIL CAR UNLOADING PIT

At the discharge of the incoming rail car, dust can be generated as the falling grain displaces air in the receiving hopper below and rises to create liberated dust. FGT shall have a simple receiving grate and baffle design that encloses the receiving hopper from the air, where grain flowing down into the hopper opens only the baffle seeing grain, keeping no other area for displaced air and dust to escape. This simple design is in use in many facilities across Western Canada. The receiving pits shall each be connected to a dust control system to ensure these areas are also kept under slight negative pressure to control dust.

3.2.2 – SHIPLOADER DISCHARGE SPOUTS

A common point of dust emissions can be where grain can free fall a long distance allowing the dust to be entrained into the air as the grain and dust laden air exit the spout at the same time. The shiploaders will be provided with telescoping cascade chutes or choke fed dust suppression discharge spouts. Both designs reduce the grain falling speed and allow the grain and dust to exit the spout as a uniform product flow. The shiploader discharge is designed to reduce minimize the height of free fall after the spout, into each hatch, which is critical to minimize dust emissions.

3.2.3 – BULK RAIL & TRUCK LOADING

Rail car and truck loading are combined into a single structure, using a single spout with a dust suppression hopper. This system operates as a choke fed discharge spout that can raise/lower to minimize drop height. Truck loading will represent a very small portion of the activity at Fraser Grain Terminal (approximately 3 trucks/day @ 40 tonnes each).

3.2.4 – CONTAINER LOADING

The Fraser Grain Terminal container loading station will optimize the filling process by tilting containers to 55 degrees above horizontal, with a partial end barrier installed. Dust is minimized by using a low speed loading spout by minimizing the vertical drop. Dust collection is provided at the loading spout discharge.

3.2.5 – STORAGE BIN VENTS

Each steel storage bin is passively vented to allow air to enter the bin during unloading (negative pressure) and exit the bin during filling (positive pressure). The bin vents are designed to ensure velocity is reduced such that grain dust cannot be entrained in the air and carried out of the bin during filling. Each bin inlet will also be fitted with a “deadstop” that reduces grain velocity and allows grain on grain impacts, to reduce breakage and creating less dust before dropping into the bin.

4- NOISE EMISSIONS

4.1 – EQUIPMENT

The handling processes throughout the plant are streamlined to reduce noise by:

- Eliminating shuttle conveyors, which eliminates wait time while shuttles reposition, leading to shorter overall work days.
- Reducing total pieces of equipment in the plant.
- Reducing number of elevated dust filters (main baghouse fans are located at grade)
- All dust fans are fitted with a silencer.
- Selection of a fixed-tower type shiploader eliminates noise generated by shiploader travel completely, and reduces the required start-up and running horn blows significantly

Total number of filters in the FWS design are 24 units, with total airflow capacity of 76,000 cubic feet per minute. It is impossible to have all fans running at the same time.

4.2 – RAIL OPERATIONS

FGT has a single rail unloading building operating on a semi-loop track design. Options for placement of the unloading pit and track are limited by the contaminated soil conditions, and it is necessary for the unloading track loop to be relatively flat to:

- Ensure adequate clearance of the rails above the existing GVRD water line
- Reduce the risk significantly for car string runaways

This design has been optimized to accommodate a single 14-car string on the loop track without interfering with other rail or truck traffic at the adjacent Fraser Surrey Docks (FSD) site. This car string length equates to breaking down the 112-car unit trains into eight 14-car strings.

The proposed batch unloading process, using 14-car strings through the rail unloading building, requires no changes to the existing Port Authority Rail Yard (PARY) currently operated by FSD.

Low emission switching locomotive is a best available technology that could be used to switch rail car strings from the PARY tracks to the FGT Terminal. Low emission locomotives can reduce nitrous oxide emissions by 80% and can reduce carbon dioxide emissions by 50% when compared to diesel powered locomotives. The low emission units also have advanced controls to achieve these potential emission reductions.

Diesel powered switching locomotives for FGT are owned and operated by FSD. The FSD existing infrastructure and economics are drivers behind this decision for the project. An electric rail car indexer is used to advance the cars over the unloading pit to reduce locomotives operating under load for multiple hours per day.

In the future, a full loop track is possible by making changes to the PARY and allowing the FGT rail unloading building to accommodate continuous unloading. The continuous processing method is optimized for noise, air emissions, and speed. Theoretically, having a single rail movement in one direction and moving at a continuous speed virtually eliminates knuckle slap.

In the long term, these side effects will be mitigated by implementing continuous rail car unloading, in which an entire 112-car train will be moved through the rail unloading building by the locomotive. In this process, it will not be necessary to decouple the train into shorter strings of cars, and then recouple them for departure. Future continuous unloading will eliminate the locomotive accelerations and knuckles slaps associated with uncoupling and recoupling.

The following table shows features of the rail operation:

	Rail Features	Current Design
1	Break up incoming unit train in the PARY into car strings ready for unloading	Required
2	Length of car strings to be handled on FGT Semi-loop track	14 cars
3	Incoming semi loop track radius of curvature.	9 degrees
4	Outgoing semi loop track radius of curvature	11 degrees
5	Recombination of empty car strings into a complete train ready for departure in the PARY	Required
6	Time required to unload a 112-car train	7.5 hours
7	Number of car strings to pull through the unloading station per day based on 112 cars	8 strings
8	Number of locomotive moves	• Approx. 50 • Some with full cars, some with empty cars

5- PLANT LAYOUT AND FOUNDATIONS

Physical layout of the Fraser Grain Terminal has been arranged to minimize excavation and drilling in contaminated areas. The existing Bekaert building slab will be removed and a Rammed Aggregate Pier (RAP) ground improvement design to be used underneath the main bin structure will:

- Minimize soil removal due to ground improvements
- Improve soil bearing capacity
- Minimize lateral spread during liquefaction events
- Limit mobility of existing contamination plumes within densified areas
- Achieve design compliance with National Building Code 2015

A densification berm using RAPs located on the land side of the existing dock area will provide:

- Minimize lateral spread during liquefaction events

The steel storage bins with steel storage hoppers are a conventional and proven method to safely store grain in a cost-effective manner. The use of storage bin roofs for deflagration venting will be used in this design, while a maintaining the primary structure of the bin walls.

6- VISUAL IMPACTS

FGT is designed using galvanized steel members to create open galleries above grade to support the totally enclosed process equipment. Galvanized steel storage bins shall provide a uniform matching color throughout. The steel superstructures and the area underneath the bins shall be open to allow a less imposing look than a slipform concrete terminal. The three, fixed tower shiploaders are approximately 3 meters shorter than a comparable traveling shiploader design thus providing a less imposing view when viewed from the West.

7- ENERGY EFFICIENCY

7.1 – NATIONAL ENERGY CODE COMPLIANCE

The Fraser Grain Terminal will be designed and built to comply with applicable requirements of the National Energy Code for Buildings (NECB) and National Building Code (NBC) Article 9.36. This includes specific energy efficiency requirements for building envelopes, lighting, HVAC systems, service water systems, electrical systems and electric motors.

7.2 – ELECTRICAL SYSTEM & LIGHTING

The plant power will be supplied by a new electrical substation and transformers providing 3-phase, 60 hz, 600 VAC power. The new substation will be designed to meet current electrical codes, and have a much smaller overall power demand than the previous tenant and plant.

Exterior lighting for the facility shall be LED fixtures, with distribution control to limit stray lighting. Minimum area lighting of the exterior yard and plant areas shall be controlled by photocells, and most of the facility shall be controlled such that full lighting is only engaged as needed for operations and maintenance.